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A REVIEW ON DIFFERENT FOREST ECOSYSTEMS

Meenambiga Setti Sudharsan*, S. Sruthi Surya, Sowmya Hari and Sakthiselvan Punniavan

Department of Bio-Engineering, School of Engineering, Vels Institute of Science, Technology and Advanced Studies (VISTAS), Chennai-600117, Tamilnadu, India

ABSTRACT

In nature, an organism does not exist in isolation. It is linked to its organisms and those from other ecosystems/communities in the area. The Physico-chemical environment makes up habitat. A forest is a highly organized system. The dominating elements are plants, particularly trees, which form a canopy cover and serve as habitats for the forest's key constituent species and animals. The forest's multi-layered structure, which results from varying amounts of sunlight reaching the understory layer, is linked to many life types. A community that is generally self-contained can be classified as an ecosystem. As a result, a forest ecosystem is unique with discrete limits. We will be able to observe clearly where the forest ecosystem begins and ends. Various types of forest ecosystems can be identified all around the world. New generations of trees and bushes fill these gaps and clearings. As a result, the forest produces patches of various-aged vegetation with trees of all sizes and compositions. Naturalists can interpret the history of the land by looking at the mosaic of plants that develop in a forest.

Keywords: Forest, Ecosystem, Plants, Animals, Environment

FOREST ECOSYSTEM

Animals rely on plants for food and shelter, whereas microorganisms rely on dead organic matter from plants and animals for food and release minerals bound to the organic matter for plant reuse. If the organism is a plant, it grows in two environments: the aerial environment for light, temperature, and carbon dioxide, and the soil environment for inorganic nutrients and water. [1].

Continuous and causal interactions occur among species and between organisms and their environment, resulting in an integrated functioning unit known as an ecosystem. When all of these interactions happen in a forest, it is referred to as a forest ecosystem [2]. A forest ecosystem is a group of plants and animals that dwell in a specific area and interact with their surroundings' chemical and physical characteristics. An example of a forest ecosystem is the Amazon rain forest ecosystem. Many plant and animal species, including producers, consumers, and decomposers, live in this ecosystem. For their survival, these species are entirely reliant on one another.

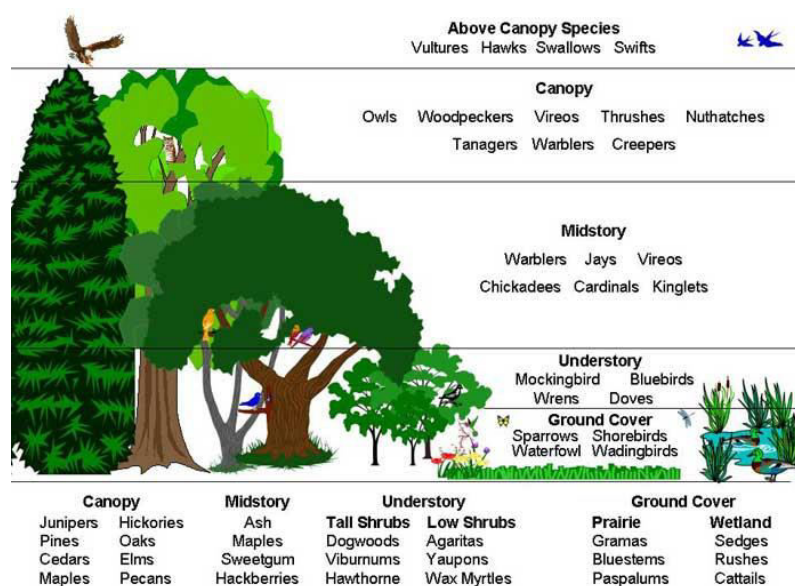


Figure 1: Forest Biome Ecosystem [3]

Forests are more than just a collection of living and nonliving things that happen to be in the same area at the same time. As food chains of interdependence, their numerous components are linked. Energy, water, carbon, air, and nutrients are moved through various links and processes in food chains. Producers—organisms that produce energy; Consumers—organisms that consume producers and other consumers; and Decomposers—

organisms that consume producers and consumers while also providing nutrients to the soil—make up all food chains [4]. The following is an example of how to apply the system above to a simple real-world scenario: grass is a producer (produces energy from the sun and nutrients) Deer as a consumer (eats grass) Worms are decomposers (eats deer, creates nutrients from which grasses can grow).

The forest receives its energy from the sun. Photosynthesis is how trees and other plants (producers) convert the sun's energy into glucose (sugars). Plant-eating creatures like caterpillars, chickadees, deer, and predators that consume animals like coyotes, woodpeckers, and spiders obtain their energy from other living things. Sowbugs, fungi, and bacteria are decomposers who receive their energy from dead plants and animals [5]. A food web is a collection of interconnected food chains. Every group of individuals, connections, or processes that interact and depend on other individuals, relationships, or procedures is referred to as a system. While each system is dependent on the others, the web adapts and adjusts flexibly when change occurs (as it always does).

Natural cycles carry oxygen, carbon dioxide, water, and nitrogen through the forest. Energy from the sun stimulates photosynthesis in plants, creating oxygen and carbon dioxide (from the air) and water (from the soil). Plants and animals then breathe oxygen while exhaling carbon dioxide and water. Water travels from the sky to the earth and back, frequently taking days, months, or years through lakes, rivers, groundwater reservoirs, and living creatures. Soil, water, air, and living beings cycle nitrogen and other nutrients [6].

As you can see, many cycles overlap and rely on one another to maintain equilibrium. In the forest, everything is connected to everything else. That means that changing just one aspect of the system is impossible. Whether deliberate or unintentional, any change will have repercussions across the ecosystem.

However, a forest ecosystem is more than just the forest habitat. It's also about the creatures that live in the woods. Birds, for example, build their nests in the forest's trees, fungi grow on the forest floor, and a variety of insects and mammals make their homes in the forest.

ANATOMY OF A TREE:

- A: The tree's outer bark protects from the elements. It helps keep moisture in the rain and prevents the tree from losing moisture when the air is dry since it is constantly regenerated. It protects against cold and heat, as well as insect pests.
- B: The inner bark, or "phloem," serves as a conduit for food to reach the rest of the tree. It only survives for a brief time before dying and transforming into the cork, which becomes part of the protective outer bark.
- C: The cambium cell layer is the trunk's growing component. In reaction to hormones that flow down via the phloem with food from the leaves, it creates new bark and wood every year. These hormones, known as "auxins," promote cell development. Leaf buds at the ends of branches develop auxins as soon as they grow in the spring.
- D: Sapwood is the tree's water pipeline transporting water to the leaves. Sapwood is a type of fresh wood. Inner cells lose their vitality and change to heartwood as new sapwood rings are set down.
- E: The tree's heartwood is the primary, sustaining pillar. It will not degrade or lose strength while the outer layers are intact, despite being dead. It's made up of hollow, needlelike cellulose fibres bonded together by a chemical glue called lignin, and it's stronger than steel in many ways. Set vertically, a piece 12" long and 1" by 2" in cross-section can carry a weight of twenty tonnes!

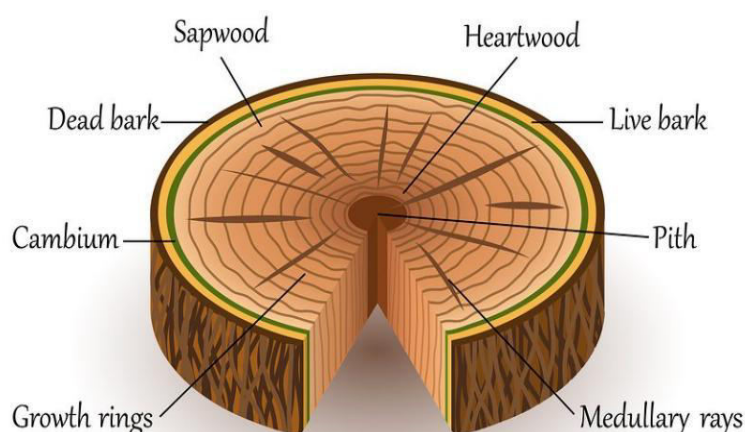


Figure 2: Structure of a tree trunk [7]

The fact that leaves provide sustenance for the tree reveals their shapes. A Douglas fir's short needles, for example, can expose up to three acres of chlorophyll surface to the sun. Many broad leaf feature lobes, leaflets, and sharp edges that can be useful [8]. They aid in the evaporation of water utilized in food production, minimize wind resistance, and even create "drip tips" to remove rain that would otherwise rot the leaf if left standing.

TYPES OF FOREST ECOSYSTEM

1. Tropical Rainforest

The Amazon, for example, is home to some of the world's most bio diverse ecosystems. Rainforests are especially abundant in India's north-eastern region. In addition, tropical rainforests can be found in India in places like Assam, the Andaman and Nicobar Islands, and the Western Ghats, among other sites [9]. Rainforests are humid in the interior, not just because they are often built near rivers. Water drips from the trees, and humidity is kept at bay in the forest because of thick canopies of leaves. Beautiful flowers, birds, and insects, as well as a few uncommon creatures, can be found here.

Tropical rainforests have the most significant diversity of species of any habitat on the planet. They can be found near the equator between 23.5 degrees N and 23.5 degrees S latitude. Temperatures in tropical rainforests are consistently between 68 and 77 degrees Fahrenheit throughout the year. In these woods, winter does not exist. Rainfall averages 100 inches per year in most tropical rainforests. In tropical rainforests, decomposition occurs rapidly due to the warm temperature and wet air. High rainfall levels frequently cause nutrient leaching from the soil, resulting in nutrient-depleted soils. Tropical rainforest trees are typically broad-leaved and grow to reach between 82 and 115 feet tall. Ferns, vines, mosses, palms, and orchids are among the other vegetation. In tropical rainforests, densely grown trees provide a high canopy layer that prevents sunlight from reaching the forest's lower strata. This means that most of the animals that live here have evolved to live in the trees [10]. Tropical rainforests are home to a wide range of birds, bats, monkeys, snakes, and other species. Unsustainable forestry methods are the greatest threat to tropical rainforests. Road construction, land clearing for agriculture and other economic activities, and climate change are all threats.

2. Temperate Deciduous Forest

The Eastern United States and Canada, Western Europe, Russia, China, and Japan are all locations. Temperate deciduous forests have four seasons, with precipitation falling throughout the year as rain in the spring, summer, fall, and snow in the winter. Rainfall in temperate deciduous forests ranges from 30 to 60 inches per year [11]. In these forests, the soil is highly productive. Mosses, ferns, and wildflowers grow on the forest floor in temperate deciduous forests, and shrubs and ferns grow in the understory. The deciduous trees that dominate these woodlands include maple, oak, and birch trees. Evergreen trees, such as pines and fir, are also limited numbers. Animals that live in temperate deciduous forests must withstand the harsh winters. Red foxes, hawks, woodpeckers, and cardinals are common species in temperate deciduous forests. The most serious hazard to temperate deciduous forests is acid rain generated by industrial and traffic emissions. Acid rain destroys tree leaves over time, causing plants to produce fewer and smaller seeds and lowering disease resistance [12]. Unsustainable forestry, strip mining, and the expansion of invasive, non-native species that compete for space and food are among the other dangers. Climate change poses concern as well.

3. Temperate Coniferous Forest

Temperate coniferous forests can be found in coastal places with moderate winters and abundant rainfall or highland areas with mild climates. Pacific Northwestern United States and Canada, southwestern South America, Southern Japan, New Zealand, and small sections of northwestern Europe are examples of these woods (Ireland, Scotland, Iceland, and Norway). A temperate climate with slight variation in temperature throughout the year. A wet environment and a long growing season are caused by high quantities of precipitation (50-200 inches per year). Most soils have a heavy layer of rotting material on top of them. Evergreen conifers dominate these woodlands. The long growing season is due to the high precipitation levels and mild temperatures, resulting in trees that grow exceptionally tall [13]. Cedar, cypress, Douglas fir, pine, spruce, and redwood are among the most common tree species in temperate coniferous forests. Some deciduous trees, such as maples, can be found, as well as mosses and ferns. Deer, marmot, elk, black bear, salmon, spotted owl, and marbled murrelet is examples of creatures in temperate coniferous woods. The most severe threats to temperate deciduous woods are unsustainable forestry, road construction, and other development-related activities.

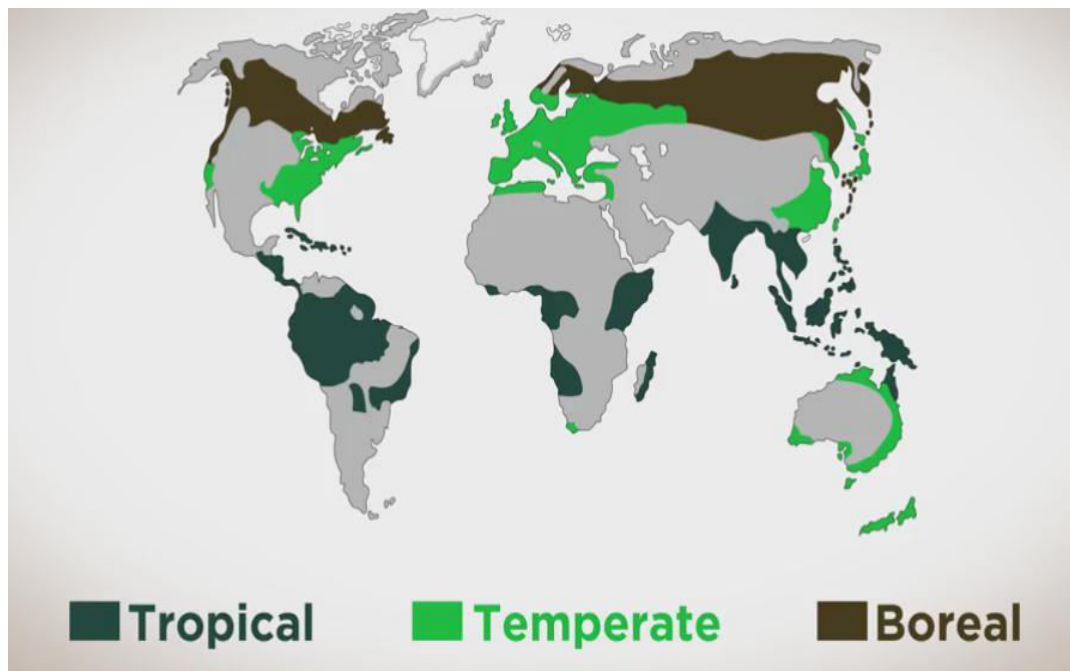


Figure 3: Geographic Distributions of Tropical, Temperate and Boreal Forests [14]

4. Boreal (taiga) Forest

The taiga is the name for the scant woodland that stretches to the world's polar regions, where temperatures can be freezing and harsh. Indeed, many of Taiga's forest ecosystems are arctic or polar ecosystems. This is the most northern forest type, occurring between 50 and 60 degrees north latitude. Canada, north of Asia, Siberia, and Scandinavia are home to boreal woods (Denmark, Norway, Sweden, Finland). Scandinavia is home to almost two-thirds of the world's boreal woods.

Long winters and short summers describe the climate of boreal forests. The majority of the precipitation falls in the snow, with these forests receiving between 15 and 40 inches of snow every year. Decomposition takes an extended period due to the freezing temperatures, resulting in thin soil [5]. Trees are predominantly evergreen, with species like spruce, fir, and pine among them. Because of the deep canopy, the understory is limited. Animals found here have thick coats and must be accustomed to long, cold winters. Some examples are deer, moose, elk, caribou, snowshoe hare, wolves, grizzly bears, lynxes, and wolverines.

5. Mangroves:

Mangroves are a unique combination of trees and tidal wetlands. Throughout the day, these fascinating forest ecosystems alter dramatically. They are dry for half of the day and are flooded for the remainder of the day, making them home to crocodiles and other swamp species. Because of this, these ecosystems may be among the most active in the world [15].

6. Inland forests:

Many mainland animals and birds can be found here (such as foxes and owls). Inland forests can be large and ancient or small and intimate, like copses.

7. Lakeside forests:

These forest habitats are home to waterfowl and other aquatic creatures. The types of species that live in these forest habitats reflect the fact that they are humid.

8. Mountain forests:

Mountain forests (such as mountain pines) contribute to creating distinct ecosystems. Take, for example, India's Himalayan mountain forests [16]. The creatures that live in forest ecosystems at the summit of mountains are well suited for life in severe environments because the peaks of mountains are typically cold and stony.

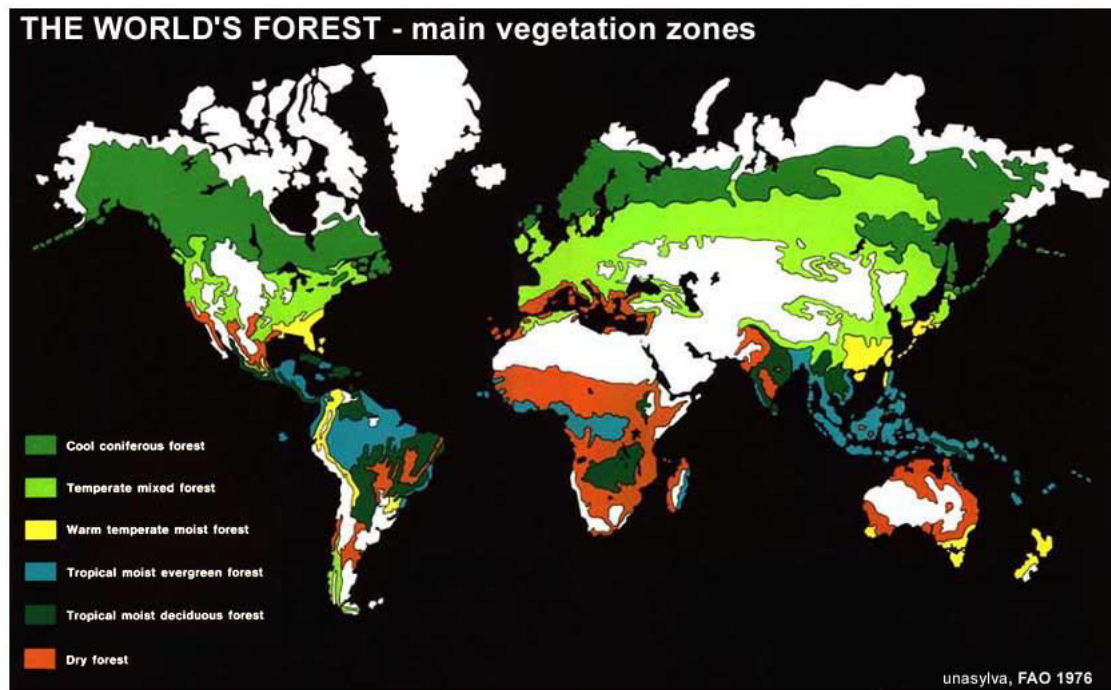


Figure 4: Geographic Distribution of Types of Forest [17]

Characteristic Features of Forest Ecosystems

Forest ecosystems are vibrant and diverse, with a plethora of thrilling and fascinating characteristics. A discussion of some of the essential elements of these ecosystems may be found below.

1. Seasonality: Forest ecosystems in nations with seasonal climates will alter with the seasons.
2. Deciduous or evergreen: A forest can be deciduous (that is, it loses its leaves in the winter) or evergreen (that is, its leaves remain green and intact all year), or it can be a combination of both.
3. Multiple levels: Some forest ecosystems, such as rain forests, have multiple levels, such as the forest floor, lower canopy, upper canopy, and treetops.
4. Bird-friendly: Many bird species nest in treetops, making forest ecosystems appealing to birds.
5. Attractive to insects: Because many insects reside in tree bark, leaf mulch, or flowers, forest ecosystems are particularly attractive places to inhabit [18].

COMPONENTS OF A FOREST

1. Vertical Structure – Vegetation Layers

The forest's vertical structure is divided into distinct levels, adapted to increasingly filtered sunlight as one progresses from top to bottom. The canopy, understory, ground layer, and forest floor are the layers that make up the forest. Each stratum isn't found in every forest. Extreme ecosystems, such as very shadowed woodlands, boreal forests, and heavily flooded woodlands, generally have fewer layers [19]. A woodland's canopy is its top stratum. It is made up of dominating and supporting tree species. These tallest trees provide shade and influence the microclimate of the layers underneath them. Below, the forest community is generally chilly and damp under a deep, continuous canopy of sugar maple and basswood. The microclimate is warmer and dryer beneath an open canopy of oak or pine trees. Shade-intolerant canopy species may regenerate where light is introduced into the understory [20].

The next layer is the understory. It symbolises the middle layer and adds shading to the layers below it. Subcanopy and shrub-seedling strata can be found in the understory. Ironwood, chokecherry, serviceberry, mountain maple, hop-hornbeam, and younger individuals of canopy species are among the small trees that make up the sub-canopy. Woody plants with many stems, such as dogwoods, viburnums, elderberries, blueberries, and raspberries, make up the shrub and seedling layer [21]. Immature offspring of shade-tolerant canopy species are also included in this tier. With the loss of the mature trees above, these saplings and seedlings may take their position in the canopy. Many woodland breeding birds live in the understory, providing plentiful food for wildlife.

The forest floor is where the ground layer is. This layer comprises wildflowers, sedges, ferns, grasses, creeping shrubs, horsetails, liverworts, and mosses. Many woodland herbs have evolved to thrive in low-light, shaded areas and cannot survive direct sunlight. Other woodland plants, known as ephemerals, responded by overgrowing and blooming early in the spring before the canopy leaves and casts the shadow. Another adaptation is growing in colonies and having broadleaf surfaces to catch the sunlight [22]. Ferns, mayapple, and wild ginger are examples of these plants. It may take years for the soil to become suitable and the light intensity to be reduced sufficiently for many of these species to thrive when recovering a woodland.

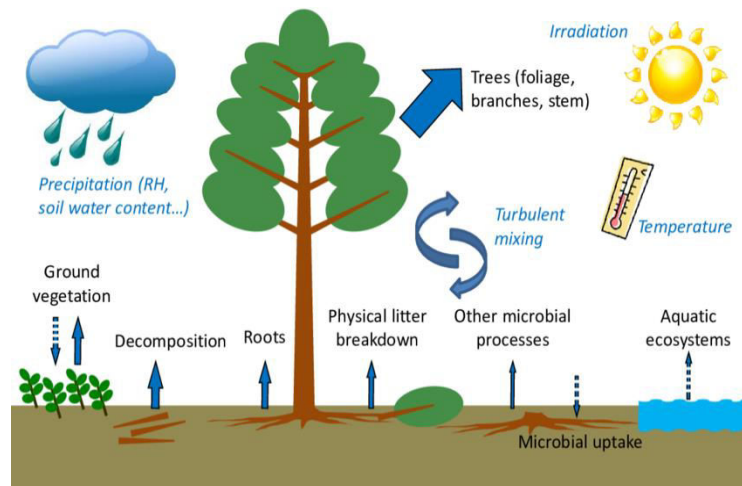


Figure 5: Components Contributing to the Total VOC Flux from Forest Ecosystems [23]

The forest floor is underneath your feet. Litter, humus, and topsoil make up the very bottom layer—trees, leaves, and branches in various stages of decomposition litter the forest floor. A varied community of species calls this place home [1]. Microscopic soil bacteria, fungus, nematodes, worms, insects, millipedes, and other minute organisms break down organic detritus and mix it with soil to create humus. Their almost invisible presence is essential for forest nutrient recycling and growth.

2. Horizontal Structure

Species composition and distribution can differ dramatically from one location to the next. These horizontal patterns in a forest are influenced by environmental gradients such as moisture, drainage, slope, slope aspect, soil type, and light intensity. Ecologists refer to the changes in species composition over an ecological gradient as a vegetational continuum. Other variables that affect the distribution and design of species include holes in the canopy caused by individual trees dying of old age, disease, lightning strikes, storms, seed availability, massive clearings caused by extensive insect and disease damage, and fire destruction [24].

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A STUDY ON CONTROLLING AND MONITORING THE GREENHOUSE EFFECT USING IOT FOR INDIAN FARMING

¹Jaytee Rathore and ²Dr. Mukesh Tiwari

¹Research Scholar and ²Professor, SSSUTMS, Sehore (M.P.), India

ABSTRACT

In any country, all the factors which are necessary to develop a solid economy are centered around an important sector and that is agriculture. This sector plays a very important role in the economic development. But there are so many hurdles for this sector that hinder its true potential. Some of them are dependency on weather, lack of land area suitable for farming, political ignorance etc. So considering all these now a days, greenhouse farming is gaining popularity among farmers. Internet of Things (IoT) is one of the promising technologies, which can be used for connecting, controlling and managing intelligent objects which are connected to the Internet using various protocols and means. The IoT plays a significant role in the field of greenhouse effect in which the farmers in the rural areas will be benefitted by automatic monitoring and control of greenhouse environment. It helps in reducing the direct supervision of the farmer. In this paper we present the review of literature work done by the various researchers in the field of greenhouse autonomous system and their application, also discusses the green IoT and their component.

Index Terms— Green IoT, Literature Survey, Applications, Energy consumption.

1. INTRODUCTION

Agriculture in India is still carried out in conventional way and lags behind in integrating modern technologies. Around 55 percentage of Indian population has been engaged in agriculture and allied activities which constitute only 15 percent of GDP so it becomes much important for the stakeholders involved to come out of the conventional agricultural practices and modernize the agriculture using technology. The economic contribution of agriculture to India's GDP is steadily declining with the country's broad-based economic growth while large

number of people continues to work in agricultural sector. Hence, there is an immediate need to improve the system, which can increase the yield and produce healthy organic food. To grow and expand, any IoT-based system requires a huge number of sensing devices, processing components, and communication technologies. Even if sensing and processing devices are powered by batteries, any IoT-based system requires a vast number of sensing devices, processing elements, and communication technologies to extend and evolve. Furthermore, the communication devices must be capable of delivering an uninterrupted connection for the system's QoS. Physical objects are seamlessly integrated into the Internet of Things' information network, allowing them to participate actively in business processes [1]. As a result, data on their current state, the surrounding environment, production, and maintenance activities with scheduling, as well as much more, may be sent. Before the IoT aim can be realised, however, various major difficulties must be tackled, and both technological and societal knots must be untangled. The main concerns are how to establish full interoperability across networked devices and how to give them with a high level of smartness by allowing them to act in ways that are safe and secure for users [2]. On the other hand, rising energy prices, growing ecological awareness, and shifting customer preferences toward greener products enable people to make spontaneous decisions to prioritise green manufacturing and energy-efficient production practices [3]. As a result, the components of an IoT system must place a higher emphasis on energy efficiency. This paper will examine current research and efforts being taken by existing researchers to build energy efficient IoT systems. According to the United Nations Sustainable Development Goals agenda [4], energy efficiency is one of the most important drivers of long-term development.

Energy efficiency also saves money by lowering the cost of fuel supply and imports, as well as the cost of energy generation and emissions from the agriculture industry. Improving energy efficiency and having more optimum energy management requires a compelling analysis of real-time data in the energy supply chain. [5].

2. OVERVIEW OF GREEN IOT

The Internet of Things (IoT) is a worldwide, invisible, immersive, ambient communication network and computing environment based on cameras, smart sensors, databases, software, and data centres in a global information fabric system [6]. The study in [7] used the Internet of Things to create a green campus environment that was energy efficient. Despite the evidence shown in [7], IoT elements were examined in [8], which demonstrated the benefits of IoT design in terms of how to develop a green campus by leveraging

sophisticated technology intelligently and efficiently. In [9], the authors outlined precise technical directions for achieving a future green internet.

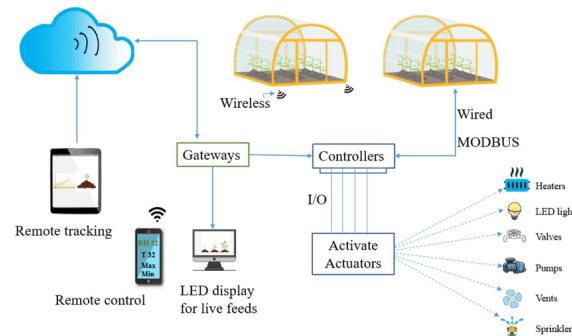


Fig.1 : Greenhouse system for smart IoT

Green IoT focuses on lowering IoT energy consumption, which is necessary for achieving the smart world's sustainability and lowering CO₂ emissions. Green IoT entails both design and implementation. Green IoT design features include designing computing hardware, communication protocols, energy efficiency, and networking topologies [10], as depicted in Figure 1. The goal of utilising the IoT element is to minimise or eliminate CO₂ emissions, reduce pollution, and improve energy efficiency. Uddin et al. [11] notwithstanding prior evidence presented the techniques for enhancing the energy efficiency and reducing CO₂ for enabling green information technology.

M2M can communicate with each other and perceive the world since it is equipped with sensors and communication add-ons. Sensors, on the other hand, will use a lot of power to do the duties. Green IoT attempts to determine the location of the relay and the number of nodes that meet energy and financial limitations in networking. Green IoT plays a vital role in deploying IoT to reduce energy consumption, CO₂ emissions [12], and pollution [13], exploit environmental conservation, and minimise power consumption [12] in order to achieve a smart and sustainable world.

Green IoT becomes more efficient as a result of green ICT technologies, which reduce energy consumption, hazardous emissions, resource usage, and pollution. As a result, Green IoT contributes to the preservation of natural resources, the reduction of cost, and the reduction of technology's influence on the environment and human health. As a result, green IoT focuses on green manufacturing, green usage, green design, and green disposal[13].

- Green computing: reducing the amount of energy used by computers and other information systems while also using them in an environmentally friendly manner.
- Recycling discarded computers and other electronic equipment, as well as restoring and reusing outdated computers.
- Energy-efficient design for green IoT sound components, computers, and servers, as well as cooling equipment.
- Environmentally friendly manufacturing: producing electronic components, computers, and other related subsystems with little or no environmental impact.

Components of Green IOT

Green IoT mainly has communication technologies like Green RFID [14], Green WSN [15], Green CC [16], Green M2M[17], Green DC[18]. CC is for cloud computing, M2M is for machine to machine and DC is Data Centres.

- Green Internet Technologies Green Internet Technologies requires special hardware and software which are specifically designed to consume less energy without reducing performance while minimizing utilization resources.
- Green RFID Tags RFID tags can store data or information at small level for any objects with which these are linked. RFID transmission requires a few meter range of RFID systems. One type of RFID tag i.e. Active tags have built-in batteries for continuous transmitting their own signal while another type i.e. Passive tags don't have an active battery source. They store energy from the reader. Reducing the size of an RFID tag can help in reducing the amount of non-degradable material.

- iii. Wireless Sensor Network for the Environment WSN features a large number of sensor nodes, but they are all low-powered and have limited storage capacity. Green WSN can be done using approaches such as green energy conservation, radio optimization, green routing strategies that reduce mobility energy consumption, and smart data algorithms that reduce storage capacity and data size. Sensors should be activated as needed.
- iv. Cloud Computing That Is Environmentally Friendly. As we all know, services like IaaS, PaaS, and SaaS are available in cloud computing. Hardware and software must be employed in a green strategy in order to reduce energy consumption. Energy-efficient policies must be implemented. Also, technologies based on the Green Cloud Computing Scheme, such as communication and networking, will be used.
- v. DC (green) Data centres are in charge of storing, maintaining, processing, and distributing various sorts of data and applications. Renewable energy resources should be used in the design of data centres. Apart from that, routing protocols should be created to make them energy aware, cut off idle network devices, and incorporate energy parameters into packet routing.
- vi. M2M in the green Because M2M communication involves a high number of machines, there should be energy-saving transmission power and efficient communication protocols, as well as routing algorithms. So that energy can be saved, there should be check passive nodes.

3. RELATED WORK

Kodali et al. (2017) [24] provided a model of a smart greenhouse, which helps the farmers to carry out the work in a farm automatically without the use of much manual inspection. Greenhouse, being a closed structure protects the plants from extreme weather conditions namely: wind, hailstorm, ultraviolet radiations, and insect and pest attacks. The irrigation of agriculture field is carried out using automatic drip irrigation, which operates according to the soil moisture threshold set accordingly so as optimal amount of water is applied to the plants. Based on data from soil health card, proper amount of nitrogen, phosphorus, potassium and other minerals can be applied by using drip fertigation techniques. Proper water management tanks are constructed and they are filled with water after measuring the current water level using an ultrasonic sensor. Plants are also provided the requisite wavelength light during the night using growing lights. Temperature and air humidity are controlled by humidity and temperature sensors and a fogger is used to control the same. A tube well is controlled using GSM module (missed call or sms). Bee-hive boxes are deployed for pollination and boxes are monitored using ultrasonic sensors to measure honey and send mails to the buyers when they are filled. Further, the readings collected from storage containers are uploaded to cloud service (Google drive) and can be forwarded to an e-commerce company.

Jehangir Arshad et al. (2018) [25] devised an architecture consisting of an embedded system and a wireless sensor network that could be employed to monitor the climatic parameters such as humidity, temperature, carbon dioxide, acidity, soil moisture, and light intensity etc. in a greenhouse. This work is accomplished by manually positioning the different sensor nodes in the greenhouse for collection of climate data which is subsequently forwarded to gateway nodes. Gateway nodes are responsible to send this information to the intended user or an agriculture professional via an internet web browser. The received data trigger the proposed embedded system to automatically proceed a decision by executing suitable actions to adjust an agriculture field with climate parameters. For instance, the climate of a greenhouse is controlled by turning on certain devices including fan, water sprinkler, lights etc. The proposed fruitful system is constructed at lab-scale prototype as a witness to proof the reliability, low-cost and efficiency of the proposed design. We consider that the proposed design can be easily implemented at large-scale in future, and will be beneficial for escalation of the profitability, sustainability, and productivity of the agricultural system.

Shreyas Bhujbal (2018) [19] discussed about IoT and how it can be used for realizing smart greenhouse parameters monitoring system using Raspberry pi 3 (microprocessor) and various sensors connected over the internet. The various parameters are monitored and the data can be sent to different devices like PC, smartphones, etc.

Shirsath et al. (2017) [20] focused on the Generic Architecture which can be applied for many other Automation Application. Greenhouse is a building where plants are grown in a controlled manner. Nowadays due to urbanization and lack of land availability there is a great need to construct the Greenhouses which will be reserved mainly for growing crops. With the advancement of technology, we can control and monitor the multiple Greenhouses using IOT from the central location wirelessly.

Nianpu Li (2019) [21] introduced a new design for IoT application on the greenhouse, which utilizes different technologies to present a new model for practical implementation in the IoT concept. This design can settle a

new method to solve problems in Market Demand, Precision in Operation and supervision. Furthermore, this design can be used in many cases and assist farmers, cropper and planted people to develop their business.

Imran Ali Lakhiar et al. (2018) [22] introduced the aeroponics methods of modern agriculture, which is commonly practiced around the world. In the system, plant cultivates under complete control conditions in the growth chamber by providing a small mist of the nutrient solution in replacement of the soil. The nutrient mist is ejected through atomization nozzles on a periodical basis. During the plant cultivation, several steps including temperature, humidity, light intensity, water nutrient solution level, pH and EC value, CO₂ concentration, atomization time, and atomization interval time require proper attention for flourishing plant growth. Therefore, the object of this review study was to provide significant knowledge about early fault detection and diagnosis in aeroponics using intelligent techniques (wireless sensors). So, the farmer could monitor several parameters without using laboratory instruments, and the farmer could control the entire system remotely. Moreover, the technique also provides a wide range of information which could be essential for plant researchers and provides a greater understanding of how the key parameters of aeroponics correlate with plant growth in the system. It offers full control of the system, not by constant manual attention from the operator but to a large extent by wireless sensors. Furthermore, the adoption of the intelligent techniques in the aeroponic system could reduce the concept of the usefulness of the system due to complicated manually monitoring and controlling process.

Arasu Sivagami (2021) [23] proposed an embedded system integrated with sensors based on nanomaterial is for closely monitoring and control microclimate parameters 24 hours a day to maximize production over the whole crop growth season by introducing greenhouse for the cultivation of plants or specific plant species. The system will also eliminate errors in human intervention to optimise production of crops. This system consists of sensors and actuators, an Analogue to Digital Converter (ADC) and a Raspberry Pi. The system will determine whether a defined threshold is passed by any climate parameter and systematically changes via the controller. The current work reduces human input through automated irrigation to optimally utilize a scarce resource, namely water. Climatic parameters for plant growth such as, moisture, humidity, temperature, water pressure in drip pipe, soil salinity etc. are monitored and optimized.

4. APPLICATION OF IOT IN SMART FARMING

Prevent Thefts and Improve Security

Greenhouses with high-value crops are a vulnerable target for thieves. As traditional surveillance networks with CCTVs are expensive to implement, many growers don't have an effective security system in place. In this context, IoT sensors in smart greenhouses provide an affordable infrastructure to monitor door status and detect suspicious activities. Connected with an automated alarm system, they instantly notify growers when a security issue arises.

Building Blocks of a Smart Greenhouse

So, what does it take to implement a smart greenhouse? There are a few key factors you should take into account:

- a) Low-energy, battery-operated sensors to capture various climatic, agronomic and security data points
- b) Reliable, cost-effective wireless connectivity to transmit data from cross-greenhouse sensors to a remote gateway
- c) A diagnostic, machine learning platform to derive intelligence from sensor data and visualizes it on preferred UIs to make informed decisions on farming activities. The platform can also be integrated directly into existing greenhouse control systems to trigger automatic actions on HVAC, lighting, sprinkler and spraying networks.

Dispersed over large geographic areas, commercial-level greenhouse complexes call for long-range wireless connectivity with strong penetration capability. Besides providing reliable data transfer, such a solution allows a gateway to be installed closer to the power source to reduce wire trenching. Scalability is another factor to consider, as it minimizes the number of gateways needed to save on hardware, installation and management costs. Above all, the connectivity must be highly power-efficient so that sensors can sit in for years with minimal maintenance involved.

Maintain Ideal Micro-Climate Conditions

IoT sensors allow farmers to collect various data points at unprecedented granularity. They provide real-time information on critical climate factors including, temperature, humidity, light exposure and carbon dioxide across the greenhouse. This data prompts relevant adjustments to HVAC and lighting settings to

maintain the best conditions for plant growth while driving energy efficiency. In parallel, motion/acceleration sensors help identify doors that are unintentionally left open to ensure a strictly controlled environment.

Enhance Irrigation and Fertilization Practices

In addition to ambient parameters, smart greenhouses enable farmers to stay on top of their crop conditions. This ensures irrigation and fertilization activities are on par with the actual needs of cultivated plants for maximized yields. For example, readings on soil volumetric water content indicate whether crops are under water stress. Likewise, measurements of soil salinity give useful insights on fertilization requirements. Based on this data, sprinkler and spraying systems can be automatically turned on to address real-time crop demands while minimizing manual intervention.

Control Infection and Avoid Disease Outbreak

Crop infection is a persistent farming challenge, with every outbreak taking a heavy toll on the crop margins. Agrochemical treatments are available at hand, but farmers often don't know the best time to apply them. Applications done too frequently raise ecological, safety and cost concerns, while failing to use treatments could lead to detrimental disease outbreaks. With the help of a machine learning platform, data on greenhouse environments, external weather and soil characteristics reveal valuable insights into existing risks of pest and fungi. Leveraging this information, farmers can apply treatments exactly when needed to ensure a healthy crop at the lowest chemical expense.

4. CONCLUSION

The following were the three broad categories they were fall in to such as monitoring , prediction or to controlling the parameters like weather, soil , pest , CO₂ , water level , crop yield, weather , and pest count and control. Some researchers have utilized machine learning Algorithm in their work to make the system intelligent. Green houses are used to protect plants from extreme weather and to grow plants in a controlled environment. This research includes a literature review of the greenhouse automation system for farmers, which enables them to monitor crop activity from anywhere and produce crops properly. Because the data is always sent to the cloud, you have more control over the parameters. We also examine the green IoT, its components, and applications in this paper.

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A STUDY ON INDIVIDUAL AWARENESS & PERCEPTION TOWARDS INVESTMENT IN CRYPTOCURRENCY AND ITS RELATION TO BLOCKCHAIN IN INDIA

Mr. Gunwant Awasthi¹, Pranita Barkul², Drishti Dave³ and Drashti Tanna⁴¹Assistant Professor, Department of Finance, Thakur Institute of Management Studies and Research, Mumbai (400101) Maharashtra, India^{2,4}Student, S.Y. M.M.S, Thakur Institute of Management Studies and Research, Mumbai (400101) Maharashtra, India**ABSTRACT**

This research paper is to analyze the Individual awareness and perception towards investment in cryptocurrency and its relation to blockchain in India. The global financial market is influenced by relatively new technologies like cryptocurrencies namely Bitcoin, Ethereum, Litecoin, etc. Cryptocurrency may be a digital currency which is made for the aim of transaction as a traditional currency. It uses cryptography and Blockchain technology to secure its exchanges and limit the assembly of a specific sort of cryptocurrency and keep track of every transaction in whole network. It's almost a decade that cryptocurrencies are existing in all over world but still its status has not been identified and people are not completely aware about it. Similarly Blockchain, people are just aware about the word, not many know what exactly that technology is. For this study, primary data has been collected from respondents through a specifically formed questionnaire. The data is analyzed through Anova. To know the individual awareness and perception towards investment in cryptocurrency and its relation to blockchain in India, the study has been carried out.

Keywords: Blockchain, Challenges, Cryptocurrency, Individual Awareness, Perception.

INTRODUCTION

Money is something which keeps an excellent value in lifetime of any living person on this planet and its history dates back to ancient time when Gold, Silver and other metal coins were used for purchasing goods.

Actually, before the dawn of Monetary System, the Barter System was the main mode of transaction i.e., people were exchanging goods in exchange of other goods of their specific need or requirements. Gradually, Barter System got replaced by Monetary System and later on different currencies came into existence which was adopted by different countries of the world. The metal coins which were predominantly used for exchange were overshadowed by folding money because it was easy to hold from one place to a different and presence of massive denominations in printed paper form helped big businesses to hold out big transactions.

Gradually, the utilization of money transactions started dwindling thanks to invention of Plastic money by the mid-20th century because it was resolving the safety issues like stealing or theft of carrying large amount of cash. It became easy for people to stay a card made from plastic to use for various transactions rather than keeping huge amount of money.

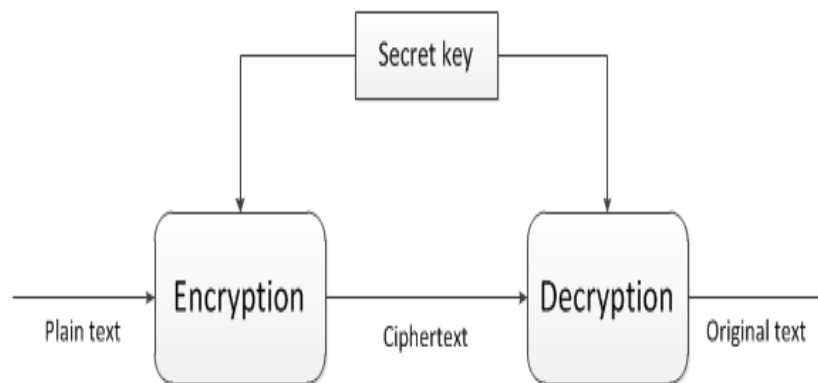
Later on, progressive development of computers and invention of Internet gave birth to Internet banking and thanks to further advancement of mobile technology, we will easily avail the facilities like mobile banking or mobile payment gateways where all transactions are going to be done just through one click in our mobile. Now, we don't need to carry anything but just a sensible mobile and rest are going to be taken care by all the advanced technology.

Till here, we'd like a specific count of money printed or minted by the govt and it'll be kept during a bank through which we feature out all our transactions, which may be a sort of centralized system but now we've gone one step ahead and Decentralized sort of currency has emerged which is getting used in transactions for various purposes, known as CRYPTOCURRENCY.

Cryptocurrency may be a digital currency which is made for the aim of transactions as a traditional currency. It uses Cryptography and Blockchain technology to secure its exchanges and limit the assembly of a specific sort of cryptocurrency and keep track of every transaction in whole network.

CRYPTOGRAPHY

Cryptography is an age-old technology which is getting used to secure data or information from being stolen or misused. In Cryptography, the data is encrypted in form of cipher text and then decoded, so that it can be understandable by the user.

Fig 1: The representation of Cryptography

Source: <https://dotnetcodr.com/2013/11/04/symmetric-encryption-algorithms-in-net-cryptography-part-1/>

Blockchain

The decentralized blockchain technology on which many of today's biggest cryptocurrency coins are built act as public ledgers where all of the transactions that are performed within the network are stored for anyone to independently verify. Public ledgers are what make trust less peer-to-peer transactions possible; due to the fact that customers of virtual foreign money realize that each one of the transactions at the community may be showed and displayed at the blockchain.

On a blockchain, transactions are recorded chronologically, forming an immutable chain, and may be greater or much less personal or nameless relying on how the generation is implemented. The ledger is sent throughout many members within the network — it would not exist in a single place. Instead, copies exist and are concurrently up to date with each completely collaborating node within the ecosystem. A block could represent transactions and data of the many types — currency, digital rights, property, identity, or property titles, to call a couple of. The first crypto-currency was Bitcoin, which was created in 2009. Satoshi Nakamoto (the unknown inventor of Bitcoin) on 9 Jan 2009 announced the first release of Bitcoin, a new electronic cash system that uses a peer-to-peer network or blockchain to prevent double spending. It is absolutely decentralized without a server or valuable authority. The creation and value setting of those currencies are entirely hooked in to public and economic process.

The Cryptocurrency laden with such a lot new age technologies and an enormous market presence all over the planet, but still, even after a decade of its existence, has now no longer attained a long-time image as a brand-new age forex gadget amongst majority of the international locations. Even though greater wide variety of nations coming ahead to regularize its use in each day commercial enterprise transactions, a few international locations are regulating its use as a part of financial investment as digital asset by devising rules and regulations but still countries like India and China aren't showing any friendly stance towards the cryptocurrencies neither in sort of currency nor as investment tool.

LITERATURE REVIEW

(Bohme, Christin, Edelman, & Moore, 2015), concluded that blockchain technology has been improved a lot as compared to its initial design, however talking about confirmation of transaction, it needs fundamental change.

(Abell, Fielder, & Singh, 2014) Dr Mark Abell, Simon Fielder and Mumuksha Singh (2014), held that Government guidelines do now no longer have an effect on bitcoin and this will be used for alternate of products and offerings provided it isn't declared illegal.

John Merriman Scholar (2016), (Scholar, 2016) held that Bitcoin will not succeed, however blockchain technology may be applied to solve many of the previously unsolved problems in the financial sector. Jonathan B. (Huhtinen, 2014) Turpin (2014) held that there's no assurance that Bitcoin will prevail and that there are too many unknown variables Kevin Dowd and Martin Hutchinson (2015), held that Bitcoin may also continue to exist withinside the brief run, but withinside the lengthy run; its survival charge is zero.

(Siba, Tarun, & Prakash, 2016) Siba, Tarun and Anuj Prakash (2016), held that Blockchain is in infancy level but it is able to be carried out in coming instances in sports, games, tourism and others.

(Nakamoto, 2008) introduced the application of Bitcoin through a technology platform that enabled a peer-to-peer electronic transfer of cash which between two parties without routing it through a financial intermediary. This triggered the approach of using Blockchain for secured transactions.

(Swan, 2015) explains that a decentralized database which shall hold public ledger of transactions involving tangible entities like, financial transfers, inventory logistics, registration details of properties; and intangible entities like health care, election process, can be implemented in Blockchain platform.

Harsha Gandhi, et al (2019) states that the hash characteristic utilized in Blockchain is tamper-evidence via public key encryption and gives stronger safety answer with progressed portability and decreased time.

RESEARCH METHODOLOGY

SCOPE OF THE STUDY

This study covers the awareness and perception of people in India.

OBJECTIVES OF THE STUDY

1. To analyze the level of awareness about cryptocurrency and blockchain among people.
2. To know the perception of individuals towards cryptocurrency as an investment option.
3. To know the challenges faced by people in accessing cryptocurrency
4. To suggest an effective way of understanding the crypto market and its relation to blockchain

The Hypothesis of the Study:

1. **H01:** There is no significant difference in awareness about cryptocurrency and blockchain among people based on the age of respondents.
H11: There is a significant difference in awareness about cryptocurrency and blockchain among people based on the age of respondents.
2. **H02:** There is no significant difference in awareness about cryptocurrency and blockchain among people based on the income of respondents.
H12: There is a significant difference in awareness about cryptocurrency and blockchain among people based on the income of respondents.
3. **H03:** There is no significant difference in awareness about cryptocurrency and blockchain among people based on the occupation of respondents.
H13: There is a significant difference in awareness about cryptocurrency and blockchain among people based on the occupation of respondents.
4. **H04:** There is no significant difference in the perception of individuals towards cryptocurrency as an investment option based on the age of respondents.
H14: There is a significant difference in the perception of individuals towards cryptocurrency as an investment option based on the age of respondents.
5. **H05:** There is no significant difference in the perception of individuals towards cryptocurrency as an investment option based on the income of respondents.
H15: There is a significant difference in the perception of individuals towards cryptocurrency as an investment option based on the income of respondents.
6. **H06:** There is no significant difference in the perception of individuals towards cryptocurrency as an investment option based on the occupation of respondents
H16: There is a significant difference in the perception of individuals towards cryptocurrency as an investment option based on the occupation of respondents.
7. **H07:** There is no significant difference in challenges faced by people in accessing cryptocurrency based on the age of respondents.

H17: There is a significant difference in challenges faced by people in accessing cryptocurrency based on the age of respondents.

8. **H08:** There is no significant difference in challenges faced by people in accessing cryptocurrency based on the income of respondents.

H18: There is a significant difference in challenges faced by people in accessing cryptocurrency based on the income of respondents.

9. **H09:** There is no significant difference in challenges faced by people in accessing cryptocurrency based on the occupation of respondents.

H19: There is a significant difference in challenges faced by people in accessing cryptocurrency based on the occupation of respondents.

Variables in the Study

Dependent variables: Individual awareness, Individual perception, Individual challenges

Independent variables: Gender, Age, Income, Occupation

Techniques of Data Collection

The data collected through primary and secondary sources. The primary data collected through a specially designed questionnaire. The secondary data is obtained from books, journals, and information available on the internet.

Sampling Universe

Individuals in India

Sample Size

136 individuals across India

Techniques of Selection

The Researcher has used Simple Random sampling, which is a type of Probability Sampling. As the Researcher finds Simple Random sampling is convenient for this study and one of the natural methods, the Researcher has decided to use this method.

Statistical Tools used: ANOVA

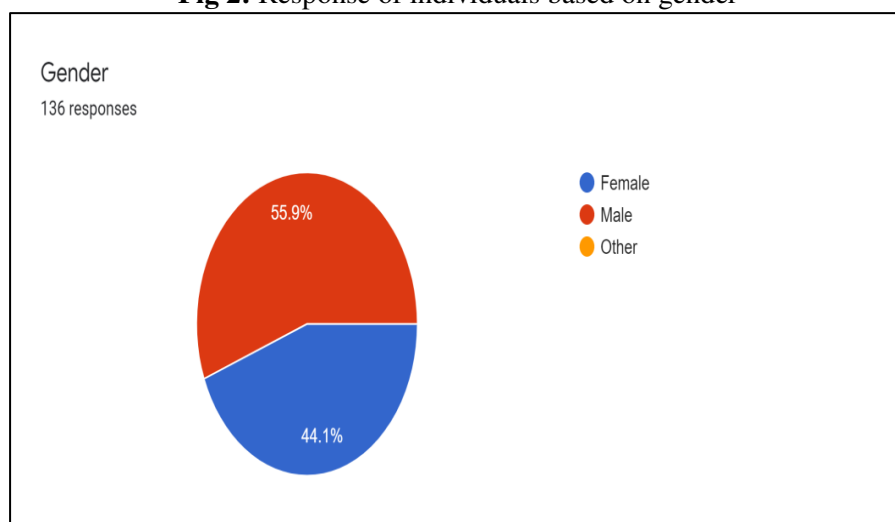
The Researcher has used ANOVA test as there are more than two groups, and also it is used to test the means of various groups are equal.

As in each hypothesis, there are one independent variable and one dependent variable in the study, ONE WAY ANOVA test has been applied for the study.

Data Interpretation and Analysis

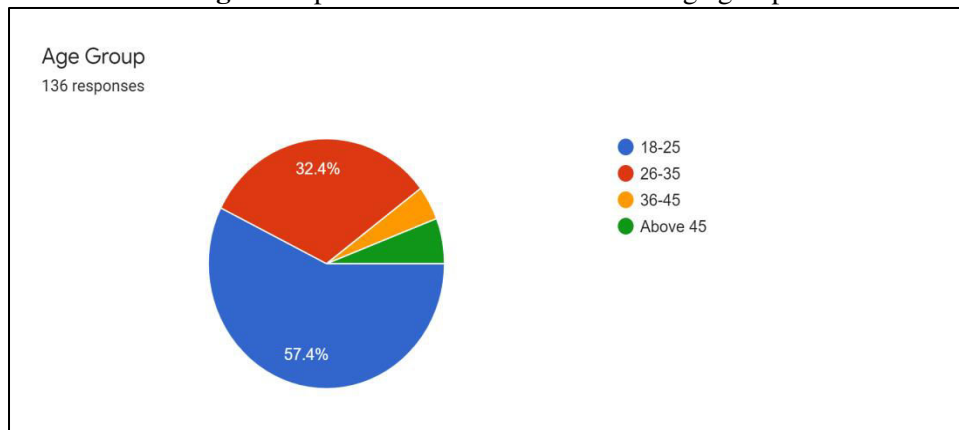
The following are the figures of responses from the primary data collected through a specially designed questionnaire. (Google Form)

Fig 2: Response of individuals based on gender



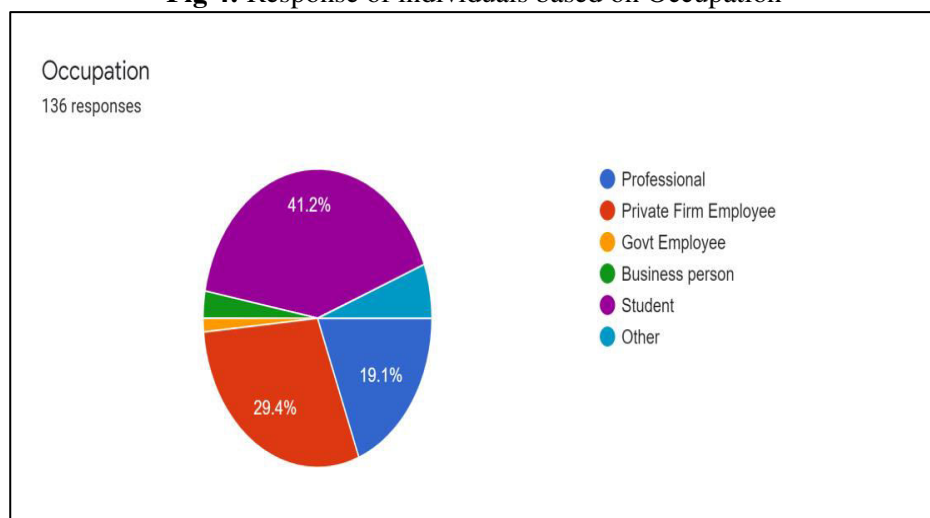
From the above, it can be seen that out of 136 respondents, 60 respondents are female and 76 respondents are male.

Fig 3: Response of individuals based on age group



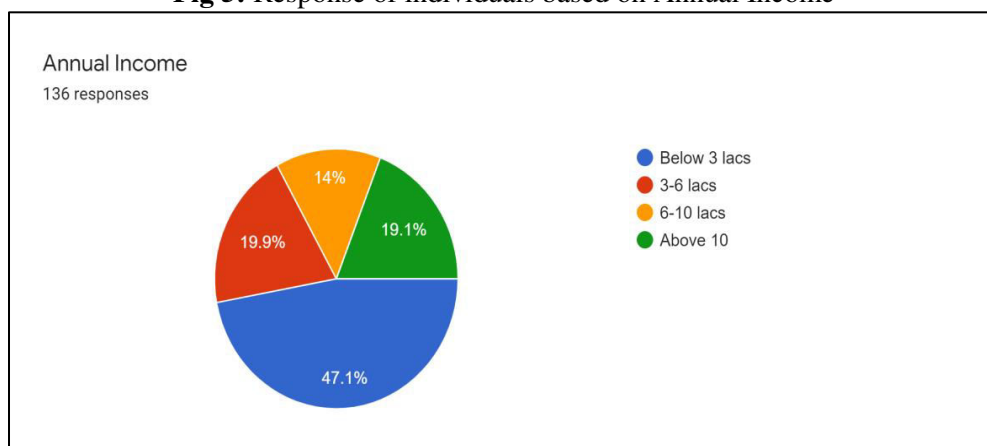
From the above, it can be seen that out of 136 respondents, 78 respondents are in the age group of 18-25, 44 respondents are in the age group of 26-35, 6 respondents are in the age group of 36-45, and 8 respondents are in the age group of above 45.

Fig 4: Response of individuals based on Occupation



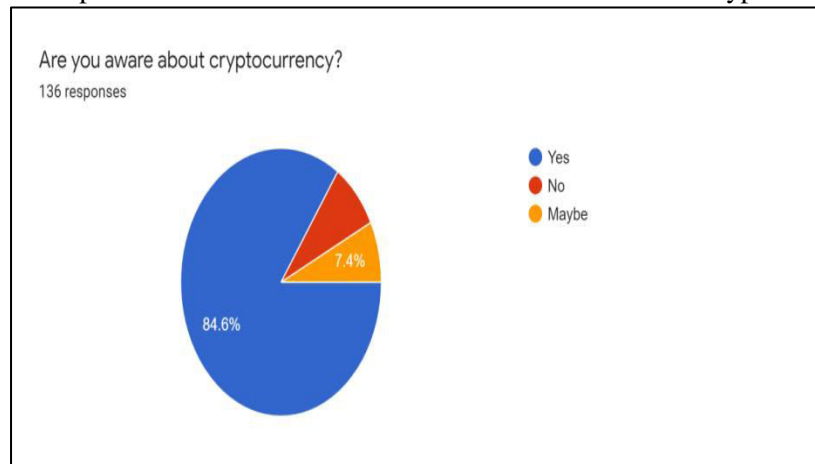
From the above, it can be seen that out of 136 respondents, 26 respondents are professionals, 40 respondents are private firm employee, 2 respondents are government employee, 4 respondents are business person, 56 respondents are students and 8 respondents belong to other occupation.

Fig 5: Response of individuals based on Annual Income



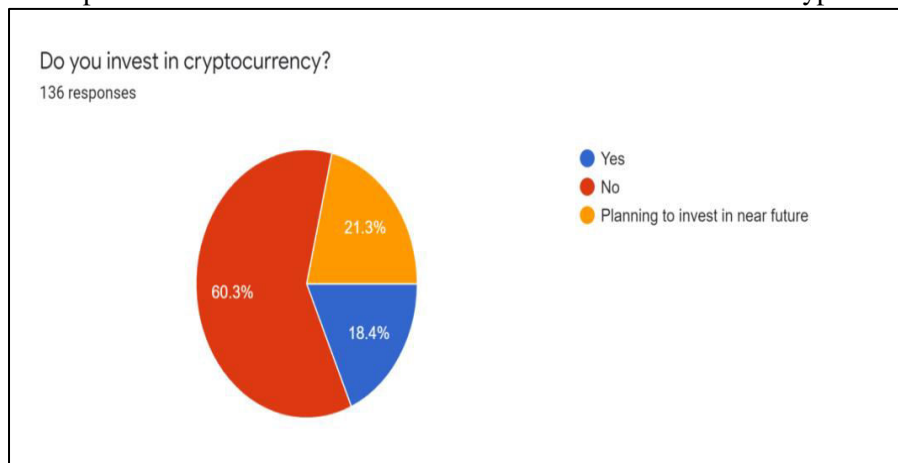
From the above, it can be seen that out of 136 respondents, 64 respondents earn below 3 lacs, 27 respondents earn between 3-6 lacs, 19 respondents earn between 6-10 lacs and 26 respondents earn above 10 lacs.

Fig 6: Response of individuals based on their awareness about Cryptocurrency



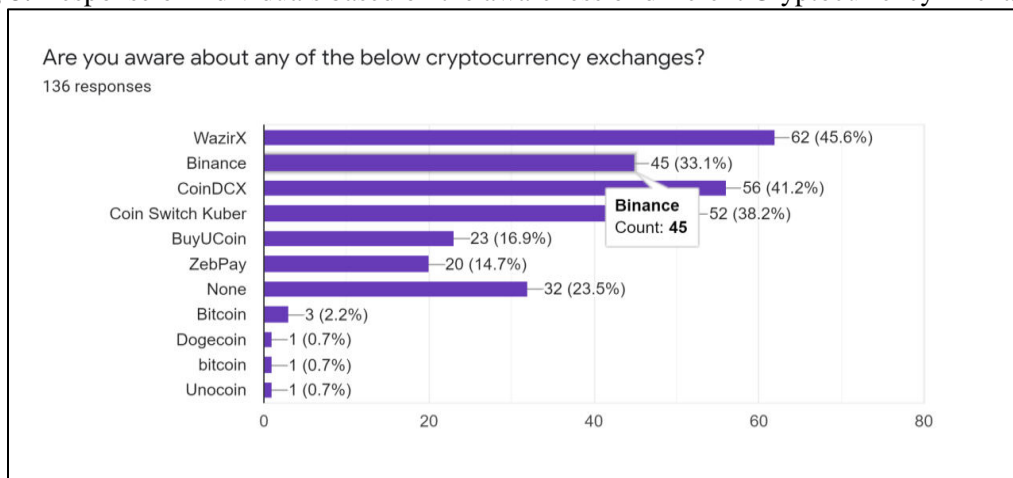
From the above, it can be seen that out of 136 respondents, 115 respondents are aware about cryptocurrency, 11 respondents are not aware about cryptocurrency and 10 respondents are not sure of their view.

Fig 7: Response of individuals based on their Investment decision in Cryptocurrency



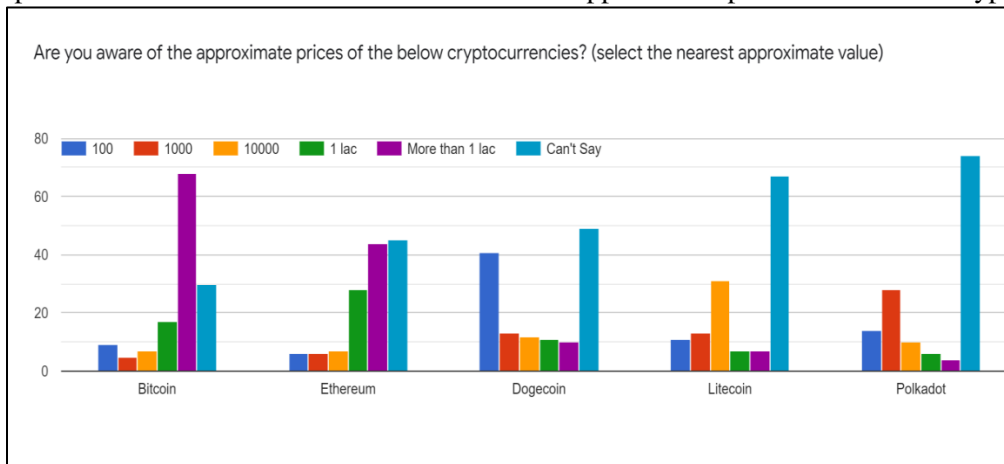
From the above, it can be seen that out of 136 respondents, 25 respondents invest in cryptocurrency, 82 respondents do not invest in cryptocurrency and 29 respondents are planning to invest in near future.

Fig 8: Response of individuals based on the awareness of different Cryptocurrency Exchanges



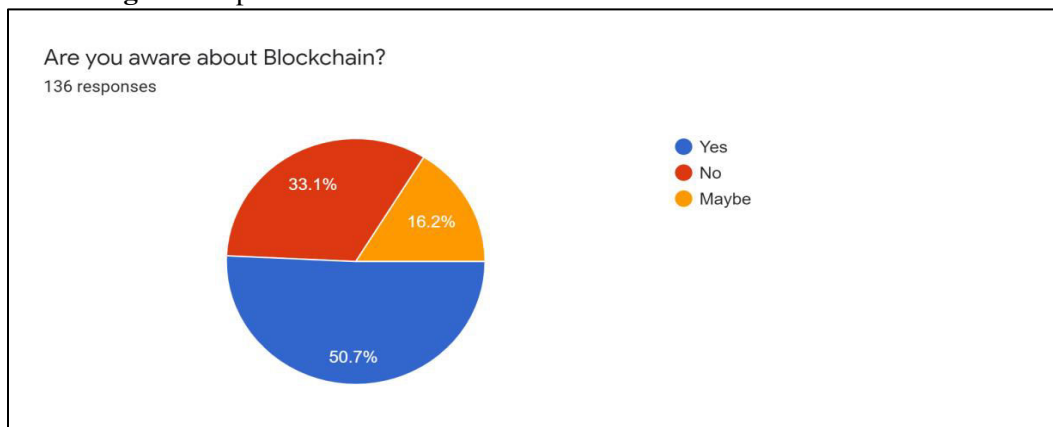
From the above, it can be seen that 62 respondents are aware about WazirX cryptocurrency exchange, 45 respondents are aware about Binance, 56 respondents are aware about CoinDCX, 52 respondents are aware about Coin Switch Kuber, 23 respondents are aware about BuyUCoin, 20 respondents are aware about Zebpay, 32 respondents are not aware about any of the crypto exchanges and 6 respondents think that Bitcoin, Dogecoin etc are cryptocurrency exchanges.

Fig 9: Response of individuals based on the awareness of approximate prices of different Cryptocurrency



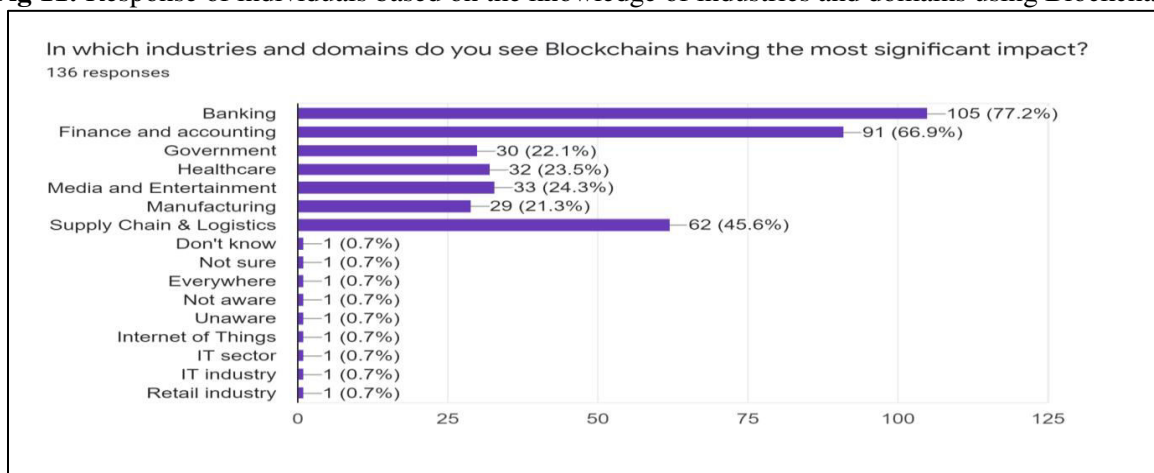
From the above, it can be seen that among 136 respondents, only 68 respondents are aware about correct price of Bitcoin, 28 respondents are aware about correct price of Ethereum, 41 respondents are aware about correct price of Dogecoin, 31 respondents are aware about correct price of Litecoin and 28 respondents are aware about correct price of Polkadot.

Fig 10: Response of individuals based on the awareness about Blockchain



From the above, it can be seen that out of 136 respondents, 69 respondents are aware about Blockchain, 45 respondents are not aware about Blockchain and 22 respondents are not sure of their view.

Fig 11: Response of individuals based on the knowledge of industries and domains using Blockchain



From the above, it can be seen that majority of the respondents (105 respondents) think that Blockchain has most significant impact on Banking sector, 91 respondents think that Blockchain has most significant impact on Finance and accounting sector, 30 respondents think that Blockchain has significant impact on Government sector, 32 respondents think that Blockchain has significant impact on Healthcare sector, 33 respondents think that Blockchain has significant impact on Media and Entertainment sector, 29 respondents think that Blockchain

has significant impact on manufacturing , 62 respondents think that Blockchain has most significant impact on Supply chain and logistics and 9 respondents have given their different opinion other than options provided.

ANOVA Table for Awareness Level

Table 1: Anova Table for Awareness on the hypothesis of difference in awareness about cryptocurrency and blockchain among people based on the age of respondents.

ONEWAY /VARIABLES= AMean BY Age.						
ANOVA						
		Sum of Squares	df	Mean Square	F	Sig.
AMean	Between Groups	9.30	3	3.10	3.25	.024
	Within Groups	123.09	129	.95		
	Total	132.39	132			

INTERPRETATION

The above results indicate that the significance value is less than 0.05; the F test is rejected. Hence the null hypothesis is rejected, and the alternate hypothesis is accepted.

CONCLUSION

There is a difference in the individual awareness level about cryptocurrency and blockchain among people based on the age of respondents.

FINDINGS

The overall individual awareness level is low, so some efforts must be taken to increase the awareness level among the different age group of individuals in India.

Table 2: Anova Table for Awareness on the hypothesis of difference in awareness about cryptocurrency and blockchain among people based on the occupation of respondents.

ONEWAY /VARIABLES= AMean BY Occupation.						
ANOVA						
		Sum of Squares	df	Mean Square	F	Sig.
AMean	Between Groups	19.40	5	3.88	4.36	.001
	Within Groups	112.99	127	.89		
	Total	132.39	132			

INTERPRETATION

The above results indicate that the significance value is less than 0.05; the F test is rejected. Hence the null hypothesis is rejected, and the alternate hypothesis is accepted.

CONCLUSION

There is a difference in the individual awareness level about cryptocurrency and blockchain among people based on the occupation of respondents.

FINDINGS

The overall individual awareness level is low, so some efforts must be taken to increase the awareness level among the different occupation of individuals in India.

Table 3: Anova Table for Awareness on the hypothesis of difference in awareness about cryptocurrency and blockchain among people based on the income of respondents.

ONEWAY /VARIABLES= AMean BY Income.						
ANOVA						
		Sum of Squares	df	Mean Square	F	Sig.
AMean	Between Groups	4.27	3	1.42	1.43	.236
	Within Groups	128.12	129	.99		
	Total	132.39	132			

INTERPRETATION

The above results indicate that the significance value is greater than 0.05; the F test is accepted. Hence the null hypothesis is accepted, and the alternate hypothesis is rejected.

CONCLUSION

There is no difference in the individual awareness level about cryptocurrency and blockchain among people based on the income of the respondents.

FINDINGS

The overall individual awareness level is high, which is an indicator that awareness level about cryptocurrency and blockchain among people is the same throughout the income ranges.

ANOVA Table for Perception

Table4: Anova Table for Perception on the hypothesis of no difference in the individual perception towards cryptocurrency as an investment option based on the income of respondents.

ONEWAY /VARIABLES= Pmean BY Income.						
ANOVA						
		Sum of Squares	df	Mean Square	F	Sig.
Pmean	Between Groups	632.78	3	210.93	.93	.429
	Within Groups	29288.52	129	227.04		
	Total	29921.30	132			

INTERPRETATION

The above results indicate that the significance value is greater than 0.05; the F test is accepted. Hence the null hypothesis is accepted, and the alternate hypothesis is rejected.

CONCLUSION

There is no difference in the individual perception towards cryptocurrency as an investment option based on the income of respondents.

FINDINGS

Individuals of all different income ranges have similar perception towards cryptocurrency as an investment option.

Table 5: Anova Table for Perception on the hypothesis of difference in the individual perception towards cryptocurrency as an investment option based on the occupation of respondents.

ONEWAY /VARIABLES= Pmean BY Occupation.						
ANOVA						
		Sum of Squares	df	Mean Square	F	Sig.
Pmean	Between Groups	4152.56	5	830.51	4.09	.002
	Within Groups	25768.74	127	202.90		
	Total	29921.30	132			

INTERPRETATION

The above results indicate that the significance value is less than 0.05; the F test is rejected. Hence the null hypothesis is rejected, and the alternate hypothesis is accepted.

CONCLUSION

There is a difference in the individual perception towards cryptocurrency as an investment option based on the occupation of respondents.

FINDINGS

Individuals from various occupations have different perception towards cryptocurrency as an investment option.

Table6: Anova Table for Perception on the hypothesis of no difference in the individual perception towards cryptocurrency as an investment option based on the age of respondents.

ONEWAY /VARIABLES= Pmean BY Age.						
ANOVA						
		Sum of Squares	df	Mean Square	F	Sig.
Pmean	Between Groups	1183.20	3	394.40	1.77	.156
	Within Groups	28738.11	129	222.78		
	Total	29921.30	132			

INTERPRETATION

The above results indicate that the significance value is greater than 0.05; the F test is accepted. Hence the null hypothesis is accepted, and the alternate hypothesis is rejected.

CONCLUSION

There is no difference in the individual perception towards cryptocurrency as an investment option based on the age of respondents.

FINDINGS

All the age groups have similar perception towards cryptocurrency as an investment option.

ANOVA Table for Challenges**Table 7:** Anova Table for Challenges on the hypothesis of difference in the challenges faced by individuals in accessing cryptocurrency based on their age

ONEWAY /VARIABLES= CMean BY Age.						
ANOVA						
		Sum of Squares	df	Mean Square	F	Sig.
CMean	Between Groups	601.88	3	200.63	.88	.452
	Within Groups	29318.12	129	227.27		
	Total	29920.00	132			

INTERPRETATION

The above results indicate that the significance value is greater than 0.05; the F test is accepted. Hence the null hypothesis is accepted, and the alternate hypothesis is rejected.

CONCLUSION

There is no difference in the challenges faced by individuals in accessing cryptocurrency based on their age

FINDINGS

The above table shows that there are no challenges faced by individuals in accessing cryptocurrency based on their age

Table 8: Anova Table for Challenges on the hypothesis of a difference in the challenges faced by individuals in accessing cryptocurrency based on their occupation.

ONEWAY /VARIABLES= CMean BY Occupation.						
ANOVA						
		Sum of Squares	df	Mean Square	F	Sig.
CMean	Between Groups	2521.56	5	504.31	2.34	.046
	Within Groups	27398.44	127	215.74		
	Total	29920.00	132			

INTERPRETATION

The above results indicate that the significance value is less than 0.05; the F test is rejected. Hence the null hypothesis is rejected, and the alternate hypothesis is accepted.

CONCLUSION

There is a difference in the challenges faced by individuals in accessing cryptocurrency based on their occupation.

FINDINGS

The above table shows that there are challenges faced by individuals in accessing cryptocurrency based on their occupation.

Table 9: Anova Table for Challenges on the hypothesis of difference in the challenges faced by individuals in accessing cryptocurrency based on their income

ONEWAY /VARIABLES= CMean BY Income.						
ANOVA						
		Sum of Squares	df	Mean Square	F	Sig.
CMean	Between Groups	587.68	3	195.89	.86	.463
	Within Groups	29332.32	129	227.38		
	Total	29920.00	132			

INTERPRETATION

The above results indicate that the significance value is greater than 0.05; the F test is accepted. Hence the null hypothesis is accepted, and the alternate hypothesis is rejected.

CONCLUSION

There is no difference in the challenges faced by individuals in accessing cryptocurrency based on their income

FINDINGS

The above table shows that there are no challenges faced by individuals in accessing cryptocurrency based on their income

FINDINGS OF THE STUDY

Below are the findings from the above data analysis and interpretation:

- It is observed that the maximum respondents are in the age group of 18-25 years.
- It is seen that 55.9% of the respondents are male and 44.1% of them are female.
- It is seen that most of the respondents are students, private firm employees, followed by professionals.
- It is observed that 47.1% of the respondents belong to low income range (below 3 lakhs) and 52.9% of the respondent belong to higher income range (above 3 lakhs).
- It is found that 84.6% of the respondents are aware about cryptocurrency, 8.1% of the respondents are not aware and 7.4% of the respondents are not sure of their view about cryptocurrency.
- It is found that 18.4% of the respondents invest in cryptocurrency, 60.3% of the respondents do not invest and 21.3% % of the respondents are planning to invest in near future.
- It is observed that maximum numbers of respondents are aware about WazirX, CoinDCX and Coin Switch Kuber cryptocurrency exchanges and very few respondents are aware about Binance, BuyUCoin and Zebpay.
- It is seen that maximum respondents know correct prices of only Bitcoin, some of them were able to guess correctly the prices of Ethereum anf Dogecoin but most of the respondents don't know the prices of Litecoin and Polkadot.
- It is found that 50.7% of the respondents are aware about blockchain, 33.1% of the respondents are not aware and 16.2% of the respondents are not sure of their view about blockchain.
- It is seen that maximum number of respondents believe , blockchains have significant impact on Banking,

Finance and accounting sector only, very few are aware that blockchians have impact on almost every sector.

- There is a difference in the individual awareness level about cryptocurrency and blockchain among people based on age and occupation of respondents, whereas there is no difference based on income.
- There is no difference in the individual perception towards cryptocurrency as an investment option based on age and income of respondents, whereas there is difference based on occupation.
- There is no difference in the challenges faced by individuals in accessing cryptocurrency based on their income and age, whereas there is difference based on occupation.

CONCLUSION

From the above findings, it can be concluded that people in general are aware of the Cryptocurrency and they would like to see it as part of their investment portfolio as it provides good return. But still people are not that comfortable with cryptocurrencies. Reason could be lack of regulation from Government and regulatory authorities. If Government of India and its regulatory authorities will come forward to regulate its use and transaction in financial market, it can play a major role in entire investment portfolio.

If we see the findings and analysis of Blockchain, it can be concluded that Blockchain is still a black box for many people. Most of the respondents are not much aware about the basic knowledge of blockchain. There is a huge scope to identify the opportunities to increase awareness and usage of Blockchain.

RECOMMENDATION

More awareness must be spread among the investors through educational programs or any interactive sessions with experts in the field.

This may also increase the preference level of alternative investment products among investors.

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A SURVEY ON BOLERO JACKETS FOR A NEW FASHION RANGE

AKANSHA

Research Scholar, Banasthali Vidyapith, Rajasthan

ABSTRACT

The present study aimed to determine the awareness of bolero jackets and abstract motifs for a new fashion range. To accomplish this study survey research was applied. Findings indicated that most of the majority of respondents were aware of the bolero jackets, abstract motifs, and digital printing. The majority of the respondents selected structural details for bolero jackets. Tucks were selected by the majority of respondents as a structural detail for the bolero jacket. 3/4th sleeve length and according to the preferences of the factor for bolero jacket quality factor selected by the majority of respondents. The embellishment on the bolero jacket was chosen by the respondents of majority. The majority of respondents select sequin work as embellishment and like to have a new range of bolero jackets for their wardrobe. Hence, it was accomplished that the design of bolero jackets with abstract motifs was accepted by the majority of respondents.

Keywords: Bolero jackets, abstract motifs, digital printing, garment designing, survey

INTRODUCTION

A fashion accessory is used secondarily with any kind of outfit. A jacket is carried to enhance the glance of the outfits. A jacket covers a small portion of the upper body. A jacket is usually worn on top of other apparel or item of clothing. The origin of the term 'bolero' was taken from the traditional Spanish dance form. The male dancer wears that waist jacket in the

„bolero“ dance performance and that is why it is called a bolero jacket. It is similar to a shrug but made with stiffed fabrics than the shrugs. Bolero jackets can be made of many different types of fabrics and can be used to dress up or down almost any type of outfit. In the present time, bolero jackets are carried by the females over every type of outfit like suits, Kurtis, sarees, jeans, etc.

A bolero jacket is an upper garment. It covers the upper part of the body as accessories with the other items of clothing.

All the printed designs have the base of a single motif repeated across the length and breadth of the fabric in a definite order to form a pattern. In other words, 'motifs' may be defined as an isolated or independent shape or figure.

The abstract is not a figurative pattern. It is based on real objects in stylized shapes that rely on balance and harmony.

The form of the real object is used in such an unrealistic shape and irregularities, that probably no one would possibly recognize and identify it. Using circles, lines, dots, or paintbrush lines across a surface where each shape wears little resemblance with one another creates some abstract designs.

The study work had been carried out to determine consumer preferences for bolero jackets with abstract motifs. The study accomplished to know the preferences of consumers on a new range of bolero jackets with the small changes in designing of bolero jackets using the abstract motifs.

RESEARCH METHODS

The present study was conducted at Banasthali Vidyapith, Rajasthan. The self-structured questionnaire was developed as a tool for the market study. The research has been carried out with the following methodology:

Selection of respondents

A sample of hundred college girls of Banasthali Vidyapith between the age group 18-25 years was selected randomly for the study.

Construction of questionnaire

A self-structured questionnaire was developed consisting of closed-ended and open-ended questions. The information about bolero jackets and abstract motifs awareness, the understanding regarding bolero jackets and abstract motifs, their preference while garment selection, the sleeve length preference, factor preference for kaftans, embellishment on bolero jackets, and their preference for bolero jackets designed with abstract motifs for wardrobe collection.

DATA COLLECTION

The data was collected by the investigator from the selected respondents in the selected place through a questionnaire. The study was explained to all respondents to satisfy their curiosity and to obtain good responses.

DATA ANALYSIS

Data was gathered and analysed based on the response given by the respondents to extract the general preferences about the present study. Frequency and responses were calculated.

RESULTS

It is necessary to conduct a consumer survey to determine the preference and needs of the consumers in respect of various parameters related to bolero jackets with abstract motifs.

Therefore, a consumer survey was conducted on which attitude of consumers toward designer bolero jackets with abstract motifs. The result of the consumer survey is presented below the following subheadings:

Awareness about Bolero Jackets

Awareness about Bolero Jackets	Percent (%)
Yes	98
No	2

This was found that awareness of bolero jackets. It was found that 98 percent of the people were aware of the bolero jackets.

Preference of motifs for Bolero Jackets

Types of Motifs	Percent (%)
Natural	8
Abstract	74
Geometrical	9
Stylized	9

It was found that 74 percent of respondents preferred abstract motifs for bolero jackets, 8 percent preferred Natural Motifs, and 9-9 percent of respondents preferred stylized and geometrical motifs. Therefore, abstract motifs were selected for designing of bolero jackets.

Awareness about digital printing

Sr. No.	Awareness about Digital Printing	Percent (%)
1	Yes	100
2	No	0

It was found that all the respondents were aware of digital printing.

Acceptance of designed bolero jackets with abstract motifs

Acceptance of Bolero Jackets	Percent (%)
Yes	95
No	5

It was observed that 95 percent of respondents preferred bolero jackets designed with abstract motifs.

Structural details on bolero jackets

Structural details on Bolero Jackets	Percent (%)
Yes	93
No	7

The survey found that 93 percent of respondents preferred structural details on bolero jackets.

Type of structural details

Structural Details	Percent (%)
Gathers	26
Pleats	10
Tucks	47

Princess line	10

It was found that 47 percent of respondents preferred Tucks as structural details in bolero jackets, 26 percent preferred Gathers, 10 percent preferred Pleats, and 10 percent preferred Princess line as a structural detail for designing of bolero jackets.

Sleeve length for bolero jackets

Sleeve Length	Percent (%)
Full Sleeve	43
3/4 th Sleeve	45
Cut Sleeve	9
½ Sleeve	3

It was found that 45 percent of respondents preferred 3/4th length for sleeves, 43 percent preferred full length of sleeve, 9 percent of respondents preferred cut sleeve and 3 percent preferred ½ length for the sleeve. Therefore, ¾ length and full length for sleeves were preferred for bolero jackets.

Factors considered while selecting bolero jackets.

Factors	Percent (%)
Fashion	23
Quality	65
Aesthetic appeal	12
Price	0

It was observed that 65 percent of respondents preferred quality, 23 percent preferred Fashion, and 12 percent of respondents preferred aesthetic appeal while purchasing the bolerojackets. None of the respondents preferred the price factor.

Preference for embellishment

Preference for embellishment	Percent (%)
Yes	82
No	18

The survey found that 82 percent of respondents preferred embellishment over bolero jackets and on the other hand only 18 percent of respondents did not prefer embellishment over bolero jackets.

Type of embellishment

Type of embellishment	Percent (%)
Beads	11
Stone Work	27
Lace	11
Sequin work	33

It was found that 33 percent of respondents preferred sequin work, 27 percent preferred stonework, 11 percent preferred Beads and 11 percent preferred lace as embellishment. Therefore, Sequin's work was used as embellishment on bolero jackets.

Purchasing bolero jackets for their wardrobe

Preference for Purchasing Bolero Jackets	Percent (%)
Yes	97
No	3

When the survey it was found that 97 percent of respondents preferred designed bolero jackets for their wardrobe, whereas 3 percent of respondents say no to prefer designed Bolerojackets for their wardrobe.

CONCLUSION

At present time each and every individual want a new style of garment. Bolero jackets may fulfil their desire to get something more innovative and trendy. Hence, the present study concluded that bolero jackets were able to express consumer acceptability and were extremely liked by the consumer.

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ALGORITHM BASED ON CLOUD COMPUTING AND IMAGE PROCESSING DESIGN

Dr. Shipra Yadav¹, Dr. Keshao D. Kalaskar² and Dr. Pankaj Dhumane³¹Assistant Professor, IICC, RTM Nagpur University Nagpur, (MH), India,²Associate Professor, Dr. Ambedkar College, Chandrapur, (MH), India,³Assistant Professor, Sardar Patel College, Chandrapur, (MH), India

Image processing technology is a popular practical technology in the computer field and has important research value for signal information processing. This article is aimed at studying the design and algorithm of image processing under cloud computing technology. This paper proposes cloud computing technology and image processing algorithms for image data processing. Among them, the material structure and performance of the system can choose a verification algorithm to achieve the final operation. Moreover, let us start with the image editing features. This article isolates software and hardware that function rationally. On this basis, the structure of a real-time image processing system based on SOPC technology is built and the corresponding functional receiving unit is designed for real-time image storage, editing, and viewing. Studies have shown that the design of an image processing system based on cloud computing has increased the speed of image data processing by 14%. Compared with other algorithms, this image processing algorithm has great advantages in image compression and image restoration.

INTRODUCTION

By improving computer hardware technology, larger storage devices and faster processors will enable computers to process digital images more efficiently. However, conventional images based on image matrix representation are not highly efficient because they require a lot of unnecessary information and a lot of storage space. Considering the different types of unnecessary information in the image represented by the image matrix, researchers have proposed many imaging methods that can improve the performance. Although the reconstruction efficiency of these imaging methods insignificantly improved compared to pixel matrix imaging, people are exploring ways to create deeper images. And the quick and easy downloads do not stop here. In recent years, real-time target detection has been widely used, and feature extraction is an indispensable part of target detection algorithms. At present, moment features are widely used in many aspects of image classification and recognition processing. If the image is moving, rotating, or scaling up or down in equal proportions. The computer system should display a fixed feature when recognizing these images, if images should remain unchanged. To improve the inspection efficiency of printed circuit board (PCB) solder joints, Wang et al. aim to detect PCB solder joints through image processing methods. Through a series of image processing algorithms, they completed the threshold segmentation and feature extraction of the solder joint image; then, the sphericity was determined according to the area and circumference, as well as the shape parameters and eccentricity of the calculated area, paving the way for the identification of defect patterns. However, there are some errors in the research process, leading to inaccurate results [1]. Hussain et al. offer a CMOS image sensor with a resolution of 200×200. The sensor is specially designed for applications where each pixel is used exclusively, measuring approximately 15 μm×15 μm and image sensor chip size approximately 3.5mm×3.5mm. The proposed sensor is simulated with a single-pixel input current variation of 2pA to 100 pA and a corresponding measurement value of 2mV to 855mV per pixel. Moreover, they proposed a new method of pattern detection and recognition in the case of blood coverage, which can accurately segment the patterns in the blood. However, there are errors in image segmentation [2]. Venkatram and Geetha put forward the main purpose of big data which is to quickly view the cutting-edge and latest work being done in the field of big data analysis in different industries [3]. Since many academicians, researchers, and practitioners are very interested, it is rapidly updated and focuses on how to use existing technologies, frameworks, methods, and models to use big data analytics to take advantage of the value of big data analytics. However, the analysis process is very complicated. According to the current technical level and development trend of video image processing systems, this document carries out a great design and implementation of logic devices that will be implemented with large logic devices in the design. In particular the computing cloud in video image processing systems and analyzing infrared, reason for the image unevenness, the theory, and the method of infrared unevenness correction is studied, and feasible image enhancement algorithm based on infrared image characteristics is proposed and realized through experiments. Performance, a proven algorithm can be selected to perform the final action [10]. In the cloud processing system, the working environments more complicated. For the processing of the original image, processing steps such as noise, interference, image clarity, and image improvement are required [11]. According to the current research status domestically and internationally, the commonly used image smoothing methods are the average sector method, intermediate filtering method, filtering method, selective masking, media collection filtering, and

other methods [12]. The average vector method is a spatial processing method that uses the average of pixel gray values instead of pixel gray values. The types of smoothed images are

method that uses the average of pixel gray values instead of pixel gray values. The types of smoothed images are

$$g(x, y) = \frac{1}{i} \sum_{(u, v) \in S} f(u, v). \quad (1)$$

2. Graphics Processing Method Based On

Cloud Computing

2.1. Cloud Computing Technology

2.1.1. Data Storage and Management Technology. Cloud computing uses distributed storage technology to store unwanted data in multiple distributed storage devices, and to maintain efficient and reliable storage, the space customers need to achieve the level of machine requirements and reduce the number of model applications [4]. In some large-scale projects, such as FIFA and League of Legends, large amounts of data will be stored on the cloud platform. Players only need to download the software and log in to the cloud platform to use it. This significantly reduces the need for computer equipment. [5]. The basic framework diagram of data storage and management technology is shown in Figure 1.

2.1.2. Virtualization Technology.

Virtualized focus of the service equipment Virtualized multi-individual visualization. This is the main content of the LAS pre calculation [6, 7]. This is the main goal: the main material of the virtual machine, the system of the operation system, the super level of the ear, the cutting high horizontal application program, the general physical equipment division, and the virtual machine [8]. The original operating system and application were virtual, the machine form was run at a virtual level, and many virtual machines could be executed on natural machines. Virtual multi machine can be applied to different operating systems in the enterprise, such as management systems and operating systems [9].

2.2. Graphics Processing Algorithms for Cloud Computing.

The computer system includes computational and detection targets. Depending on the hardware structure and system

2.2.1. Spatial Low-Pass Filtering Algorithm. We know that the slow part of the signal belongs to the low-frequency part of the frequency part, and the fast part of the signal belongs to the high-frequency part of the frequency part [14]. The spatial frequency of the image and the interference frequency of the edge are higher. Therefore, low-pass filtering

can be used to remove noise, while frequency-domain filtering can be easily achieved by spatial rotation. Therefore, as long as the impulse response matrix of the spatial system is designed reasonably, the noise can be filtered [15]. The basic flowchart of the system using low-pass filtering algorithm to remove noise is shown in Figure 2. If there is a two-dimensional function $F(A, B)$, input the filter system and the output signal is recorded as $G(A, B)$. Suppose the impulse response function of the filter system is (DA, B) ; then, there is

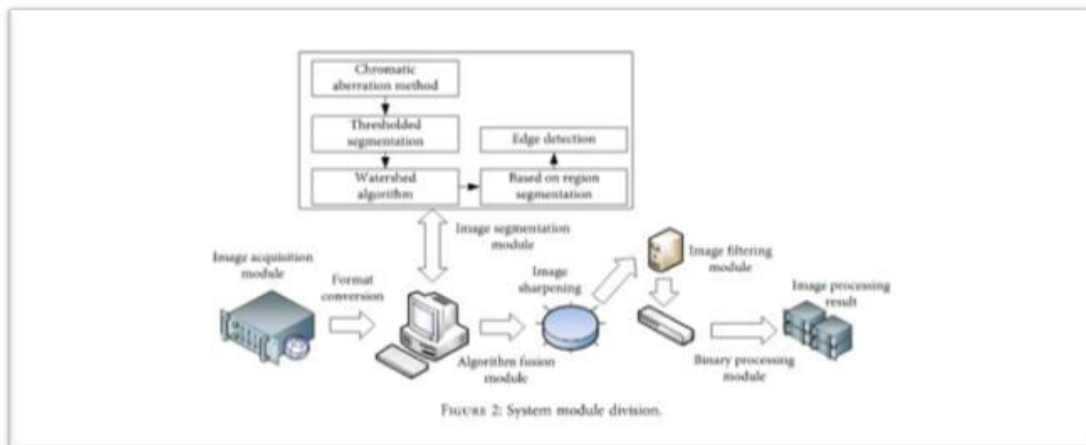
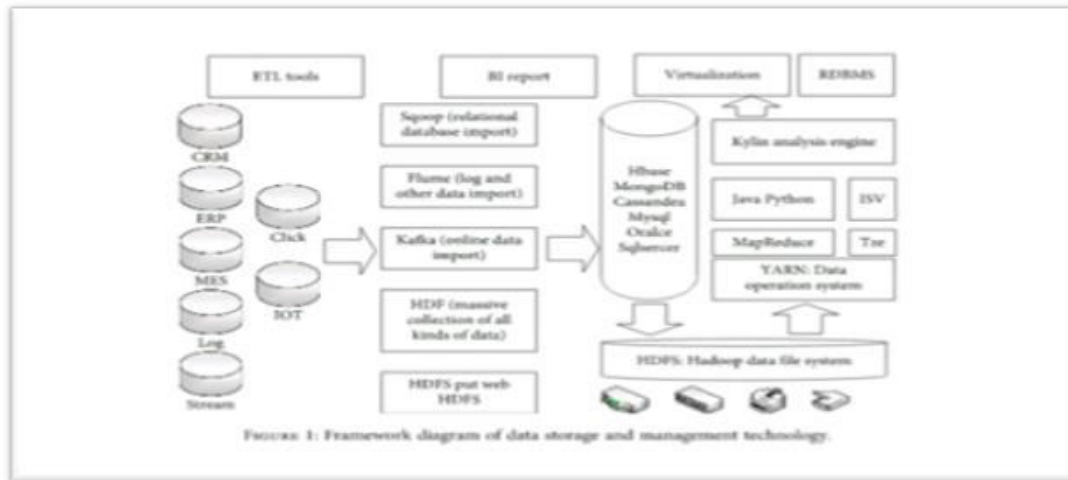
$$G(A, B) = F(A, B) * D(A, B). \quad (2)$$

When the input is a distinct image Q , the output is a distinct image $P \times P$ and the pulse response function is an order of $L \times L$ to avoid duplication. $L \leq P - Q + 1$ should be satisfied. The discrete form of the filtering sector is

$$G(P_1, P_2) = \sum_{P_1} \sum_{P_2} F(Q_1, Q_2) H(P_1 - Q_1 + 1, P_2 - Q_2 + 1). \quad (3)$$

Because noise is not spatially irrelevant in the image, the noise is higher than the spatial frequency spectrum of the general composition, and low-pass filtering can be used to remove the noise in the image. The following are the

Because noise is not spatially irrelevant in the image, the noise is higher than the spatial frequency spectrum of the general composition, and low-pass filtering can be used to remove the noise in the image. The following are the



different forms of the low-pass spatial response function in the case of $L = 3$, represented by matrix

different forms of the low-pass spatial response function in the case of $L = 3$, represented by matrix K :

$$1 - \delta_K \leq \frac{\|\Phi_x\|_2^2}{\|x\|_2^2} \leq 1 + \delta_K. \quad (4)$$

It can be seen that using the second filter, the result is similar to the result achieved by the simple neighbor hood average method under a 3×3 window.

2.2.2. Median Filtering Algorithm.

In an image contaminated by noise, if linear filtering is used in the processing, most of the linear filtering flow is relatively small, and the image edge is blurred while removing the noise. Under certain conditions, the average filtering method can get better results in removing noise and protecting image edges. In other words, this is a nonlinear image emphasis technology, which has an excellent suppression effect on interference pulses and speckle noise and can more appropriately maintain the

edges of the image [16].

The operation process of median filtering is as follows: Here is a combination $X_1, X_2, \dots, X_n$; arrange the magnitudes of the n numbers as follows

$$\bar{\theta} = \sum_{i=1}^K \alpha_i V_i, \text{subject to } \|\theta - \bar{\theta}\| \leq \varepsilon, \quad (5)$$

4

$$Y = \text{MED}\{X_1, X_2, \dots, X_n\} = \begin{cases} X_{l((n+1)/2)}, \\ \frac{1}{2} [X_{l(n/2)} + X_{l((n/2)+1)}], \end{cases} \quad \text{th} \quad (6)$$

The median of the category is represented by y . For example, the sequence is (70, 80, 190, 100, 110,) and the median value of this sequence is 100. Suppose the input sequence is $\{X_i, i \in I, \}$ and the subset of natural numbers is represented by I , where the length of the window is n . Next, the output filter is represented a

$$Y_i = \text{MED}\{X_i\} = \text{MED}\{X_{i-u}, \dots, X_i, \dots, X_{i+u}\}. \quad (7)$$

The filter can be represented in the form of a two-dimensional window. Let $\{X_{ij}\}$ represent the gray value of each point of a digital image. The two-dimensional central filter of filter window A can be represented as

$$Y_{ij} = \text{MED}\{X_{ij}\} = \text{MED}\{X_{(i+r),(j+s)}, (r,s) \in A, (i,j) \in I^2\}. \quad (8)$$

2.2.3. Edge Detection Algorithm.

The local intensity of the target in the image represents that the edge detection method, background area, etc. change greatly. It serves as basis for image analysis, such as image fragmentation and texture characteristics. The first step is edge detection, which is by the sharpness strength of continuity. The image intensity sequence can be divided as follows. The grayscale pixel value of the image link is different, and the image intensity returns to the starting point after maintaining a small change. The images obtained using various detection methods have a high edge detection effect and can suppress noise. Image processing methods usually use general edge detection methods.

2.3. Digital Image Processing Algorithm.

The result of sampling and quantization is a table. There are generally two ways to represent digital images:

$$f(x,y) = \begin{bmatrix} f(0,0) & f(0,1) & \dots & f(0,n-1) \\ f(1,0) & f(1,1) & \dots & f(1,n-1) \\ \dots & \dots & \dots & \dots \\ f(n-1,0) & f(n-1,1) & \dots & f(n-1,n-1) \end{bmatrix}. \quad (9)$$

The various elements of the image layout are individual values called pixels. In digital image processing, the general table N and gray level G have the integral power of 2, namely, $N = 2^n$ and $G = 2^m$. For TV images in general laboratories, N is 256 or 512 and grayscale G is 64-256, which can meet the needs of image processing. For images with special requirements such as satellite images, take 2340×3240 and the grayscale m is 8-12 bits.

Let the number b be the number of bits required to store the digital image, and there are

Let the number b be the number of bits required to store the digital image, and there are

$$b = \frac{M \times N \times K}{8 \times [M \times N]}, \quad (10)$$

where K is the relational expression of the gray level number $G = 2^k$. When $M = N$, the above formula becomes

$$(1 - \delta_K) \|\theta\|_2^2 \leq \|A_K^C \theta\|_2^2 \leq (1 + \delta_K). \quad (11)$$

The chain code represents a binary image composed of straight lines and curves, which is very suitable for describing the boundaries of images. Using chain code ratio matrix expressions can save a lot of bits.

2.4. Edge Detection Algorithm.

The edges of the image are usually related to the continuation of the image intensity or the first derivative of the image intensity. The continuation of the image intensity can be divided into the following:

- (1) Step discontinuity, that is, the gray value of the pixel on both sides of the discontinuity has a significant difference
- (2) The line is not continuous; that is, the image intensity suddenly changes from one value to another and then returns to the original value after maintaining a small stroke.

Edge detection is the most basic function for detecting important local changes in an image. In one direction, the end of the step is related to the local top of the dominant function of the image. The slope is a measure of the change of the function, and the image can be regarded as a series of sampling points by continuously operating image intensity. Therefore, the situation of the same dimension is similar, and discrete hierarchical approximation functions can be used to detect large changes in image gray values.

$$g(i, j) = \begin{bmatrix} g_i \\ g_j \end{bmatrix} = \begin{bmatrix} \frac{\partial f}{\partial i} & \frac{\partial f}{\partial j} \end{bmatrix}. \quad (12)$$

Two important properties are related to gradient:

- (1) The direction of vector $g(i, j)$ is the direction of the maximum rate of change when the function increases
- (2) The magnitude of the gradient is given by the following formula:

$$|g(i, j)| = \sqrt{g_i^2 + g_j^2}. \quad (13)$$

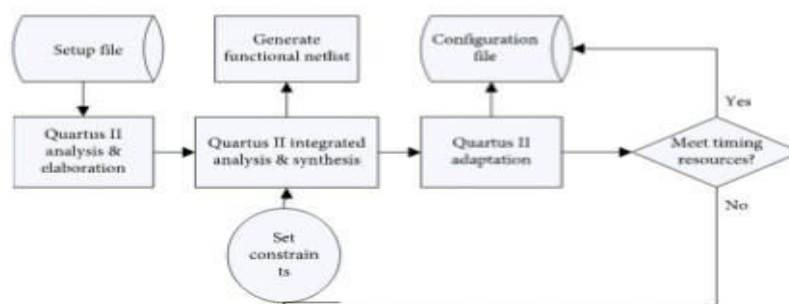


FIGURE 3: Quartus II typical design flowchart.

In practical applications, the absolute value is usually used to approximate the gradient amplitude:

$$|g(i, j)| = \max(|g_i|, |g_j|). \quad (14)$$

According to vector analysis, the slowly changing vector is

$$a(i, j) = \arctan\left(\frac{g_j}{g_i}\right). \quad (15)$$

The angle α is the angle relative to the x-axis.

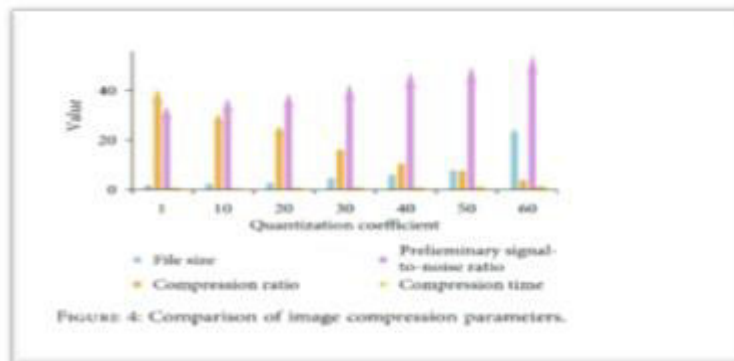
3. Image Processing System Design Experiment

3.1. Experimental Parameter Design.

In this experiment, MATLAB is used for modeling, and then, the sample data of this article is imported. The compressed sensing sparsity is 1000; that is, after the original image is wavelet transformed, the wavelet coefficients are sorted, and then, 1000 large coefficients are retained and reset the remaining coefficients to zero. Observe the sparse wavelet coefficients of the observation matrix. The size of the observation matrix is 4116×16424 , and then, the observation results are transmitted to SOPC for reconstruction. This experiment was conducted to determine whether the SOPC system regenerated by OMP was functioning normally. Therefore, the wavelet coefficients after zeroing are used to observe the original image instead of the original image [17]. In this experiment, the wavelet coefficients after zeroing are equal to the original image and the reconstructed wavelet coefficients are equal to the reconstructed image.

3.2. Image Processing Programmable System Design

(1) Design input: there are many ways to introduce design. At present, the two most commonly used are circuit diagrams and material description languages. For simple drawings, you can use charts or ABEL language design. For complex designs



schematic diagrams or material description languages or a mixture of the two can be used, and hierarchical design methods can be used to describe units and hierarchical structures. When the software design and input check for grammatical errors, the software will create a list of grammatical errors for the design and input

(2) Design realization: design realization refers to the drawing process from design input files to bit stream files. In this process, the training software automatically compiles and optimizes the design files and performs mapping, placement, and routing of selected devices and creates the corresponding bit stream data files

(3) Device configuration:

FPGA device configuration modes fall into two categories: active configuration features and passive configuration features. Active configuration mode is a configuration operation program guided by GAL devices that control the external storage and preparation process. Passive configuration is a controlled synthesis process

(4) Design verification: this is consistent with the design verification process including functional simulation,

Table 1: Image compression parameter table with different quantization coefficients.

Quantization Coefficient		File Size (KB)		Compression Ration		Preliminary Signal to noise Ratio		Compression time (Seconds)	
60		1.9		41		33.9		0.6	
50		2.5		31		37.3		0.5	
40		2.9		36		39.3		0.7	
30		4.8		17		43.1		0.8	
20		6.3		11		48.2		0.9	
10		8.2		18		50.5		0.95	
1		25		4		55.1		1.2	
S.No	1	2	3	4	5	6	7	8	9
a	0.4	0.45	0.5	0.55	0.6	0.65	0.7	0.8	0.9
Fuzzy SSIM	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58
PSF restore SSIM	0.79	0.8	0.804	0.807	0.808	0.8	0.79	0.78	0.77
SVPSF Restore SSIM	0.85	0.854	0.857	0.867	0.868	0.858	0.856	0.845	0.845

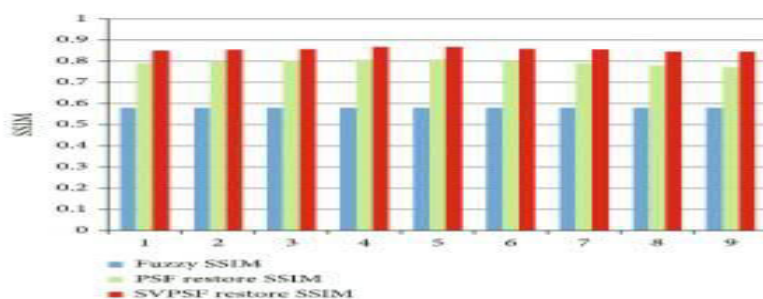
Table 2: The influence of parameter a on the restored image SSIM.

timing simulation, and equipment testing. Functional simulation verified the design logic. In the process of introducing the design, part of the operation or the entire design can be simulated. Timing simulation is a delay simulation of device layout and operation after the design is implemented, and the timing relationship is analyzed. Equipment testing is to use test tools to test the final function and performance indicators of the equipment after the experiment or programming, as shown in Figure 3.

4. Image Processing Algorithms Based on Cloud Computing

This section analyzes the performance of the compression algorithm, the complexity of the processing process, and the image reconstruction of compressed sensing.

4.1. Image Coding Compression Performance Test. To test the performance index of the algorithm, this paper selects the real scene geometric regular image collected by the web camera as the original image of compression coding. The image resolution is in pixels. Figure 4 is an image effect frame encoding with different quantization factors in a compression encoder. The difference in image quality after compression coding can be instinctively compared through human vision [18, 19]. The experiment compares the processing effect map from the file size reduction ratio, peak signal-to-noise ratio, time complexity, visual effect, and other aspects. The running results of the reduction algorithm with different quantization coefficients are shown in Table 1. From the data in Table 1, it can be seen that different choices of system parameter settings will have a greater impact on the image compression effect. The larger the quantization coefficient, the smaller the amount of compressed image data, the larger the image compression ratio, and the smaller the peak signal-to-noise ratio of the image. At the same time, the compression time of the algorithm is

**Figure 5:** The effect of parameter a on the restored image SSIM.

also less, and the visual effect of the image can be seen in obvious blocking effects. The complexity of the algorithm is $O(n \log 2n)$. The real object taken by the image cannot be distinguished. To observe the comparison of data more intuitively, draw the table into a picture, as shown in Figure 4.

It can be seen from the experimental data that the system quantization coefficient is set to 15, and the visual effect of the compressed image is obvious. At this time, the image has no obvious distortion, and the difference from the original image is small. At the same time, the image compression, peak signal-to-noise ratio,

compression time, and other parameters are compared. So it can be ensure the compression ratio under the condition of get a better image quality.

Table 3: Influence of parameter b on reconstructed image SSIM.

S.No	1	2	3	4	5	6
b	256	200	400	600	1600	4600
Fuzzy SSIM	0.57	0.57	0.57	0.57	0.57	0.57
PSF Restore SSIM	0.8	0.51	0.8	0.51	0.815	0.818
SCPSF Restore SSIM	0.86	0.86	0.85	0.87	0.88	0.86

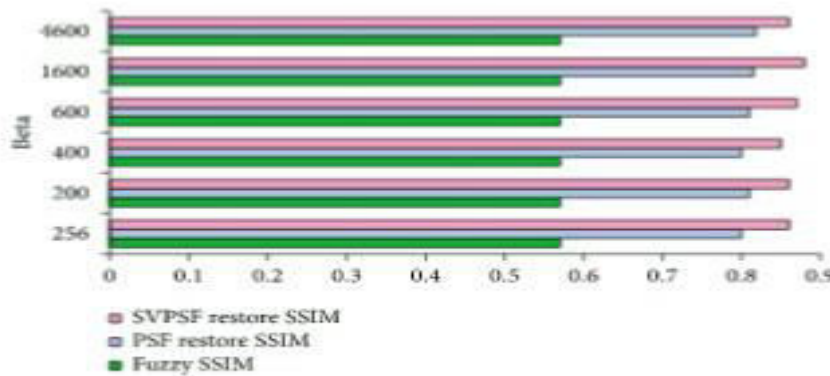


FIGURE 6: The effect of parameter b on the restored image SSIM.

4.2. Image Processing Algorithm Analysis.

The fuzzy image is restored based on the super Laplace prior model. From the above analysis, it can be seen that the regularization term index a and the regularization parameter b of the algorithm have a great impact on the restoration quality of the image and the execution time of the algorithm. In this paper, based on SVPSF, the image formed by the single-lens imaging system can be restored in blocks through the super Laplace prior algorithm. By taking the values of the parameters a and b selected by Dilip Krishnan's experiment as 0.5 and 256, respectively, the block restoration is based on the SVPSF image.

4.2.1. The Influence of Parameter on the Image Restoration Algorithm.

The image is restored by accurately establishing the model through the super Laplacian operator; usually, the range of a is 0.5-0.8 and the index has a great influence on the restoration effect. Different intervals correspond to different algorithm models. When $a = 1$, it is the Laplace restoration model, which does not fit the heavy-tailed distribution of the image very well. When

$a = 2$, it is a Gaussian distribution model, and the fitting effect is very different. When a is between 0 and 1, it is a super Laplace model, and when a is between 0.5 and 0.8, the restoration effect is better. Therefore, it is necessary to analyze the value of parameter a and restore the restored image with different values of a parameter to obtain different SSIM. The experimental data is shown in Table 2. According to the analysis of the experimental data in the table, the restored image and SSIM change with the value of

Table 4: Compressed sensing SOPC image reconstruction results.

Image	Lena	Man	House	Hill	Camera
PSNR	26.9	26.1	30.5	27.6	27.5

parameter a . SSIM increase monotonously in the range of 0.4-0.55. When $a = 0.6$, the SSIM value is the largest, and the similarity is increased by 1.5% compared to that before optimization; it decreases monotonously in the range of 0.6-0.9. It can be seen from Figure 5 that the parameter a had influence on the restored image SSIM.

4.2.2. The Influence of Parameter b on the Image Restoration Algorithm. It is solved by the semi quadratic penalty method, and the variable w is introduced while giving the blurred image x . b is the weight of a regularization process change, and its value increases monotonously from $b(0)$ to $b(\text{inc})$ to $b(\text{max})$; as b changes, the number of iterations of graph restoration also changes. At the same time, the number of iterations is closely related to the running time of the restoration algorithm and the restoration effect, so this article analyzes the parameter b .

From the data analysis in Table 3 and Figure 6, it can be seen that under the condition that parameter a does not change, the SSIM of the restored image changes with the change of parameter b

From the data in the table, it can be known that as the parameter b gradually increases, the SSIM of the restored image shows a trend of first increasing and then decreasing.

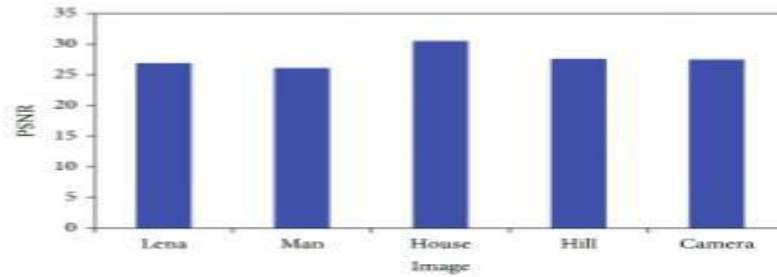


FIGURE 7: PSNR value comparison after SOPC image reconstruction.

Table 5: The relationship between image reconstruction sparsity and PSNR.

Sparsity	500	600	700	800	900	1000	1100	1200	1300	1400
Cameraman	24	25	25.6	26.4	27.1	28	28.3	28.6	23	21
Hill	25.2	26	26.5	27	27.3	27.5	27.9	28.1	25.3	23
House	26.7	27.8	28.3	29	29.5	30	31.2	31.7	27	25
Man	23.7	24	24.6	25.3	26.2	26.5	27	27.2	24.5	21.4
Lena	24	24.3	25	25.8	26.8	27.2	28	28.2	23.4	21.6

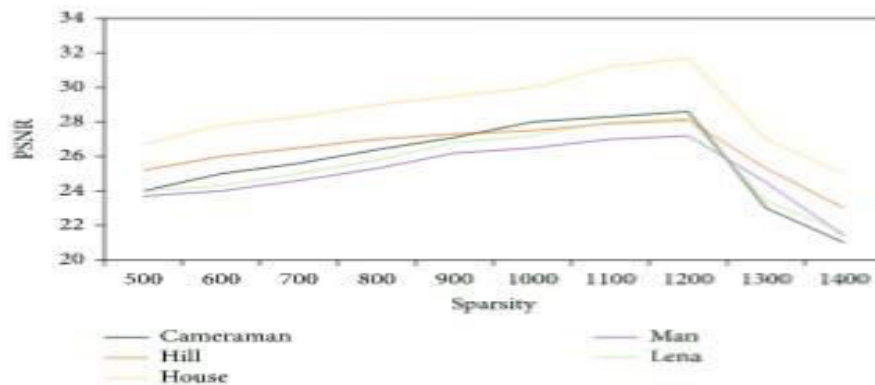


FIGURE 8: The result of image reconstruction changes with sparsity.

When b is between 200 and 600, the value of the restored image SSIM gradually increases, and there is a maximum value of 0.87. When b is between 1600 and 4600, the SSIM value of the restored image gradually decreases, and the SSIM value after restoration is smaller than that before optimization.

4.3. Image Reconstruction Analysis of Compressed Sensing. This article introduces the SOPC implementation of compressed sensing based on the OMP reconstruction of Cholesky matrix decomposition. The following is an analysis of the experimental results of SOPC. The results of the analysis are shown in Table 4. From the comparison of the data in the table, it can be seen that the PSNR of the SOPC reconstructed image is not high. Analysis shows that three reasons affect the PSNR:

- (1) All data in this SOPC system are represented by fixed-point numbers, so the accuracy of the algorithm is affected to a certain extent, so the PSNR of the reconstructed image is not high.
- (2) In this system, LFSR is used to generate a random observation matrix. Since the random number generated by LFSR is not completely random, it affects the incoherence of the observation matrix to a certain extent. Reconstructed PSNR is affected.
- (3) Before observing the wavelet coefficients, the small coefficients in the wavelet coefficients are reset to zero, and then, some small details are lost, so PSNR will be affected. the data, draw the table into a graph, as shown in Figure 7.

According to the data analysis in the figure, it can be concluded that among the 5 images, the house image has the highest PSNR. The analysis shows that the house image is relatively regular, and the coefficients obtained

after the wavelet transform are relatively sparse, and the wavelet coefficients are reset to the minimum of the house image, so the PSNR after reconstruction is the maximum. In this experiment, the size of the observation matrix is still 4100×16400 , but the sparsity is increased from 500 to 1400, with an interval of 10 each time. Five images were reconstructed, and the relationship between the sparsity and PSNR obtained is shown in Table 5 and Figure 8.

4.4. Discussion. This paper builds a wavelet transform model under Quartus II. Compared with the model in the reference, the simulation parameter in this paper has a better effect in the range of 0.5-0.8. In the literature, the value of a is between 0.5 and 2 due to the difference in the model. This is because the model in this paper optimizes parameters such as image compression, peak signal-to-noise ratio, and compression time to reduce interference, so the value range is concentrated, which facilitates the control of the model and does not cause model distortion. In addition, the model in this paper can process images with a signal-to-noise ratio between 500 and 1400, while other methods have smaller signal-to-noise ratio intervals. Therefore, the method in this paper can process images with a large signal-to-noise ratio range to a small value and has a high degree of recovery.

5. CONCLUSIONS

The hardware implementation scheme of the image processing algorithm is proposed. By comparing the PC implementation of the image processing system and the dedicated digital signal processor (DSP) implementation, the structure of the cloud computing-based on-chip programmable system is constructed, and the various parts of image acquisition, storage, and real-time display of each part of image processing are carried out, and the overall structure design is improved. The structure design has been improved. The cloud computing application introduced in this article is an important cloud imaging system project. Different choices of system parameter settings will have a greater impact on the image compression effect. The larger the quantization coefficient, the smaller the amount of compressed image data, the larger the image compression rate, and the smaller the peak signal-to-noise ratio of the image. At the same time, the compression time of the algorithm is less, and the visual effect of the image can be seen in the obvious occlusion effect. It is impossible to distinguish the real objects captured in the image.

Because the image data itself contains a large amount of information, the realization of image processing algorithms puts forward higher requirements on hardware devices. With the development of embedded system technology, the functions of embedded microprocessors are becoming increasingly powerful. The combination of style and image processing will also become a complex system project.

DATA AVAILABILITY

The data underlying the results presented in the study are available within the manuscript.

Conflicts of Interest The authors declare that they have no conflicts of interest.

ACKNOWLEDGMENTS

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ANTI PROLIFERATIVE AND ANTI-TUMOR EFFECT OF DIALLYL DISULFIDE AND CISPLATIN ON UPSURGING TRIPLE NEGATIVE BREAST CANCER CELL LINE: MDA MB 231**Kaavya Gunasekaran, Priyadharshini Thangavelu and Suja Samiappan***

Department of Biochemistry, Bharathiar University, Coimbatore, Tamil Nadu, India

ABSTRACT

Metastasis of tumor cells is one of the biggest concerns in chemotherapy in triple negative breast cancer. Due to vigorous motility of tumor cells into the blood stream followed by extravasation, tumor metastasis occurs eventually which may further cause invasion of normal cells. To reduce the metastasizing of tumor cells we have used combinational drug therapy with diallyl disulfide (DADS) and cisplatin (CDDP) to decrease cancer cell migration. Henceforth, in this study we have performed cytotoxicity assay and wound healing assay to assess the anticancer activity and possible antimetastatic activity of DADS and CDDP on MDA MB 231 breast cancer cell line which could be of great aid for further studies.

Keywords: Tumor metastasis, extravasation, combinational drug therapy, Antimetastatic activity, anti-tumor activity, cell migration.

1. INTRODUCTION

Triple negative breast cancer is one of the aggressive forms of cancer. It accounts for about 10-12% of common cancers that occur in women. Being an aggressive form of cancer and have possible chance for recurrence, the treatment for TNBC becomes less successful and sometimes untreatable. Even though chemotherapy is likely to be successful the adverse side effects of chemotherapeutic drugs might interrupt the therapeutic process. Combination therapy has been long in practice which only not increases the efficacy of the treatment but also overcomes drug resistance of a single drug (Zhang *et al*, 2021).

Cell motility is related to the survival of cells which migrates from one part of the body to another, which is interlinked with tumor metastasis. Tumor metastasis is one of the major concerns in cancer treatment (Ridley *et al*, 2003). Metastasis is mainly related with epithelial based carcinomas that results polarity loss in epithelium which in turn ruptures the basement membrane followed by invasion of cancer cells into the blood stream or lymphatic vessels. The tumor cells survive/ escapes the high pressure of the vessels and finally extravasate the secondary organ/tissue while forming secondary tumors (Wang *et al*, 2019). Further in the secondary tissues the cancer cells start adapting themselves according to the blood pressure of the organ with changes in their blood capillaries (Mahmood *et al*, 2018).

Garlic has been used in diet for ages which holds many therapeutic values. The organosulfur compounds present in garlic possess various pharmacological activities. Diallyl disulfide, an organosulfur compound derived from garlic possess various chemotherapeutic activity which may be a good choice for treating TNBC. Cisplatin is one of the most commonly used anticancer agent for the treatment of aggressive forms of cancer. Combination of DADS and CDDP would become a better targeting for aggressive forms of cancer, which also increases the drug sensitivity and efficacy.

The main aim of this study was to combine two chemotherapeutic drugs to target the tumor cells and assess their cytotoxic and anti-metastatic potential on *In vitro*.

2. MATERIALS AND METHODS:

Diallyl Disulfide and Cisplatin were procured from Sigma-Aldrich (St. Louis, MO). Dulbecco's modified eagle's medium (DMEM), Fetal Bovine Serum (FBS), Antibiotics, MTT (3- [4, 5-dimethylthiazol-2-yl]-2, 5-diphenyltetrazolium bromide) were procured from HiMedia laboratories, Mumbai. MDA MB 231 cell line was procured from NCCS, Pune.

2.1 Cell Culture:

Briefly, MDA MB 231 cells were maintained in DMEM medium with 10% FBS and 1% antibiotic at 37°C and 5 % CO₂ with continuous until the commencement of the experiments.

2.2. In Vitro Drug Cytotoxicity Study:

MDA-MB-231 cells were seeded into 96-well plate with density of 1×10^5 cells and incubated for 24 h. After 24 h post seeding the cells were treated with various concentrations of DADS, CDDP and their combined ratios. It was then incubated for 24 h after where MTT (5mg/ml) was added and incubated again for 5 h in CO₂ incubator. The plate was then removed from the incubator and 100 µl of Dimethyl Sulfoxide (DMSO) was

added to all the wells. The absorbance of the colored solution was quantified by a microplate reader (Multiskan Go, Thermo Fisher Scientific, USA) at 570 nm. The viability was calculated as:

$$(\text{OD of individual test group} - \text{OD of control group}) / \text{OD of control group} \times 100$$

2.3. Wound Closure Assay

MDA MB 231 cells were seeded in 24 well plate and were allowed to reach confluency/ monolayer for 24 h. then a sterile 10 - 100 μL pipette tip was used to make the wound across the well. The detached cells were removed by replacing the existing medium with fresh medium. Then plates were treated with the IC50 concentrations of DADS, CDDP and combined accepted synergistic ratio. The wound closure was imaged for 0 h and 24 h using a microscope (Nikon, Ti2, Japan) at 4 x magnification.

2.4. Statistical Analysis

All the data were shown as mean ± standard error of the mean.

3. RESULTS:

3.1. In Vitro Cytotoxicity Study

The *Invitro* cytotoxicity assay revealed the efficacy of DADS and CDDP in combination. While comparing to the free DADS and CDDP, the combination of DADS/CDDP showed much cytotoxic effect on MDA MD 231 cells. The IC50 value of DADS was 24.8 μg ± 0.95 after 24 h, and IC 50 for free CDDP was 12.7 μg ± 0.98. The combined IC50 for DADS/CDDP was found to be 9 μg ± 1.34, which clearly showed a better combinatorial therapy against MDA MD 231 cells. This proves that the combination therapy could not only inhibit the cancer progression but also can reduce the metastasis in a concentration dependent manner.

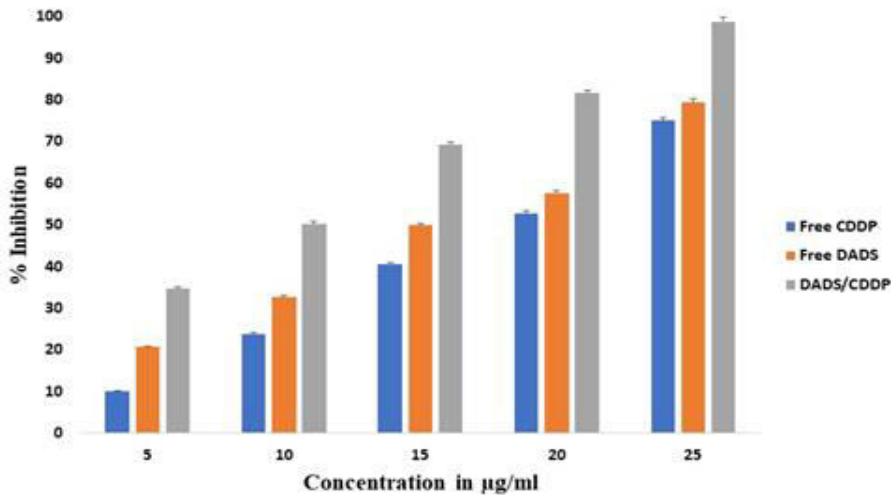


Figure 2: Shows the % Inhibition of free DADS, free CDDP and DADS/CDDP at 0 h respectively.

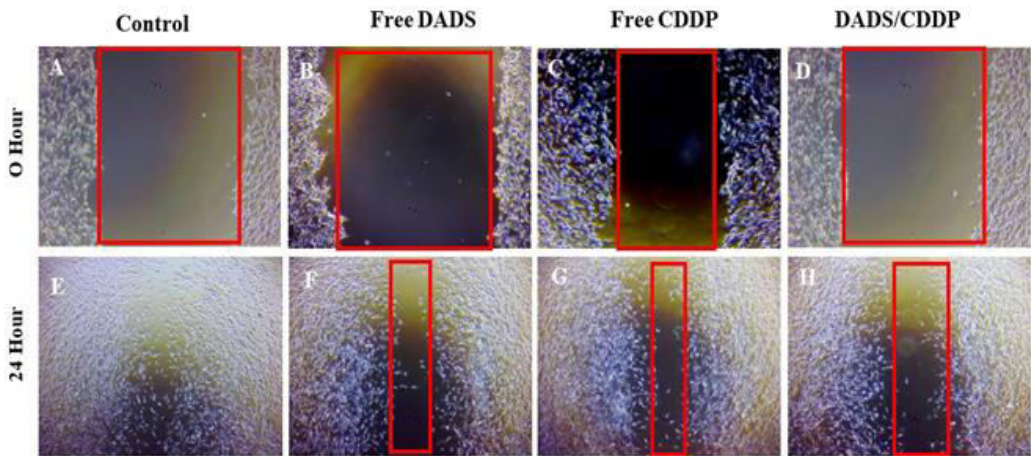


Figure 2: Shows the wound closure of control (A), free DADS (B), free CDDP (C) and DADS/CDDP (D) at 0 h respectively. E-H shows the closure of wound after 24 h, which shows that DADS/CDDP inhibits cell migration.

3.2. Wound Closure Assay

The wound closure assay showed the migration of cells in the well which denotes their motility profile. The wound was analyzed with or without the drug treatment to analyze the activity of DADS/CDDP in cancer cell migration. The wound was monitored for 0, 12, 24 h respectively. The control well with no drug treatment exhibited faster wound closure rate (complete closure within 24 h), whereas the free drug (DADS and CDDP) treated wells showed delayed wound closure compared to the control groups. Further, the combined DADS/CDDP wound closure rate was much slower than the rest of the two groups.

4. DISCUSSION

Therapies for cancer usually includes chemotherapy, radiation therapy and surgery, while chemotherapy being the most preferred therapy for most of the cancer types including TNBC. But the success of chemotherapy strategies is still at large due to poor drug availability and efficacy. Combination therapy is amalgamation of two or more anticancer drugs to make it synergistically strong than single drug therapy (Bayat *et al*, 2017). Therefore, combining two drugs would likely address this issue in TNBC treatment. In our study, we have assessed combined anti-tumor and antimetastatic/antiproliferative activity of DADS/CDDP on MDA MB 231 cells. Our results depicted that free DADS and CDDP have both anti-tumor and antimetastatic activity but the combination of DADS/CDDP had significant less IC₅₀ value compared to its counterpart. A study conducted by Alrumaihi *et al*, 2022, showed that DADS showed a good anticancer activity with lower concentrations of drug. Through this we may infer that the drugs of our choice had better inhibition activity against MDA MB 231 cell lines. Moreover, the wound closure results showed the anti-metastatic activity of DADS/CDDP in combined form rather than the mono drugs. Tumor metastasis of DADS/CDDP treated well showed very slow cell migration compared to the rest of the groups. This may infer the low motility and loss of cytoskeletal structure/ inhibition of protein biosynthesis responsible for cytoskeletal structure in the cancer cells which lead to poor migration activity (Wang *et al*, 2019) (Ballestrem *et al*, 2000).

5. CONCLUSION

This study interprets about possible interaction and anti-tumor activity of DADS/CDDP combination with lower drug concentrations. Moreover, this combination also proves to have a positive impact by inhibiting cancer cell migration which could prevent tumor metastasis. Thus, we conclude that combination therapy will be a better option in treating various aggressive cancer types.

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ANTIMETASTATIC EFFECTS OF 6-GINGEROL AND PACLITAXEL COMBINATION IN A549 NSCLC CELL LINES**Priyadharshini Thangavelu, Kaavya Gunasekaran and Suja Samiappan**

Department of Biochemistry, Bharathiar University, Coimbatore, Tamil Nadu, India

ABSTRACT

Most lung cancer patients are diagnosed at an advanced stage due to lack of symptoms. Treating patients in advanced stages is very challenging. Many chemotherapy drugs are in the treatment regimen to prevent metastatic cancer. However, toxicities associated with those agents limit their use in cancer treatment. Metastatic cancer patients commonly develop resistance to chemotherapeutic drugs. In recent studies, phytochemicals have been shown to not only reduce the toxicities of chemotherapeutic drugs but to also enhance their sensitization. Researchers are also paying attention to the combination of phytochemicals and chemotherapy nowadays for cancer treatment. Paclitaxel (PTX) is one of the promissive chemo drugs used in lung cancer treatment. PTX is a substrate for the P-gp protein, which is responsible for drug efflux. 6-Gingerol (Gn) derived from ginger has been reported to inhibit cell invasion as well as enhance the sensitization of PTX in many tumour cells. Hence, in this study, we evaluated synergistic ratio of PTX and Gn assess its cytotoxic activity and antimetastatic activity in A549 cell lines against free drugs. In this study, Physicak mixture of PTX-Gn significantly delayed wound closure percentage as well as increased cytotoxic effect at lower concentration against free PTX and Gn. The findings from this study concluded that PTX/Gn combination would be an effective approach to treat metastatic lung cancer.

Keywords: 6 – Gingerol, Paclitaxel, Combination Synergism, Lung cancer, Metastatis, Wound closure.

ABBREVIATIONS

Gn	-	6-Gingerol
NSCLC	-	Non small cell lung cancer cell lines
OD	-	Optical density
MTT	-	3 - (4, 5-dimethylthiazol-2-yl) - 2, 5-diphenyltetrazolium bromide
IC50	-	50% inhibitory concentration
NSCLC	-	Non small cell lung cancer
B (a) P	-	Benzo[a]pyrene

1.0 INTRODUCTION

Globalcon 2020 survey stated that, lung cancer is the second most common cancer, resulting in approximately 9 million deaths per year in both sexes. Most of the patients ignore the symptoms of lung cancer, such as coughing and shortness of breath consequently develop metastatic cancer (Paul et al 2022). Paclitaxel belongs to the class of drugs known as taxanes. In a medical treatment, it is used to treat breast, ovary, and non-small cell lung cancer. During the M phase of cell division, it inhibits depolymerization of microtubules. Nab-paclitaxel has been approved for use in combination with chemotherapy to treat patients with metastatic cancer (Christina et al., 2021, Wang et al., 2021). Dietary phytochemicals have the potential to enhance the sensitization of paclitaxel and thereby reduce its toxicity (Sadia et al., 2018).

6-gingerol derived from ginger has been found to possess a variety of beneficial pharmacological effects. It has been reported that 6-gingerol treatmentsignificantly increase the cytotoxicity in lung cancer cell lines (Babajide et al., 2022). A recent study found that 6-gingerol was more effective than curcumin, it inhibiting 12-O-tetradecanoylphorbol 13-acetate (TPA)-induced tumor promotion in mice (Mohan et al., 2022).

Utilizing drugs that work by different mechanisms reduces the likelihood of cancer cells becoming resistant to treatment. Taking this approach reduces drug resistance while simultaneously reducing metastatic potential, tumour growth arresting mitotically active cells, decreased cancer stem cell populations, and inducing apoptosis (Iman et al., 2022) Hence combination of PTX and Gn would be considered as a one pot treatment to deliver those agents synergistic ratio of Gn and PTX in tumour microenvironment at same time to treat metastatic lung cancer.

Cytotoxicity testing is one of the biological evaluation methods that uses tissue cells in vitro to measure the efficacy of drug combination to promote or decrease cell proliferation and evaluate the morphological changes

may occur upon treatment. Wound healing assay is a one of the standard in vitro technique to analyse the drug efficacy to inhibit migration of cancer cells (Wu et al .,2020) Hence, in this study, we evaluate the synergistic ratio of Gn and PTX to exert better antimetastatic activity in A549 cell lines over single drugs.

2.0 MATERIALS AND METHODS

2.1. Chemicals and Cell Culture

Paclitaxel, 6 – gingerol, were procured from Sigma Aldrich, All cell culture materials, including, Dulbecco's modified eagle's medium [DMEM], Fetal Bovine Serum [FBS], and L-glutamine, were obtained from Gibco [Grand Island, NY, United States]. 5-diphenyltetrazolium bromide [3-[4, 5-dimethylthiazol-2-yl]-2, 5-diphenyltetrazolium bromide] MTT, obtained from Himedia Mumbai, India. A549 and NCCS, Pune. All the solvents used in the study are HPLC grade and were purchased from Himedia.

2.2 Cell Culture Condition

A549 Cell lines were cultured in DMEM supplemented with 10% v/v FBS, 100 units/ml penicillin, and 100 µg/ml of streptomycin under steady state conditions at 37°C with 5% CO₂ in a humidified incubator.

2.3 Cytotoxicity Study

The cytotoxicity of free PTX, Gn alone and combination of both were evaluated in A549 cells by MTT assay. Briefly, A549 cells were seeded in a 96-well plate at a density of to 1×10⁴ cells per well. After 12 h, Cells were then treated with various concentrations of PTX (and Gn alone or in combination with both. After treatment, DMSO (100 µL) was added to dissolve the formazan crystals. The samples were fully dissolved by the pipet mixing technique. The absorbance was measured at 560 nm using a multiplate reader [Multiskan Go, Thermo Fisher Scientific, and USA]. The results were expressed as the percentage of viable cells relative to untreated control cells.

2.4 Combination Studies

Combinations of PTX at different concentrations with a fixed Gn concentration were utilized in the cell treatments. A549 cells were exposed to solutions containing 20, 40 and 60 µM Gn combined with PTX (0.02–2nM). The median effect analysis was employed to study the combined effect; the combination index (CI) was calculated based on the median effect equation of Chou

$$CI = \frac{D1}{D1X} + \frac{D2}{D2X}$$

Where as D¹ and D² represent the concentrations of compounds 1 and 2 in combination to achieve x% inhibition, respectively, whereas Dx and D represent concentrations of compounds 1 and 2 to achieve x% inhibition when used alone, respectively. CI<1, CI=1 and CI>1 indicate synergism, additivity and antagonism, respectively.

2.5 Cell-Migration Assays

Cell migration of free PTX and Gn, PTX + Gn , were assessed through wound-healing assays. In brief, A549 cells were seeded in six-well plates and grown for 24 hours at 37°C in a CO₂ incubator. When cell density reached 90%, cells were scratched with a sterile pipette tip with at least three lines per well. Scratched cells were washed off with PBS and the different drug formulations added. Images of cells invading the scratch were captured at 0, 24 h using microscopy. The effect of drugs on cell migration was evaluated by calculating the migration rate:

$$\text{Migration rate} = (W_n/W_0) \times 100\%$$

Where W_n and W₀ represent average scratch widths at n and 0 hours, respectively.

3.0 RESULTS AND DISCUSSION

3.1 Effects of PTX and Gn on A549 Cell Proliferation

The antiproliferative effects of PTX and Gn against NSCLC A549 cells were assessed with a MTT assay after 48 h of treatment. Gn (25–200 µM) inhibited the proliferation of A549 cells in a dose-dependent manner (Figure 1(A)). Concentrations of 2 – 10 nM PTX enhanced the antiproliferative effect in concentration dependant manner (Figure 1(B)). IC₅₀ value of PTX was 8.9 nM. The IC₅₀ value of Gn was 102 µM.

3.2 Combination Effect of PTX and Gn

When PTX was combined with Gn (20, 40 or 60 µM), the IC₅₀ value of the combination was significantly lower than PTX alone (Table 1). The CI values of 1.0nM PTX were lower than 0.8 was between 0.1 and 0.6. These results suggest significant synergy between Gn and PTX when 10–60% of the cells were inhibited.(Figure 1C)

3.3 In Vitro Wound Healing Assay of PTX and Gn

Synergistic ratio of PTX and Gn and same concentration of free drugs were treated in wound scratched 6 well plate with A549 cell lines. The wound in control well closed quickly when compared to all treated well. The synergistic ratio of PTX and Gn significantly increased (49%) the wound closure percentage over single drugs IC₅₀ value. A graph [Fig. 10. E] Indicating the percentage of wound closure at indicated time points 0, and 24 h after the initiation of the wound was given.

4.0 DISCUSSION

Lung cancer is the leading cancer resulting high mortality rate in both men and women. Diagnosed at metastatic stage is the challenge to treat lung cancer (Garofalo et al., 2018). Single drug treatment is replaced with combination of drug treatment in clinical practice to exert multi pathway target (Loo et al 2022). Phytochemicals combination with chemodrug was reported to be a potent combination to treat metastatic lung cancer (Yu hu et al., 2022). Recent studies focused on combination of Gn and PTX to treat cancer due to efficiency of both drugs (Wala et al., 2022). The combination index and viability assay revealed that the PTX and Gn exert better cytotoxicity in combined form. This may be due to the efficacy of Gn to increase the sensitization of PTX in cancer cells. Viability results were further validated by wound closure assay that the synergistic combination of Gn and PTX significantly inhibited when compared with single drug alone. Aforementioned statement agreed with the conclusion of Wala et al., 2022 that, 6-Gingerol may act as a cell death-inducing agent in cancer cells and, in combination with paclitaxel, and increase the effectiveness of PTX in breast cancer treatment.

CONCLUSION

The results of the present study concluded that the PTX showed significant cytotoxicity and wound closure percentage at lower dosage when associated with Gn. Gn would be a potent phytochemical to increase the sensitization of PTX and reduce the toxicity associated with it. Our results evident the PTX and Gn would be effective combination to treat metastatic lung cancer.

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Tables:

Table 1: Combination index (CI) of PTX and Gn

PTX (nm)	Gn(μM)	Combination index
0.2	20	Strong antagonism
	40	moderate antagonism
	60	Moderate antagonism
0.4	20	moderate antagonism
	40	moderate antagonism
	60	Mild antagonism
0.6	20	moderate antagonism
	40	moderate antagonism
	80	Mild synergism
0.8	20	Moderate synergism
	40	Moderate synergism
	80	Moderate synergism
1.0	20	Strong synergism
	40	Strong synergism
	80	Strong synergism

Figures:

Figure 1: Effects of PTX and Gn on A549 cell proliferation. Viability percentage of A549 cells subjected to Andro (A), Gn (B) PTX (C) CIs of PTX with Gn.

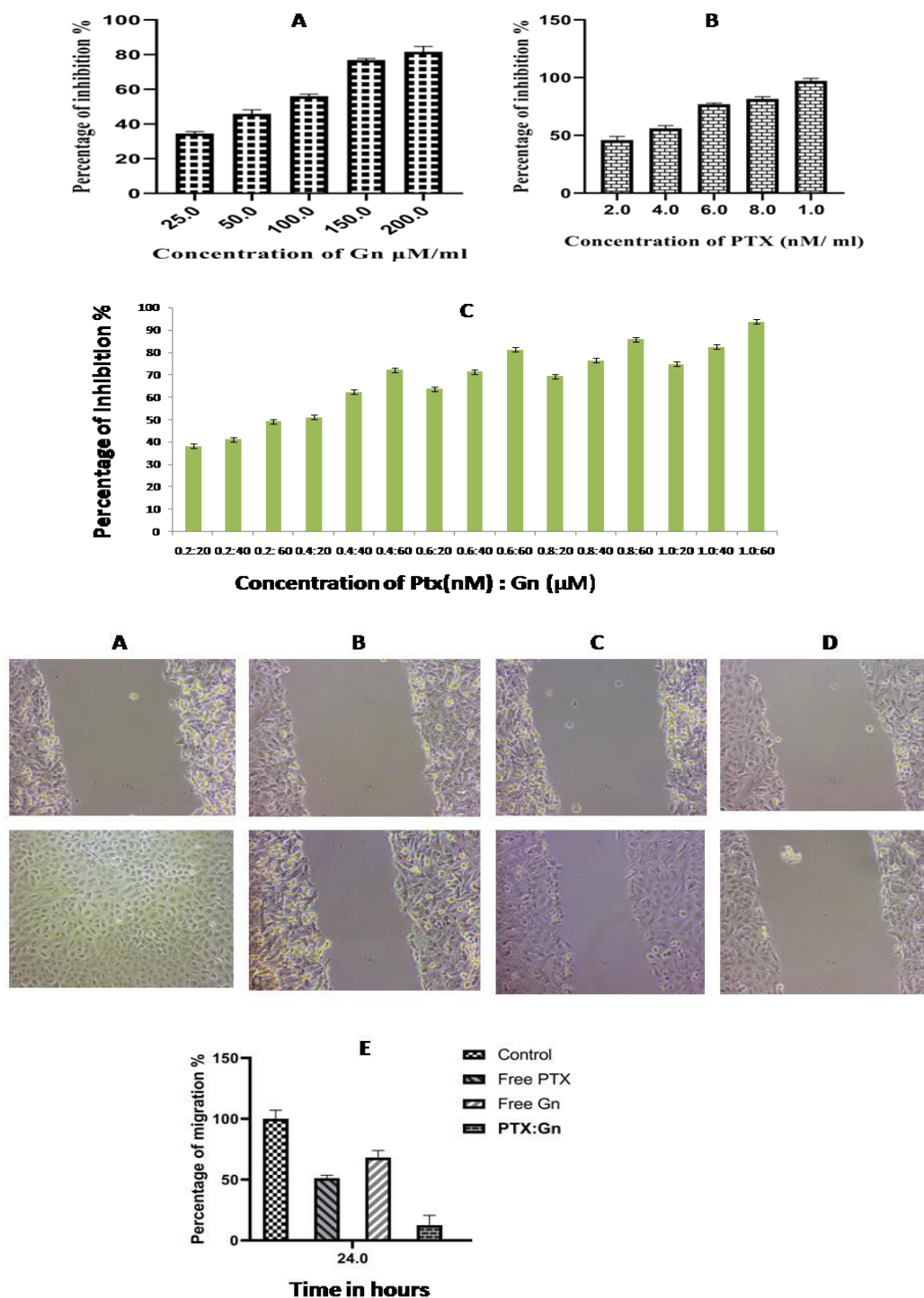


Fig. 2: The antimigration of (A) control (B) PTX (C) Gn (D) PTX+Gn on A549 cells. (E) graphical representation of wound closure percentage after incubation 24 h.

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ASSESSING THE PUBLIC HEALTH EFFECTS OF NARGHILE SMOKING AMONG THE YOUNG PEOPLE IN BAGHDAD CITY

Luma H. AliCommunity Health Department the College of Health and Medical Technology Middle Technical University
Baghdad, Iraq**ABSTRACT**

Water pipe smoking is a cultural activity and commonly occurs in groups where the water pipe may be shared, such as at social or family gatherings and in order to assess, environmental awareness, a descriptive cross-sectional investigation utilizing self-administered questionnaire was directed by 250 youth male with (20-34) age in Baghdad province during 2019. narghile smoking students.

General descriptive statistics were used to analyze the data. there were 216 (86.4%) smokers, 92 (36.8%) of them smoke narghile only, 34(13.6%) of non-smoking as well as the main factors helps in wide distribution of narghile smoking are the friend ship (48%) whereas the difficult of life and unemployment (34.8%) and (14.4%) for social media and appearance showed that the majority of youth were agree that smoking in narghile increase the ability to fit in a group and most of their friend are smoker (80.8%) , fill the time (70.8%) , clam the nerves and leaves worries (77.6%) so the environmental awareness about the impact of narghile on public health is less polluted (53.2%) to environment and other person in home or public place.

INTRODUCTION

Water pipe smoking (commonly known in the uk as shisha, and elsewhere as hookah, narghile ,and hubble bubble .water pipe smoking (shisha) is a way of inhaling smoke usually tobacco smoke which has existed for several hundred years and is a traditional practice in the Middle East and Southern Asia[1]. and prior to the 1990s appeared to be becoming less common, and occurred predominantly in older men .

In recent decades it has grown in popularity, both in settings where it is traditionally used, particularly among young people which increased with introduction of flavoured waterpipe tobacco, known as Mo'assel (Arabic for honeyed), which is used by most waterpipe smokers.

The internet, mass and social media, which facilitate the marketing of shisha products; the expansion of café culture, which lends itself to an activity which is mostly practiced in the company of friends and family; and the relative lack of water pipe-specific policies and regulations[1]. Furthermore, several studies indicate that smokers perceive water pipe smoking to be less harmful, less addictive, and more socially acceptable than regular cigarettes, which is likely to contribute to the use of water pipes [2].

Water pipe smoking is a cultural activity and commonly occurs in groups where the water pipe may be shared, such as at social or family gatherings. Key motives for using shisha have been found to be socializing, relaxation, pleasure and entertainment.[2] Water pipe smoking also appears to function as an adjunct activity; that is, smokers engage in other forms of activity while smoking, such as watching television, playing cards, studying, or conversing with one another[3,4].

Patterns of water pipe use tend to be quite different from those commonly seen with cigarette smoking. Water pipe smoking sessions usually last around 45 minutes, but in some cases extend to several hour[5,4]; however research indicates that most users are infrequent smokers and that around half of lifetime users have only smoked a water pipe up to three times.[6,7]. Misperceptions of Harm Favorable attitudes toward Water pipe unite(WPU) are possibly related to its reported sweet smell and pleasant taste by users; as a result, users view it as an appealing way to spend leisure time socializing with friends [8] WPU is widely perceived to be less harmful and less addictive than cigarette smoking [9,10,8–11] due to the erroneous belief that water filters the carcinogens in tobacco smoke [12,13]. In fact, water pipe smoke contains similar toxins to those found in cigarette smoke, including carbon monoxide, and tar; 82 other toxins have been identified. Thus, WPU may pose similar health risks as cigarette smoking, such as cancer, heart disease, and nicotine addiction, which can affect non-smokers through exposure which is equivalent to smoking of 10 cigarettes per day [15] and exposes users to higher levels of carbon monoxide due to the use of charcoal [16].

AIMS OF STUDY

- 1- To determine the prevalence of nargileh smoking among young people
- 2- Assess patterns perception and knowledge of people in Baghdad city about narghila use

- 3- Identify the factors associated with nargileh use among a sample of man in Baghdad province
- 4- Ascertain those public health impacts of water pipe and their ability to contribute the nicotine addiction to community population.

LITERATURE REVIEW

Water pipe is generic name of tobacco smoking that refers to any apparatus involves the passage of smoke through water before inhalation [17]. Shisha is becoming an increasingly popular method of tobacco use worldwide. It originated in the Eastern Mediterranean region and is now gaining popularity in many western countries including Australia, the UK, Canada, and the USA, and also in Southeast Asia. Shisha is typically smoked in social settings such as cafés and restaurants, and is very frequently smoked by urban youth, young professionals, and university and college students [18–19]. As a result of the rising popularity, shisha smoking is a growing threat to public health. The reason is because, firstly, there is a common misconception that smoking shisha is relatively less hazardous than smoking tobacco cigarettes, and secondly, most of outlets offering shisha remain largely unregulated. The erroneous perception that shisha is less hazardous than tobacco cigarettes has been a very widespread view [20–21]. Many erroneously believe that bubbling tobacco smoke through water makes it safe [22].

However, recent research proved that filtering tobacco smoke through water does not make it safer [23]. There is mounting evidence that indicates that shisha smoking is even more harmful than tobacco cigarettes [24,25]. Shisha smoking takes place typically in groups and lasts for nearly an hour. Therefore, shisha smokers often inhale more smoke than tobacco cigarette smokers because of the length of time a shisha session lasts. Furthermore, all members in the group will be exposed to the hazard of second-hand smoke from other members in the group in addition to their own shisha smoke. In addition to exposure to smoke from the tobacco, shisha smokers are also exposed to other toxic substances such as charcoal from the heat source [26].

Research studies on the health effects of shisha smoking are limited. In general, health risks caused by shisha smoking as well as breathing secondhand smoke from it are not expected to be dramatically different from those caused by cigarette smoking. For example, refers that shisha could be responsible for health adverse such as cancer, cardiovascular disease, and addiction similar to those caused by cigarette smoking, because dangerous smoke constituents, including carbon monoxide (CO), nicotine released from each of cigarette and shisha during smoking [27]. Another study found that compared to non-smokers, those who smoke shisha on a daily basis have high levels of Carcino Embryonic Antigen (CEA), which is a precursor to tumor development [28]. Data obtained from a systematic review of twenty-four studies linked shisha smoking to lung cancer and respiratory tract diseases, as well as mouth and gum diseases. The studies also found that pregnant women and infants are vulnerable to shisha risks. Also important associations were detected linking shisha smokers to the risks of bladder cancer, nasopharyngeal and esophageal cancers. Some studies have also correlated the unsanitary practice of sharing shisha between individuals without changing the mouthpiece to be a source of serious infectious diseases such as tuberculosis, hepatitis, and herpes [29]. There is a common belief that water-pipe is less harmful than cigarette due to the water filter, which supposedly traps most of smoke gases and nicotine. This fact may subconsciously increase the daily frequency of water-pipe smoking. Subsequently, smokers will be exposed to more toxic substances [30].

Harmful Constituents of Shisha Smoking and Adverse Health Effects

Scientific research has shown that shisha smoke is composed of toxicants and harmful constituents in quantities similar to or even higher than cigarettes [27]. Shisha smoke contains nicotine, carbon monoxide, tar, heavy metals such as cobalt, arsenic, chromium, and lead, and other carcinogens [27]. The adverse health effects caused by shisha smoking depend on various determinants. Health risks are affected by the amount and type of tobacco used, the charcoal brand, the combustion temperature, the size of the shisha device, the length and number of smoking sessions, and the amount of the smoke inhaled [28]. Smokers consider shisha smoking to be less harmful and less addictive practice than smoking cigarettes [30]. This misconception could be due to the presence of water, with people believing that it filters the harmful materials present in tobacco [31], however, research has demonstrated that this is not the case [30]. considerable number of studies have reported that shisha smoking is at least as toxic as cigarette smoking, if not more so [32]. In general, occasional shisha smokers, in a normal session that lasts between 15-90 minutes, are exposed to same amount of nicotine as that produced from smoking two cigarettes, while the amount of nicotine for regular smokers who smoke between 2-3 sessions/day is equivalent to smoking a pack of cigarettes over 24 hours [33].

Other research found that during a normal shisha smoking session ranging between 40 to 50 minutes, smokers are exposed to 40 times the amount of tar, 10 times the amount of carbon monoxide, double the amount of

nicotine, and 30 times the carcinogenic hydrocarbons released when smoking one cigarette [34,29]. Even though research studies on the adverse health effects of shisha smoking are limited, the fact that shisha smoking causes adverse health effects is undeniable. The extent of these health hazards is what requires further investigation [35]. Another study found that compared to non-smokers, those who smoke shisha on a daily basis have high levels of carcinoembryonic antigen (CEA), which is a precursor to tumor development [29]. Scientists further link shisha smoking to health hazards similar to those caused by cigarette smoking, such as several types of malignancies, respiratory tract diseases, palpitation and hypertension, cardiovascular diseases, fertility problems, low birth weight infants, and second-hand smoke and its related health risks [36,37]. Furthermore, data obtained from a meta-analysis of 24 studies associated the prolonged use of shisha to nicotine dependence and a subsequent increase in the likelihood of tobacco related health hazards [38]. Some studies have also correlated the unsanitary practice of sharing shisha between individuals without changing the mouthpiece to be a source of serious infectious diseases such as tuberculosis, hepatitis, and herpes [28].

GLOBAL TRENDS IN SHISHA SMOKING

Shisha smoking is a traditional method of smoking tobacco products. It is mainly prevalent in the Middle East, Africa (especially the northern countries), and in the South East Asia [39]. This traditionally cultural practice has spread to the western world, where it is used mostly among university and high school aged students of both sexes [27,40].

PERCEPTION OF SHISHA SMOKING

The increasing prevalence of shisha smoking, especially among younger population may be partly due to a perceived positive image that shisha smokers are sociable and more appealing [10]. Indeed, evidence suggests that social norms have made shisha smoking more popular and more acceptable for females to use. In a Syrian study investigating attitudes toward shisha smoking among different genders, a positive attitude toward shisha smoking, specifically among the female group participants, who perceived smoking shisha as an appealing habit was found [10]. However, the rate of shisha smoking is still higher among males [40]. Factors that may account for the rising use of shisha include the widespread availability of the product and social norms around the acceptability of shisha use. .

The number of shisha bars are increasing worldwide and their presence re-enforce acceptability of shisha. Shisha smoking appears to be increasing particularly among younger age groups, due to a greater amount of spare time and disposable money, both of which have been associated with greater likelihood of use[41].

There is also a prevalent misconception that shisha smoking is less addictive than cigarette smoking[40]. The difficulty in associating shisha smoking with nicotine dependence gives smokers the false impression that they are able to quit shisha smoking anytime without undergoing nicotine dependence symptoms. However, this impression is far from the reality. A study examining the pattern of shisha use among beginning and established smokers concluded that about 66.0% of study participants found it very difficult to quit shisha smoking due to nicotine dependence [29]. Another common misconception regarding shisha is that it is less harmful than cigarette smoking [40].

WATER PIPE SMOKING AND ADDICTION

Existing studies indicate that daily water pipe smokers could have levels of nicotine approximately equivalent to a ten-a-day smoker.[42] A recent review exploring the association between water pipe use and dependence found that while information with regard to population-level prevalence of dependence induced by water-pipe tobacco smoking is lacking, regular water-pipe tobacco smokers may report or display signs of addiction.[43] These include experiencing withdrawal, altering their behavior in order to access a water-pipe and having difficulty quitting, even when motivated to do so.[43] This is supported by a number of studies conducted in London.[5,4, 6]

COMPARISON BETWEEN SHISHA AND CIGARETTE SMOKING

WHO, 2005 report states that smoking using a shisha was different as compared to cigarette smoking. First differences in the tobacco smoked (e.g., shisha tobacco is highly sweetened and flavored, relative to cigarette tobacco [39].The average session typically lasts more than (about 45-60 minutes for shisha , compared to about 5 minutes for a cigarette [27].

Tobacco in shisha is heated to about half the temperature of tobacco in a cigarette. The chemical composition of cigarette smoke is different from shisha smoke. In shisha, charcoal heated the tobacco mixture in a lower temperature (about 450 C); as opposed to the higher temperature (900 C), in a cigarette where the tobacco is directly burn [40]. In an hour-long smoking session of shisha, users consume about 100 to 200 times the volume of smoke of a cigarette, so the smoke produced from a single shisha use contains approximately the same

amount of tar as 20 cigarettes , Measurement of users' exposure to shisha-related toxicants reveals that, relative to a single cigarette, a single shisha session exposes the smoker to 3–9 times the CO and 1.7 times the nicotine [27]. Most of the CO in the mainstream smoke of shisha is likely originating from the charcoal consequently; the potential health effects of shisha smoke are expected to be very different [42].

1.3 METHODOLOGY

A simple random cross- sectional study design was used to assess narghile smoking patterns among 250 young and students with (18 – 30) age in Baghdad province during December to May 2019. A questionnaire has been designed to collect the information including age of smokers, place of smoking narghile , with who smokes narghile , prevalence , diseases caused by narghile , the amount of nicotine and addiction to cigarette or narghile. General descriptive statistics were used to analyze the obtained data

RESULTS

Socio –demographic characteristics of students that participated in the study are given in Table (1) in which there is about 250 randomly samples of male from Baghdad city

at age (20-<34) years old, the high percentage (99.7%) at age (20-24) years and the low percentage about (8.4%) at <34 age . There were 216(86.4%) of them smoker, 124 (49.6%) smoke cigarette and narghile as well as 92(36.8%) of them smoke narghile only.

Most of samples were from university student (78.8%) and lower percentage from non worker (2.4%). On other hand the present study appears that the more place those favorites from youth were the café and public place (78.8%).

Table (1): Socio-demographic characteristics of youth samples in Baghdad city

Characteristics	Ranges	NO.	Percentage %
Age groups	(20-34) years	229	99.7
	>34 years	21	8.3
Work	not work	6	2.4
	Work	47	18.8
	study	197	78.8
Status of smoking	Smoker (cigarette & narghile)	124	49.6
	Smoker(narghlie)	92	36.8
	Non smoker	34	13.6
Place of smoking	a friend house	24	9.6
	at home	29	11.6
	in the café and public place	197	78.8
Distributions factors	friend effects	127	50.8
	life difficulties & unemployment	87	34.8
	social media& appearance	36	14.4

The present study shows that main factors helps in wide distribution of narghile smoking are the friend ship (48%) where as the difficult of life and unemployment (34.8%) and (14.4%) for social media and appearance .

The knowledge and attitude of youth at present study Table (2) showed that the majority of youth were agree that smoking in narghile increase the ability to fit in a group and most of their friend are smoker (80.8%) , fill the time (70.8%) , clam the nerves and leaves worries (77.6%) depending on that narghile is stronger than cigarette in its effects (83.6%) as well as the believing that narghile is less polluted (53.2%) to environment and other person in home or public place and so on they didn't agree with that narghile is cheaper than cigarette smoking(67.2%) or their harmful less than cigarette smoking (70.8%) .

Table (2): Knowledge and attitude of youth at present study in Baghdad city

N=250		NO.	Percentage %
Smoke the narghile to fill the time	NO	73	29.2
	Yes	177	70.8
To calm nerves and leave worries	NO	56	22.4
	Yes	194	77.6
Narghile is spread and my friends smoke it	NO	48	19.2
	Yes	202	80.8
Narghile is less harmful than cigarettes	NO	177	70.8

	Yes	73	29.2
Narghile is cheaper than cigarettes	NO	168	67.2
	Yes	82	32.8
Narghile less polluted to others	NO	117	46.8
	Yes	133	53.2
Narghile is stronger than cigarettes	NO	41	16.4
	Yes	209	83.6

Regarding about the health effects of narghile smoking table (3) most of youth consider that narghile as harmful to health like cigarette and an way to transmitted epidemiological disease during the same narghile between the group (87.2%) as well as narghlie contains more carcinogenic substances compared to cigarette (80.8%) also the regular uses of narghile can lead to addiction (50%) from smoker and non smoker person.

Table (3): Health effects of Narghile smoking on youth sample of Baghdad city

N=250		No	Percentage (%)
Sharing in the same narghile caused diseases	NO	32	12.8
	Yes	218	87.2
The amount of nicotine in the narghileh is much lower than cigarettes	NO	100	40
	Yes	150	60
Narghileh contains more carcinogenic substance compared to cigarettes	NO	48	19.2
	Yes	202	80.8

DISCUSSION

The smoking habit was positively related to males, being unmarried, increasing age, college, having a positive disposition toward smoking and higher educational level of their fathers which was agree with our study that the high percentage of smoker were from students and worker at age (20-34) years .

Depending on the design of water pipe our study showed that (53.2%) have a false opinion that narghile smoking is harmless and less pollution to home and public place than cigarette smoking because the smoke passes through water and filtered [12]

About the perceived health risk, (29.2%) of people believe that narghile was harmless. This finding agreed with some of the previous studies [16, 30]. In all actuality, narghile smoke is similarly as perilous as tobacco smoke. When contrasted with a solitary cigarette, narghile smoke contains a significantly more elevated amount of metals, like, arsenic, nickel, and lead, 15 times more CO and nicotine, 36 times more tar[31].

Friends of narghile smoker had encourage role in beginning of smoking in great part of the smoker in present study (80.8%) and the café may be another explanation behind the high prevalence of narghile smoker to fill the time and to allow the youth adult fit in group which demonstrates the impact of friend's pressure on narghile smoking and several studies like [24] have demonstrated the effect of friends. All these findings show that narghile smoking is becoming more popular among youths who are the producer part of the population without any conception with the dangerous effects of nerghile smoking which can lead to carcinogenic effects on human health and addiction of youth adult in the community.

CONCLUSION AND RECOMMENDATION

Narghile smoking is increased in popularity due to few regulatory laws and public attraction to this new -
and cool form of smoking .

Reduce the use of shisha by eradicating the misconception that shisha is healthier than tobacco cigarette -
and provide factual information about the health hazards of shisha use.

There is a need for strict enforcement of the role tat requires not to offer shisha to underage use -

Shisha should contain healthy warning similar to tobacco cigarette. -

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AUTO SELECTION OF ANY AVAILABLE PHASE, IN 3 PHASE SUPPLY SYSTEM**Mr. P. Bhaskar Prasad, T. Kanchana, C.T. Balaji, D. Vijay Chander, S. Surendra, M. Vishnu Vardhan**

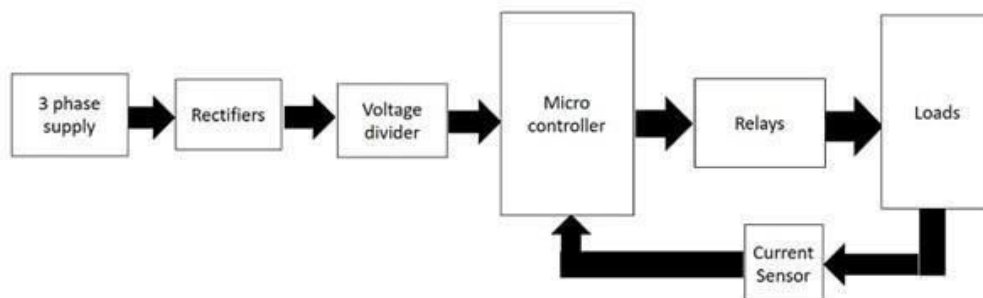
Electrical and Electronics Engineering Annamacharya Institute of Technology and Sciences-Rajampet

ABSTRACT

Power failure is a common problem. It hampers the production of industry, construction work of new plants and building. It can be overcome by using a backup power supply such as a generator. But it is cost effective and also time consuming as a certain time is required to switch on the generator manually. It is often noticed that power interruption in distribution system is about 70 percent for single phase faults while other two phases are in normal condition. Thus, in any commercial or domestic power supply system where three phases is available, an automatic phase selector system is required for uninterrupted power to critical loads in the event of power failure in any phase. This project presents a system which is a power based auto select technology which automatically selects an alternating current (A.C) phase out of three phases instead of the usual manual changing of cut out fuses which is tedious and prone to human error. The purpose of this project is to use the system of automation to carry out the selection of an Alternating current (A.C) power phases using a combination of power, microcontroller and relay (switch) circuit thereby eliminating every form of human involvement in the process. This project also includes a current sensing circuit which is fed back to the microcontroller for balancing of the three phases. The goal of A.C phase automatic selection was achieved using fewer components, lesser consumption of energy as well and at a lesser cost compared to the usual, conventional way (manual switching) of phase selection.

I. INTRODUCTION

Most firms Industrial, commercial and domestic necessities are depending on public power supply which have erratic supply such as phase failure, phase imbalances or total power lapse due to frequent technical problems in power generation, transmission or distribution. Hence, it is highly necessary to make automation in phase change during phase failure or total power failure so as to protect consumer appliances from epileptic supply of power. In most cases, many manufacturing firms, be it domestic or industrial, which employs single phase equipment for its operation might come across challenges during unbalance voltages, overloads and under-voltages in supply of power, where much time would be required in the process of manual change over. This means that time and the process needed for the phase change may cause serious damages to machines and even the products. Hence, there is need for automatic phase switching system and this system will provide a single phase correct voltage in the same power supply lines through relays from other phase where correct voltage is available. The system operates by stepping down 220 Volts AC to 12 Volts DC, rectified and fed into the microcontroller through the voltage divider circuit. The microcontroller compares the three phases and switches the relays through the transistor drives.

Ii. Block Diagram and Discription

PHASE INPUT: It is the input source of the device. Contains three identical phase lines represented by R,Y,B respectively. **POWER SUPPLY:** Provides necessary power supply to the circuit components. Uses rectifiers, filters and voltage regulators to ensure the input voltage between safe operative range. **CURRENT SENSING CIRCUIT:** Senses the output voltage of the loads. Feedback provided by the current transformer eliminates load

unbalanced condition. RELAY BOX: Depending upon the output of controllers the relay circuit get energized or de energized.

CONTROLLER UNIT: The output of the controller unit drives the relay which distributes the load in a most economical way during phase and load unbalance.

iii. Circuit Diagram and Working

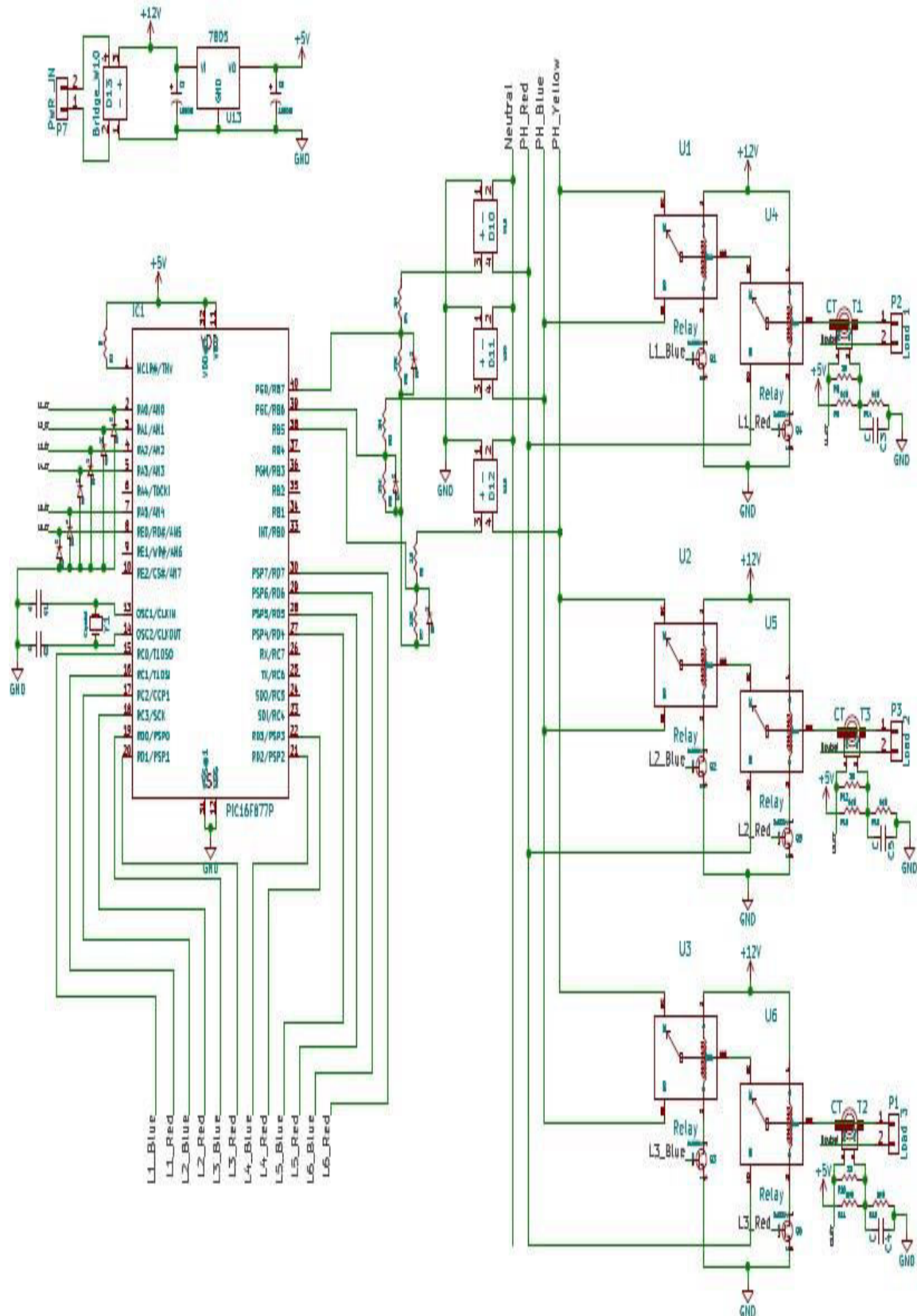


Figure 3.1.

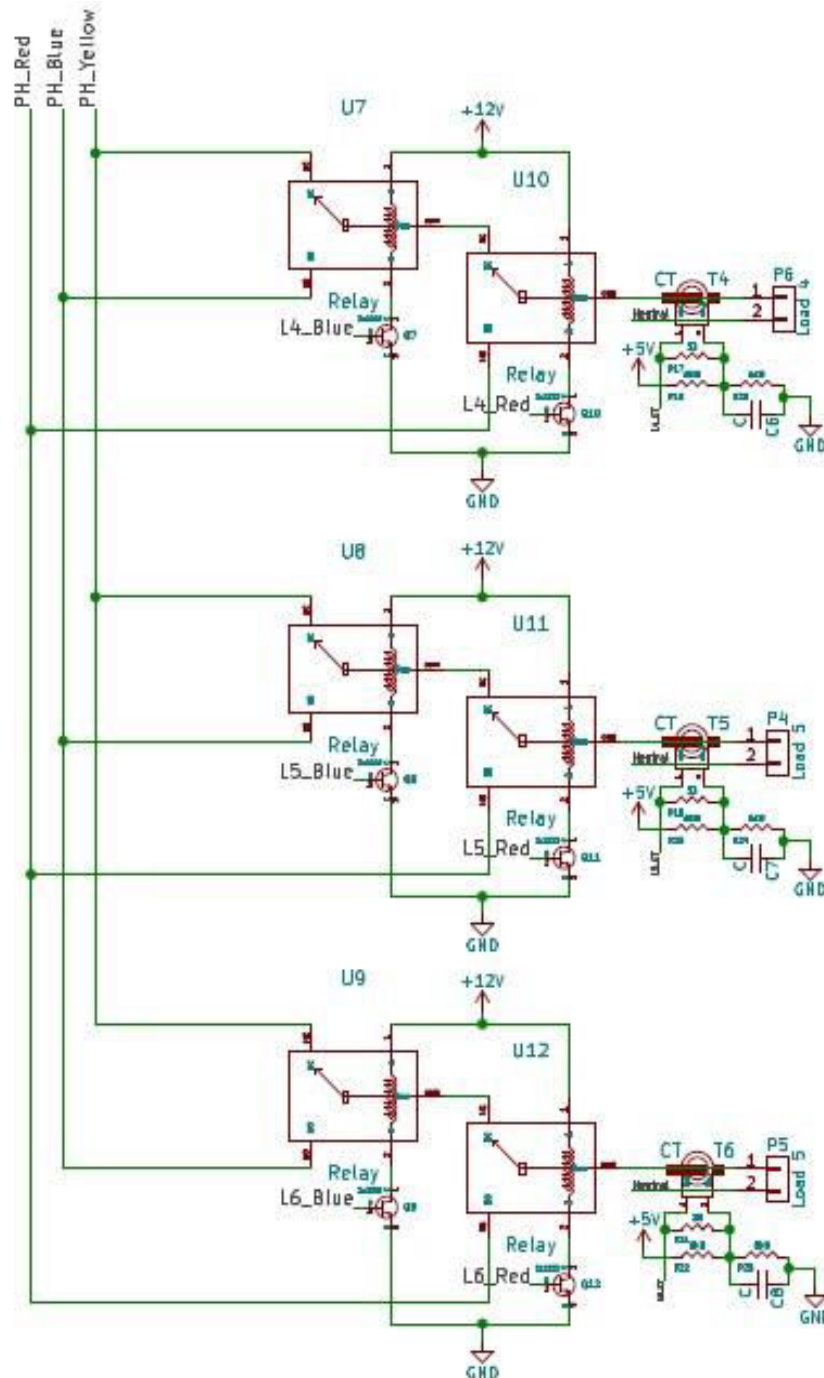


Figure 3.2.

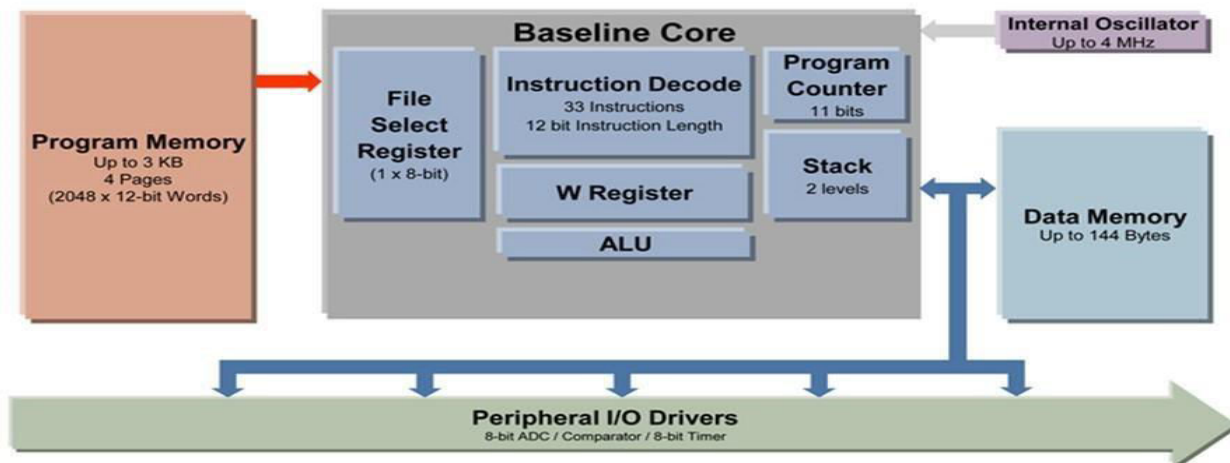
The main 3 phase supply is rectified using three bridge rectifiers which convert 230V AC to 230V DC. Three sets of voltage regulators and filters follow the bridge rectifiers which regulate the DC. Using voltage divider circuit 230V is stepped down to 5V and is given to the ADC pins of microcontroller. This continuously checks the availability of all the three phases. A total of 6 loads are used in the prototype. Two relays are used to switch between 3 phases for each load. Each relay is energized or de-energized using transistors whose base is connected to the output ports microcontroller. The PIC16F877P microcontroller is being used. A VCC of 5V is given to the microcontroller. A clock signal is given to the microcontroller using a crystal oscillator. Two capacitors are connected in parallel to crystal oscillator to stabilize the oscillations. Each load is connected to two relays to switch between three phases. The normally open (NO) and normally closed (NC) terminals of the first relay are connected to the blue phase and yellow phase respectively. Similarly the NC and NO terminals of the second relay are connected to the output of first relay and red phase respectively. When any one of the phase undergoes any fault, it is detected by the microcontroller. A signal is send to the corresponding output port. The respective transistor connected to that port turns ON and energizes the respective relay. Hence the switching action takes place. The loads are switched according to the priority. Loads 1, 2 and 3 are given highest priority.

Loads 4, 5 and 6 are given priority in the decreasing order. Current transformers are used as the current sensing element. Each load is connected to the primary of a current transformer and the secondary is connected to a voltage divider circuit. It is then fed back to the microcontroller which senses the condition of the load. Thus according to the condition of the load balancing of three phases is done.

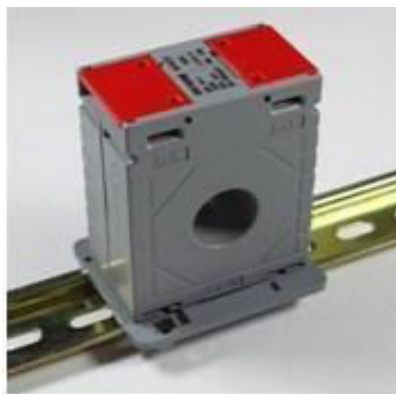
IV. EXPERIMENTAL SETUP

4.1. Pic Microcontroller

PIC16F877 is a 40-pin 8-Bit CMOS FLASH microcontroller. The core architecture is high-performance RISC CPU with 35 single word instructions. As it is following the RISC architecture, all single cycle instructions consume only one instruction cycle except for program branches which take two cycles. The microcontroller comes with 3 operating frequencies 4, 8, or 20MHz as clock input. As each instruction cycle takes four operating clock cycles, these instruction takes 0.2s when 20MHz oscillator is implemented. It occupies two types of internal memories: program memory and data memory. Program memory is incorporated with 8K words of FLASH memory. The data memory has two sources. i.e., one type of data memory is a 368-byte RAM and the other is 256-byte EEPROM. The core feature comprises interrupt capability of up to 14 sources, power saving SLEEP mode, and single 5V In-Circuit serial programming (ICSP) facility. The sink/source current, which depicts the driving energy from I/O port, is high with 25mA. Power consumption is much less than 2mA in 5V operating condition. The peripheral features comprises: (a) 3 time blocks: Timer0 for 8-bit timer/counter; Timer1 for 16-bit timer/counter; and Timer2: 8-bit timer/counter with 8-bit period registers, prescaler and postscaler. (b) Two capture compare, PWM modules for capturing, comparing 16-bit, and PWM generation with 10-bit resolution. (c) 10-bit multichanneled (max 8) Analog-to-Digital converter module. (d) Synchronous Serial Port (SSP) with SPI (Master Mode) and I2C2 (Master/Slave) (e) Universal Synchronous Asynchronous Receiver Transmitter (USART/SCI) with 9-bit address plotting (f) Parallel Slave Port (PSP) 8-bits wide, with RD externally, WR and CS controls (g) I/O ports.



4.2. Current Transformer



The current transformer produces 0 to 5A ac signal with a 0 to 100A ac primary current. It is Class 1.0 which means it is suitable for metering and can be used with a 3 phase Power Meter ALT-022. The included DIN-rail base clip could be mounted either vertical or horizontal. The primary hole can accommodate conductors up to 22 mm.

Features:

100:5A Current Ratio

720 VAC rated

Built-in hinged terminal covers

22 mm diameter primary hole

DIN rail mount in two orientations

SPECIFICATIONSPrimary Current (I_p): 100 A Secondary Current (I_s): 5 A

Standard Approvals: IEC60044-1, EN60044-1, Rated Frequency: 50/60 Hz

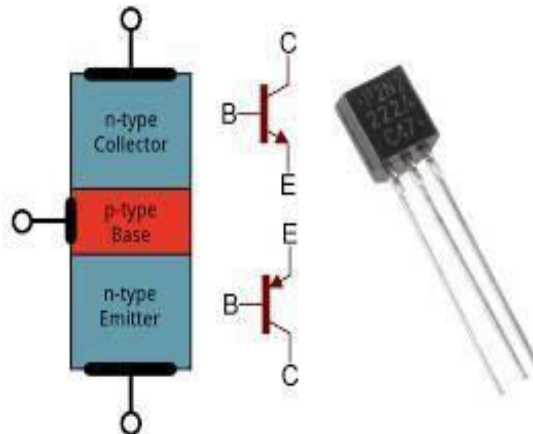
Rated Test Voltage (1 minute): 3 kVAC

Rated Short-Time Thermal Current: $40I_p$ Rated Dynamic Current: $2.5I_{th}$ Rated Voltage: 720 VAC Continuous Overload (I_d): $1.2 I_p$ Operating Temperature: -10 to 50 C**4.3. RELAY**

A relay is an electrically operated switch. Many relays use an electromagnet to mechanically operate as a switch, but other operating principles are also employed, such as SSR. Relays are used where it is pertinent to control a circuit by a different low-power signal, or where several circuits must be controlled by one signal. The first relays were used in long transmission telegraph circuits as amplifiers: it repeats the signal coming in from one circuit and re-transmits it onto another circuit. Relays were used ubiquitously in telephone exchanges and early computers to perform logical operations. A type of relay that can handle the high power required to directly control an electric motor or other loads is called a contractor. SSR control power circuits with no moving parts, instead using a semiconductor device to perform switching. Relays calibrate operating characteristics and sometimes multiple operating coils are used to protect electrical circuits from overloads or faults; in modern electric power systems these functions are done by digital instruments called “protective relays”. A simple electromagnetic relay consists of a coil of wire wrapped around a soft iron core, an iron yoke which provides a less reluctance path for magnetic flux, a movable iron armature, and one or more sets of contacts (there are two contacts in the relay pictured). The armature is clinged to the yoke and mechanically attached to one or more sets of moving contacts. The armature is kept in place by a spring so that when the relay is de-energized there is an air gap in the magnetic circuit. When an electric current is passed through the coil it generates a magnetic field that activates the armature, and consequently the movement of the movable contact either makes or breaks (depending upon construction) a connection with a fixed contact. If the set of contacts is closed when the relay was de-energized, then the movement opens the contacts and breaks the connection, and vice versa if the contacts were open. When the current to the coil is switched off, the armature is returned by a force, nearly half as strong as the magnetic force, to its relaxed position. Generally this force is provided by a spring, but gravity is also used commonly in industrial motor starters. Most relays are manufactured to operate quickly. In a low-voltage application this reduces noise; in a high voltage application it reduces arcing. When the coil is energized with direct current, a diode is often placed to dissipate the energy from the collapsing magnetic field at deactivation, which would otherwise generate a voltage spike which is dangerous to circuit components. Such diodes were not widely used before the application of transistors as relay drivers, but soon ubiquitous as early germanium transistors were easily damaged by these surges. Some automotive relays has a diode inside the relay case. If the relay is driving a large, or especially a reactive load, there may be a similar

problem of surge currents around the relay output contacts. In this case a snubber circuit (a capacitor and resistor in series) across the contacts is introduced which absorbs the surge. Suitably rated capacitors and resistor are sold as a single packaged component for this commonplace use. If the coil is designed to be energized with alternating current (AC), some method is used to split the flux into two out-of-phase components which add together, increasing the minimum pull on the armature during the AC cycle. Literally this is done with a small copper "shading ring" which is crimped around a portion of the core that creates the delayed, out-of-phase component that holds the contacts during the zero crossings of control voltage.

4.4. TRANSISTOR



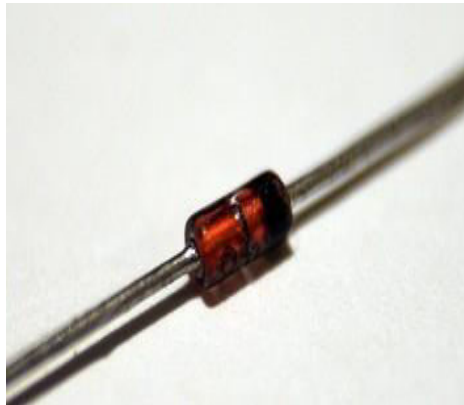
A transistor is a semiconductor device used in amplification or switch electronic signals and electrical power. It is composed of semiconductor material usually with at the least three terminals for connection to an external circuit. A voltage or current applied to one set of the transistor's terminals controls the current through another pair of terminals. Because the controlled (output) power can be higher than the controlling (input) power, a transistor could amplify a signal that is essential of a transistor comes from its ability to use a minute signal given between one pair of its terminals to control a very strong and large signal at another pair of terminals, this phenomenon is called gain. It can produce a higher output signal whereby a voltage or current can be made proportional to a weaker input signal; i.e.: it can work as an amplifier. Alternatively, the transistor can be incorporated in a circuit to turn current on or off, as an electrically controlled switch, where the amount of current is determined by other circuit elements. Transistors are of two, which have slight disparity in how they are implemented in a circuit. A bipolar transistor has terminals labeled base, collector, and emitter. A small current at the base terminal (that is, flowing between the base and the emitter) can limit or switch a huge current between the collector and emitter terminals. For a FET, the terminals are gate with labels, source, and drain, and a voltage at the gate can control a current between source and drain. BJT which is utilized as an electronic switch, in grounded-emitter configuration. Transistors are implemented in large scale in digital circuits as electronic switches which can either be in "ON" or "OFF" state, both for high-power applications such as switched-mode power supplies and for low-power uses such as logic gates. The main parameters for this application involves the current switched, the voltage handled, and the switching speed, characterized by the rise and fall times. In a grounded-emitter transistor configuration, such as the light-switch circuit has shown, as the base voltage raises, the emitter and collector current increases drastically. The collector voltage drops because of mitigated resistance from collector to emitter. If the voltage disparity between the collector and emitter were zero (or near zero), the collector current would be limited only by the load resistance (light bulb) and the supply voltage. This is called saturation as the current is flowing freely from collector to emitter. When saturated, the switch is said to be on. Providing sufficient base drive current is the main problem in the use of bipolar transistors as switches. The transistor provides current gain, allowing a huge current in the collector to be switched by a much smaller current into the base terminal. The ratio of these currents changes depending on the type of transistor, and even for a particular type, varies depending on the collector current. In the example light-switch circuit shown, the resistor is chosen to provide sufficient base current to ensure the transistor will be in saturated state. In a switching circuit, the idea is to refresh, as near as possible, the ideal switch having the properties of open circuit when off, short circuit when on, and an immediate transition between the two states. Parameters are chosen such that "off" output is limited to leakage currents too small to affect connected circuitry; the resistance of the transistor in the

"on" state is too small to affect circuitry; and the transition between both states are fast enough not to have a detrimental effect.

4.5. BRIDGE RECTIFIER

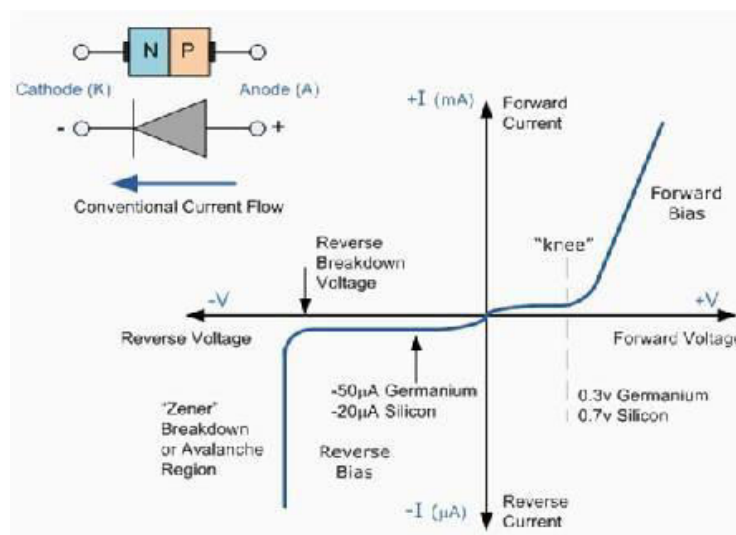
A diode bridge is a model of four (or more) diodes in a bridge circuit configuration that provides the same polarity of output for either polarity of input. When used for its most common application, in conversion of an alternating current (AC) input into a direct current (DC) output, it is known as a bridge rectifier. A bridge rectifier provides full-wave rectification from a two-wire AC input, resulting in lower cost and weight as compared to any rectifier with a 3-wire input from a transformer with a center-tapped secondary winding. According to the traditional models of current flow (originally established by Benjamin Franklin) current is defined to be positive when it flows through electrical conductors from the positive to the negative pole. In reality, free electrons in a conductor nearly flow from the negative to the positive pole. In major number of applications, the actual direction of current flow is impertinent.

4.6. ZENER DIODE



A Zener diode allows current to flow from anode to cathode like any normal semiconductor diode, but it also permits current to flow in the reverse direction. Zener diodes have a highly doped p-n junction. Normal diodes will also break down when a reverse voltage is applied but the voltage and sharpness of the knee are not as well defined as for a Zener diode. Also common diodes are not manufactured to operate in the breakdown region, but Zener diodes can comfortably operate in this region. The device was named after the scientist Clarence Melvin Zener, who discovered the Zener effect. Zener reverse breakdown is due to electron quantum tunneling which is caused by a very high strength electric field. However, many diodes described as "Zener" diodes mostly rely on avalanche breakdown. Both breakdown types are commonly used in Zener diodes with the Zener effect predominating working under 5.6V and avalanche breakdown above. Zener diodes are hugely used in electronic equipments of all kinds and are one of the fundamental building blocks of electronic circuits. They have wide applications especially to generate low power stabilized supply rails from a higher voltage and to provide reference voltages to circuits, especially consistent stabilized power supplies. They are also used in protection circuits due to over-voltage, especially electrostatic discharge (ESD).

4.7. DIODE



Diodes only allow electricity to flow in single direction. The arrow in the symbol shows the direction in which the current would flow. Diodes are the electrical version of a valve and early diodes were actually known as

valves. During forward voltage drop, electricity uses up quite little energy pushing its way through the diode. This means that there is a small voltage across a conducting diode, it is called the forward voltage drop and it's about 0.7V for most of the normal diodes which are made from silicon. The forward voltage drop of a diode is almost consistent to the current passing through the diode so they have a very steep characteristic (current - voltage graph). Reverse Voltage: When a reverse voltage is applied to a perfect diode, it does not conduct, but all real diodes leak small currents of a few A or less. This can be ignored in most of the circuits because it will be smaller than the current flowing in the forward direction. However, all diodes have a maximum reverse voltage (usually 50V or more) and if this is exceeded, the diode will fail and pass a large current in the reverse direction, this is called breakdown current.

4.8. CAPACITOR



The capacitor (also known as a condenser) is a passive two-terminal electrical component used for storing energy electrostatically in an electric field. The forms of practical capacitors has wide variety, but most contain at least two electrical conductors (plates) separated by a dielectric (i.e., insulator). The conductors are mostly thin films of metal, aluminum foil or disks, etc. The 'non-conducting' dielectric acts to increase the capacitor's charge capacity. A dielectric medium can be glass, ceramic, plastic film, air, paper, mica, etc. Capacitors are used as parts of electrical circuits in many electrical devices. Unlike a resistor, a capacitor does not dissipate much energy. Instead, a capacitor stores the energy in the form of an electrostatic field between the plates. When there occurs a potential difference between the conductors (e.g., when a capacitor is attached across a battery), an electric field develops across the dielectric, causing positive charge (+Q) to collect on one side of the plate and negative charge (-Q) to collect on the other plate. If a battery is attached to a capacitor for a given amount of time, no current can flow through the capacitor. However, if an accelerating or alternating voltage is given/applied across the leads of the capacitor, a displacement current can occur.

V. PCB LAYOUT

The Printed Circuit Board (PCB) mechanically holds and electrically connects electronic components using conductive tracks, pads and other features etched from copper sheets laminated onto a non-conductive substrate. PCB's has few variants: single sided (one copper layer), double sided (two copper layers) or multi-layer. Conductors on different layers are connected using plated-through holes called vias. Advanced PCBs may contain components-capacitors, resistors or active devices - embedded on the substrate. PCBs are used in all even in the basic electronic products. Variants to PCB's include wire wrap and P2P construction. PCB's needs the additional design effort to lay out the circuit but manufacturing and assembly can be made automated. Manufacturing circuits with PCBs is cost effective and faster than with other wiring methods as components are mounted and wired on one single part. Further, operator wiring errors are also eliminated.

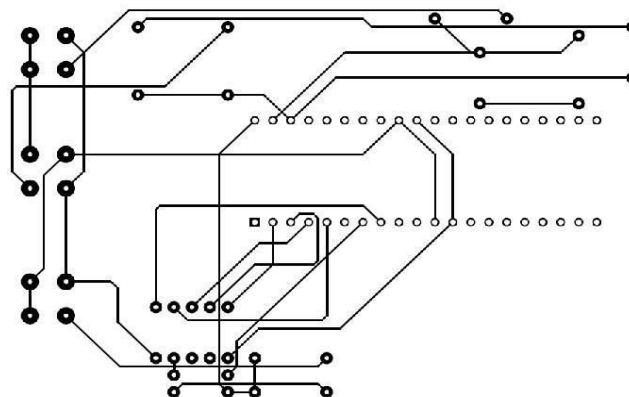


Figure5.1. Control section

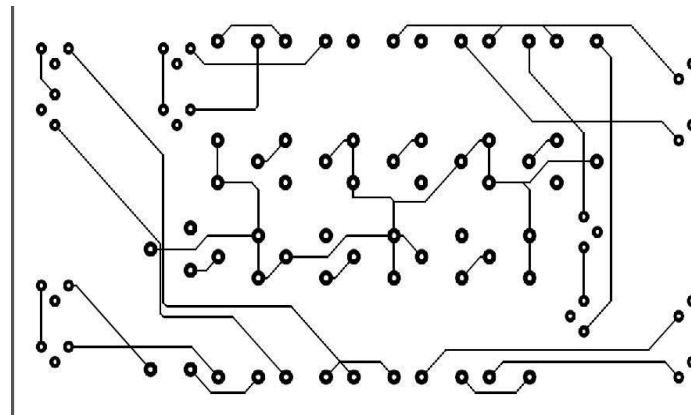
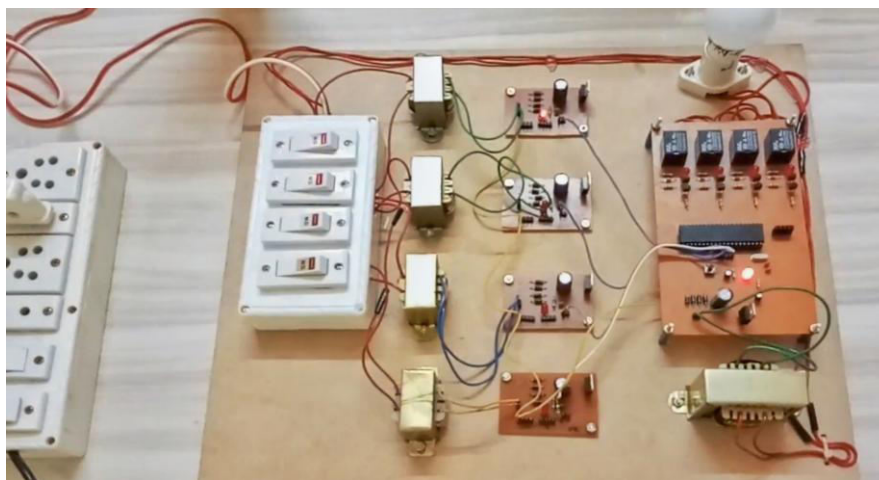


Figure 5.2. Relay Section

VI. EXPERIMENTAL RESULT



Vii. Conclusion and Future Scope

Automatic phase changer holds wide application in modern industry. During the earlier days, if there was any power failure in any one of the three phases, we had to manually switch to the available phase. By using the automatic phase changer it automatically shifts to the necessary phase where correct voltage is available. It automatically supplies voltage in up to 2 of the 3 incoming phases in case of power failure or low voltage. Automatic Phase Changer automatically cuts supply during low voltage, thus it protects the equipment from the harmful effects of unhealthy low voltage. It can be used in 1) Residential buildings 2) Commercial offices.

3) Factories operating with 1 phase machineries. 4) Hospitals/Banks/Institutions

Automatic phase changer finds huge application in the modern world .This device is more cost effective, reliable and of maintenance free.

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BRAIN TUMOR DETECTION USING TRANSFER LEARNING

Dr. Meena Arora, Shiva, Bhaskar, Ishita and Dev

JSS Academy of Technical Education, Noida, 201301

ABSTRACT

A Brain Tumor is an abnormal mass of tissue that grows uncontrollably. This paper focuses on the detection of Brain Tumor on MR Images of Human Beings. The output after applying various techniques will be classified as Benign or Malignant. In diseases like brain tumors, time is a factor that can decide between life and death. So the aim is to develop a working model which can help in better treatment of patients.

I. INTRODUCTION

A Brain Tumor is the growth of an abnormal mass of tissue in the brain. The skull, which encloses the brain, is a rigid part, and abnormal growth in such a restricted space can cause serious problems.

In recent years, there has been an exponential increase in cases of Brain Tumor. According to recent studies, nervous system cancers, and brain cancers are the 10th leading cause of death, with a five-year survival rate for people with a cancerous brain is 34% for men, and 36% for women". According to WHO, around 4,00,000 people in the world are affected by brain tumors, and 120,000 people have died in the previous years.

Brain tumors are divided into two types: low-grade, and high-grade tumors. Low-grade brain tumors are called benign tumors, and high-grade tumors are also called malignant tumors. Benign tumors are not cancerous tumors as they are unable to spread beyond the brain. Benign tumors in the brain generally do not essential to be treated, and their progress is self-limited, Malignant tumors are typically called brain cancer.

Brain Magnetic Resonance Image or MRI is mainly used for tumor detection, and treatment processes. Brain MRI consists of various kinds of tissues such as the white, and the gray matter, cerebrospinal fluid, skull, and the actual tumor.

In our approach, we will be applying techniques to real MR Images, and the collection of such images was a difficult task since this type of data is kept classified. We will be enhancing our dataset by applying Data Augmentation for training, and testing purposes.

II. OBJECTIVE

1. To provide a working model which can help radiologists and doctors to take immediate actions.
2. Enhancing the quality of MR Images for further Processing.
3. To find out whether the MR Image of the brain is cancerous or not.

III. LITERATURE SURVEY

Brain Tumor is one such disease with considerable death rates all over the world. Different researchers have applied many approaches in combination for better classification and results.

Abiwinanda N[1] tried to implement the system using CNN, a deep learning algorithm. To train the model and optimize its performance, enough previous records of brain tumors are needed. This paper aims at giving more information about brain tumor detection using CNN. The target area is segmented, and the evaluation of the tumor using the tool here helps the doctors in diagnosis, the treatment plan, and the state of the tumor detection. The advantages of this system are to improve the segmentation level and spatial localization of the image and also improve the efficiency compared to the other system. It consumes less time for computation and becomes easier to train with fewer parameters than other networks.

Perkuhn M [15] tried to implement the system using CNN, a deep learning algorithm. Instead of adding new samples to the dataset, its size was increased by applying augmentation. To train the model and optimize its performance, previous records of brain tumors are needed. So Augmentation has been applied to the dataset while training the network. Jin KH, McCann MT [10] presents the comparison of the various current methodologies of brain image segmentation using automated algorithms that are accurate and require little user interaction are reviewed, and their advantages and disadvantages are discussed. It also proposes combining two or more methods to produce accurate results. Many image segmentation methods have been developed in the past several decades for segmentation. MRI brain images, but still it remains a challenging task. Choudhury, C. L.[4], Two distinct models are used, the first model is segmented by FCM and classified by traditional machine learning algorithms, and the second model focuses on deep learning for tumor detection.

The first model can easily be described in the 7 stages: Skull Stripping, Filtering and Enhancement, Segmentation, Morphological operations, Tumor Contouring, Traditional classifier, and Evaluation Stage. In Evaluation Stage 6 different classification techniques are applied, and SVM gives the best accuracy. In the Second model, CNN is applied. A total of 7 layers are used in this model out of which 5 layers are Convolutional, Max pooling, Flatten, Dense-128, and Dense-1 respectively, and 2 are hidden layers.

Muhammad Umer Mushtaq [7], the convolutional neural network (CNN) approach along with Data Augmentation to categorize brain MRI scan images into cancerous and non-cancerous is used. Using the transfer learning approach, the performance of scratched CNN models with pre-trained VGG-16, ResNet-50, and Inception-v3 models are observed. The experiment is evaluated on a very small dataset, but the experimental result shows that our model accuracy result is very effective and has a very low complexity rate by achieving 89% accuracy, while VGG-16 achieved 86%, ResNet-50 achieved 89% and Inception-V3 achieved 75% accuracy. The model requires very less computational power and has much better results as compared to other pre-trained models.

Author A Rehman[17] presented work in the domain of brain tumor classification using transfer learning and deep CNN architectures. The author applied transfer learning techniques using natural images of the ImageNet dataset and classified the brain tumor type from glioma, meningioma, and pituitary using the Figshare dataset. They deployed three powerful deep CNN architectures(AlexNet, GoogLeNet, and VGGNet) on MRI slices of Figshare to identify the tumor type. We have attained the highest accuracy of 89.69% using the VGG16 TL model among all experiments.

Hassan Ali Khan, Wu Jue[7], has tried to emphasize the study of the concept of training and model learning in Brain Tumor Detection using CNN architecture to extricate visually distinguishable features and functions with Transfer Learning and CNN models. It uses the classification of these features through the layer traversal and feature extraction through Fuzzy C means traversal. The model uses Fuzzy C means traversal through clustering of data points categorized under a parameter for feature extraction and processes the feature through the incremental condition of clustering for diverse feature processing. The clusters work to extract features through processed augmented images and then increment through feature extraction and are categorized for determining the region and processing for further detection.

Esraa Salah Bayoumi[5], uses the transfer learning approach and compares the performance of pre-trained CNN models VGG-16, ResNet-50, and Inception-v3 models. These models require very less computational power. VGG-16 achieved 86%, ResNet-50 achieved 89% and Inception-V3 achieved 75% accuracy.

IV. METHODOLOGY OF THE WORK PRESENTED

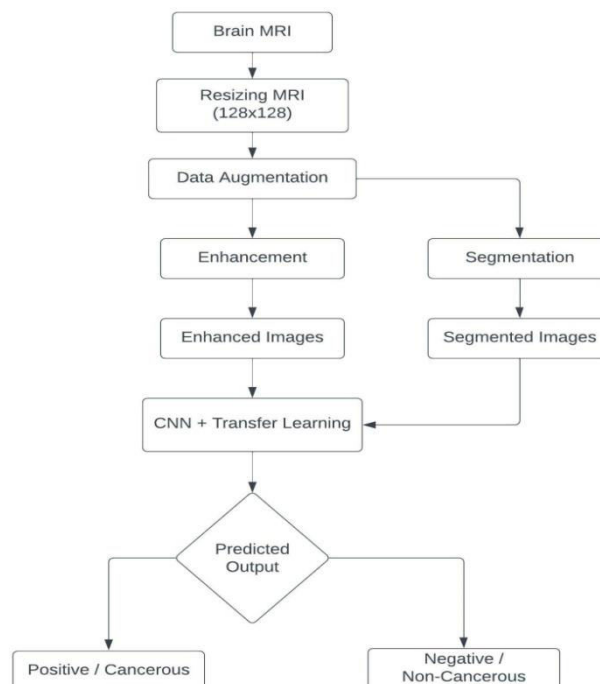


Fig 1: Flowchart of methodology used.

Fig. 1: Shows the basic flowchart for Brain Tumor Detection. First, Brain MRI was collected.

Image Resizing: The Collected MRIs are of different sizes, and the greater the number of pixels in the images, the more it will take time for the processing. Images are resized to an optimal value of 128x128 to prevent data loss. Resizing will reduce the area of processing.

Data Augmentation: Since the dataset used is small, we have to apply data augmentation to generate more images using the ImageDataGenerator of the Keras Library. The Inputted dataset folder contains two folders: yes and no. Yes contains 154 tumorous MR Images, and No contains 85 MR Images. After applying Data Augmentation, the yes folder contains 1076 tumorous MR Images, and the no folder contains 847 Magnetic Resonance Images (MRI).

Image Enhancement: As mentioned, the project's second objective is to increase the quality of MR Images. For Image Enhancement of Augmented MR Images, the Histogram Equalization technique is used.

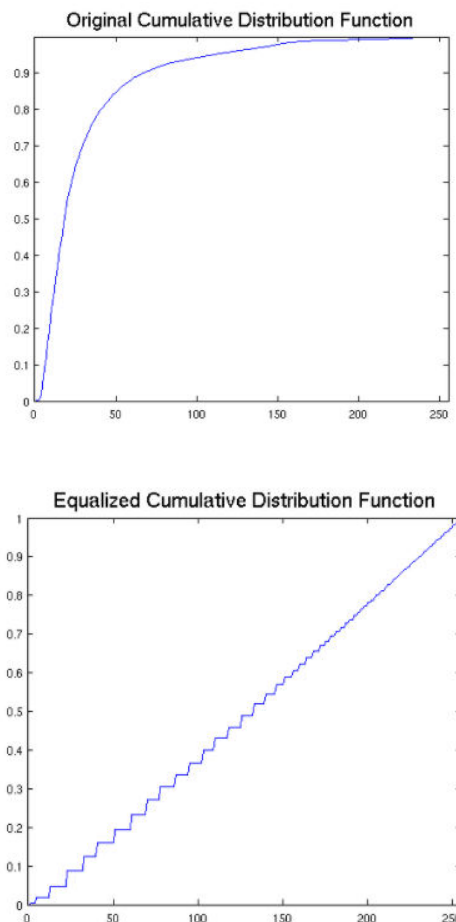


Fig 2: Variation in images before and after applying Histogram Equalization.

Histogram Equalization spreads the uniform intensity throughout the image. This primary step will help a lot for further classification.

Image Segmentation: Segmentation is the key step for predicting whether the inputted MR Image is tumorous or not. Segmentation is done using the Fuzzy-c means algorithm.

After Segmentation, it will segment out the area if there is any presence of intensity inhomogeneity in the MR Image.

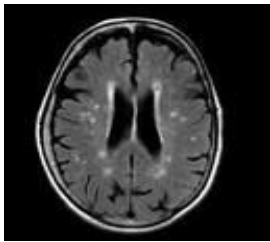
Classification and Transfer Learning: Finally, these segmented images are used by the CNN classifier for classifying brain tumors. CNN is a neural network containing several layers. We are also implementing Transfer Learning; the learning gained by the model can be used for further prediction in cross-domains. Since our classification is binary, the knowledge gained by the model can only be applied if the output in the cross-domain is also binary classification.

V. EXPERIMENTAL RESULTS

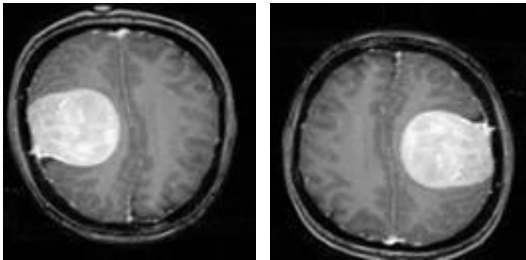
A. Dataset Description

Dataset Contains two folders, yes and no, yes contains 154 tumorous MR Images and no contains 85 MRIs.

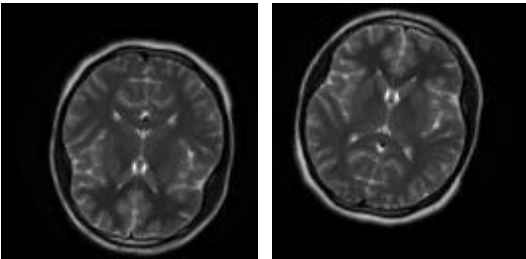
B. Resized (128x128) Images



C. Augmented Images

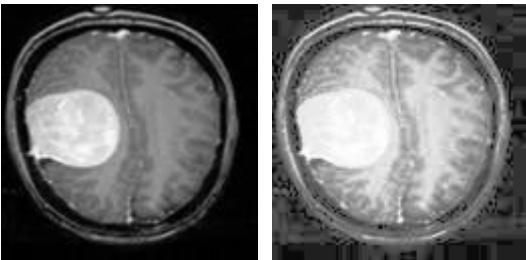


Augmented Images with Tumor



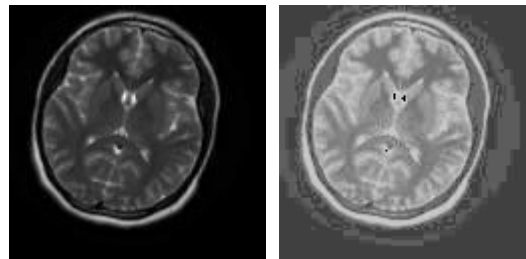
Augmented Images without Tumor

D. After Enhancement



Normal Tumorous Image

Enhanced Tumorous Images



Normal non-tumorous Image

Enhanced non-tumorous Images

VI. CONCLUSION

Various Techniques are implemented in combination to achieve our desired objectives. Image Resizing confines our processing domain. Data Augmentation provides enough samples for proper training and testing. Enhancement is done for increasing the quality of images. Segmentation is done for Segmenting the inhomogeneity. Segmented Images are used by classifiers and Transfer Learning for cross-domain-implementation.

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CYBER SECURITY: AWARENESS IS THE BEST REMEDY AGAINST CYBERCRIME

Pratik Biswas

Sr. Lecturer ICFAI University Jharkhand Ranchi

ABSTRACT

Information Technology has become a part of daily life for most of the people. Communication (in the form of data) plays the most important role in today's society. In order to communicate information safely, cyber security plays a very crucial role. Secured representation of data throws a big challenge on the modern trend of technology. To protect critical information while allowing access to those who really need it, is not an easy task as the information is already available in the network. The greatest threats are the one where it had access to our network already and malevolent attacks from hackers occur with trusted user access. Specially in case of banking sector and legal matters, the greatest threats is the one where it had access to our network already and malevolent attacks from hackers occur with trusted user access. Cyber security is defined as the activity of Protection of computers, databases, and network from any external threats. This paper deals with issues of cyber security including understanding of cybercrime, features, and challenges. It also provides a comprehensive study of the most relevant topics.

Keyword: Cyber security, cybercrime, data, legal aspects, threats

I. INTRODUCTION

This is an era of communication; we can't think our life without it. And this communication is mostly done by computer using internet. Internet is one of the fastest-growing areas of technical infrastructure development [1]. Today we just can't think our life without internet. Any information related to any field; we depend on Google; Facebook & YouTube as they are most popular search engine. But unfortunately, this branch of technology has given birth to a new generation crime i.e: Cybercrime. It is a crime on the internet which includes cyber stalking, gambling, hacking, terrorism, fraud, cyber theft, pornography, flowing of viruses etc. Cybercrime means unlawful act wherein the computer is used as a tool or a target or else both [2]. Cybercrime also poses a great threat to the national security of all countries, and sometimes leads to a great loss in financial stability. Norton's Cyber Crime Report 2011 reveals that India loses approximately few crores of Rupees annually due to cyber related crimes [3]. Now the most important question is how to protect this infrastructure (information /data) from malicious attack and protect their valuable assets. Cyber security is the activity of protecting information and information systems. It protects computer, database and application of computer network. This paper provides a brief explanation of what are the different types of cybercrime and how it can penetrate one's private issues whether it is a single PC of someone own or related to any organization. At the same time what is cyber security and how it can protect an individual / a firm to keep its information safe from potential losses. But at the same time we should understand cyber security is a very complicated issue and no level of security can protect all the cybercrime. Therefore, awareness and prevention are the only measures.

An unknown crime is always more difficult to handle than a known crime. Moreover, when the crime is conducted, the related persons need not be present in the place of occurrence. In India the internet services was started by the state-owned Vides Sanchar Nigam Limited in year 1995 and in 1998 the government has ended the monopoly of VSNL and market was open to private operators. At that point, the internet users in India were 0.1% of total population, and now India has become the 2nd largest country in terms of internet users after China with 33.22% people using internet [4]. The first recorded cybercrime took place in the year 1820, after that journey begins. From the middle of 1990 a new term was added in the domain: "cyber-attack". The India Computer Emergency Response Team (CERT-In) estimates that there were 8,266 instances of cyber security breaches in 2009 alone, and this had shot up to 13,201 in 2011 and 22,016 in 2012[5]. As per the statistics of the National Crime Records Bureau, 2,876 cybercrimes were registered in 2012, an increase of 60.6%. While IT has empowered individuals, it has also thrown up new challenges in cyber policing. The growth of internet usage is probably highest in India and we registered a 50% increase in internet usage over the last 16 months. By 2017, we would go up from 165 million internet users to 350million. As per the statistics of the National Crime Records Bureau, 2,876 cybercrimes were registered in 2012, an increase of 60.6%. While IT has empowered individuals, it has also thrown up new challenges in cyber policing. The growth of internet usage is probably highest in India and we registered a 50% increase in internet usage over the last 16 months. By 2017, we would go up from 165 million internet user's to 350million [3].

II. OBJECTIVES OF THE STUDY

The purpose of this paper aims to present how awareness and knowledge about cyber security only can save us from cybercrime. Secondary data about cybercrime, internet usage, cyber-attack and cyber security with different heads have been collected. The choice of literature is based on both public library and internet. A strategy has been adopted to collect the information from different source so that there should uniformity about the topic's cybercrime, internet usage, cyber-attack and cyber security can be maintained. This work contains two parts firstly the Secondary data part, which covers definition, impact, types and what is what about cybercrime and cyber security. The second part contains why knowledge and awareness is so much important for safe handling of internet.

The Main Objectives of this Paper are as Follows:

- a) To know the impact of cybercrime in day-to-day life
- b) To understand various pros and cons of cyber security
- c) To know how awareness and prior knowledge of network security can reducible-crimes

III. Understanding Cyber Security And Cybercrime

Every crime has its own impact on the society, so as the computer crime, which became more popular as cybercrime latter on. Cybercrime in a narrow sense (computer crime) covers any illegal behavior directed by means of electronic operations that target the security of computer systems and the data processed by them. Cybercrime in a broader sense (computer-related crimes) covers any illegal behavior committed by means of, or in relation to, a computer system or network, including such crimes as illegal possession and offering or distributing information by means of a computer system or network [6]. Making the use of Internet safer is the priority for cyber security cell. Cybercrime and cyber security are issues that can hardly be separated in an interconnected environment. Cyber security plays a vital role in handling the challenge of cybercrime. Enhancing cyber security and protecting critical information infrastructures are essential to each nation's security and economic well-being [9].

Security is the quality or state of being secure. Cyber security, also referred to as information technology security, focuses on protecting computers, networks, programs and data from unintended or unauthorized access, change or destruction [7]. It is also defined as Cyber Security involves reducing the risk of malicious attack to software, computers and networks. This includes tools used to detect break-ins, stop viruses, block malicious access, enforce authentication, enable encrypted communications, and on and on [8].

There is no imminent definition of cybercrime in a lay man's world. The Indian government doesn't provide the exact definition of Cybercrime, not even Information Technology Act, 2000 which is the most authentic documents so far. However, it may be defined as illegal activities done using Computer and Internet. Actually, in early days any crime related to computer was known as a computer crime/ computer related crime and it was appropriate also because it covered all aspects of computer. Later on, when the concept of cyber space developed as the internet era began, the term cybercrime was coined. Some common types of cybercrime are as follows: Hacking, Online harassment, Credit/Debit Card Fraud, etc. Therefore, cybercrime is combination of illegal access of computer by a person or a group of persons using internet. It does not require the persons to belong from the same town, city or country, they can be from any part of the world. Here computer is used as tool or object.

IV. Impact of Cyber Crime in Our Life

Cybercrime has a deep impact in our life; it can simply ruin one's social life, economic status and personal position in no time. Here we will discuss how this can happen:

IV.I How easy: Any one can buy computer, software/hardware and any device that's connected and can get to an Internet gateway. There are many common places like Railway station, Shopping mall hotel /restaurant etc.

IV.II why people are interested: Cybercrime is a (well paid) business. Information is the biggest commodity in today's market. One can earn a lot by multiple using of the same data. If we see it is a very organized global business. And it is continuously spreading. Financial attack in banks, office or industry is very common now a days. In case of real crime the criminals are within the country so the laws are same for all but in case of cyber-attack it covers different countries and it is very difficult to find exactly from where the attack took place. Also cyber laws are different for different countries.

IV.III Cyber terrorism: It is the adaptation of terrorism to computer resources whose purpose is to

cause fear in its victims by attacking electronic resources [3]. Perhaps it is the worst use of cybercrime. If we analyze the mode of attack made by terrorist, cybercrime leads a major role there. Reason may be explained in two ways: one can perform this by hiding him/herself very easily, the expenditure is nearly negligible in comparison to other mode of attack. At the same time in very short span of time, it can cause damage across the world.

IV.IV E-Cheating: Now a day's all most all financial transactions are made using credit card or debit card, and most of them are done using computer. This transaction field is like "Gold Mine" for the cyber criminals, financial websites are often hacked or misused. This innovative way of cheating is coined by cyber cell of police department as E-Cheating and almost all the major cities of India have one cyber cell to protect from this crime.

V. CYBER CRIME – AN EXAMPLE

Understanding cyber security and cybercrime, or the impact of cyber security on cybercrime or vice versa is not an easy task. The question is why? Main reason is that: it is not like any border of a country that the army will protect it from the trespasser, here enemy is invisible or even in disguise of a friend. Cyberspace is different, it is different than real world. It has no boundaries; here we have to think in different way to fight against our unknown and unseen enemy. For this purpose, we have needed most updated cyber security policies which can prevent all types of cyber threat. But practically it is not possible. We must not forget the fact that internet is fundamentally an insecure medium. Its protocols have been designed to support academics whose objectives were to achieve easy exchanges of information. The original design of Internet is still in place and remains embedded in DOD (Department of Defense) networks that use Internet connections [10]. The issues of cyber security and cybercrime are both so much complicated that only technology can't help us to protect our self. It is only general awareness which can help us to be safe from cybercrime. Here the author explained the topic using an example. An internet service is provided to the customer by service provider. It is like a straight line. Whose one end is occupied by service provider and the other end by users. Fig-I.

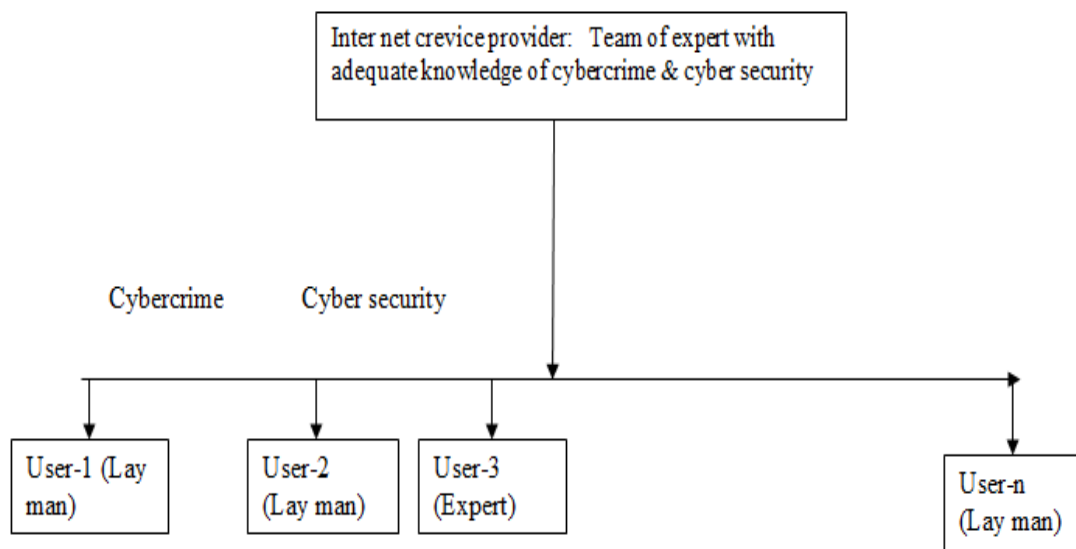


Figure – I: Cybercrime Vs Cyber security

Here we can see that most of the people who are using computer and internet are not computer expert, only very few have knowledge of Cybercrime, Cyber security Cyber laws. These are the common men who are easily victim of computer crime. So far internet provider is concern they don't find any difficulty because they have expert team and knew prose and cons of Cybercrime, Cyber security Cyber laws. It is the common men who are the soft target and can easily be motivated. It not possible to make all of them a computer expert but general awareness and knowledge about these field can save them from easy victims.

CONCLUSION

There is no doubt that controlling cybercrime totally is impossible. Our life is dependent on computer and internet without it we are helpless. Internet become life line of today's life. According to Vinton Cerf, the co-designer of Internet, anyone who are doing transaction using internet must be cautious about this technology. Therefore, following the rule to prevent the device before it is to late so that it could not be cured. Basic knowledge and general awareness are two means which can prevent us from being an easy target.

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DESIGN A FRAMEWORK FOR CONTROLLING AND MONITORING OF GREEN HOUSE EFFECT FOR INDIAN FARMER**¹Jaytee Rathore and ²Dr. Mukesh Tiwari**¹Research Scholar and ²Professor, SSSUTMS, Sehore (M.P.), India**ABSTRACT**

In this paper, we present a wireless sensor-based IoT system for controlling and monitoring greenhouse parameters. We will assist our farmers in increasing plant growth in a range of fields by employing this technology. Light intensity, temperature, soil moisture, and relative humidity are all used in the installation of this system for greenhouse control and monitoring. This suggested effort will aid in the regulation and monitoring of these parameters, which are sensed by various types of sensors such as light, temperature, soil moisture, and humidity sensors. The implementation entails the deployment of a wireless sensor system (WSS) for greenhouse control and monitoring, which is based on IoT. In terms of wireless communication, we used an ESP8266E to create sensor and actuator nodes for monitoring parameters, sending data via a wireless connection to a computer via Wi-Fi communication, and sending appropriate commands to the end device to overcome environmental parameter variation inside the greenhouse. These applications assist farmers in growing plants in non-farmable conditions.

Index Terms—Wi-Fi, Web Application, Intelligent Greenhouse, Internet of Thing (IoT), Wireless Sensor System (WSS), ESP8266E.

1. INTRODUCTION

A green house is where plants such as flowers and vegetables are grown. Greenhouses warmup during the day when sun-rays penetrates through it, which heats the plant, soil and structure. Green houses help to protect crops from many diseases, particularly those that are soil borne and splash onto plants in the rain. Greenhouse effect is a natural phenomenon and beneficial to human being. Numerous farmers fail to get good profits from the greenhouse crops for the reason that they can't manage two essential factors, which determines plant growth as well as productivity. Green house temperature should not go below a certain degree, High humidity can result to crop transpiration, condensation of water vapour on various greenhouse surfaces, and water evaporation from the humid soil. To overcome such challenges, this greenhouse monitoring and control system comes to rescue [1]. The radical evolution of the current Internet in to connect everything that not only converges the information from the environment and cooperate with physical world like actuation, command, and control, but also using the Internet to provide the services for information, transfer, analytics, applications, and communication [2]. Along with the trend of Big Data, Cloud Computing, and Machine Learning, an IoT system integrated with the latest technologies in data processing will potentially solve obstacles and bring advancements to various domains, such as manufacturing, healthcare, logistics, and agriculture. In recent years, governments throughout the world have greatly supported the research and application of IoT in agriculture. One of the models of agriculture combining with IoT is a hydroponic system which demands many devices been connected. As for communication between devices, IEEE 805.15.4 is always chosen as physical layer and access protocol to achieve mesh network communication. IEEE805.15.4, included in IEEE802.15, is a standard of the wireless personal area networks (WPANs) and it is a standard to meet the requirement of low power consumption and low-cost wireless network.

In this paper, our objective is to develop a greenhouse with an wireless sensor based IoT system to help the farmer to control and monitor the productivity of crop and atmospheric effect.

2. GREENHOUSE SYSTEM**2.1 GREENHOUSE EFFECT**

Before moving further let's takes a look on Greenhouse effect a natural process which warms earth's Surface when sunlight is trapped inside the earth environment. As per Oxford Dictionary of Geology and Earth Sciences the greenhouse is described as "The effect of heat retention in the lower atmosphere as a result of absorption and reradiation by clouds and gases of long-wave [9]. The following process takes place while Greenhouse effect takes place figure 1 is shows the graphical representation of Greenhouse Effect.

Step 1 Radiation from Sun reaches to Earth's lower atmosphere while some get reflected back.

Step 2 Sunlight than absorbed by oceans, and land.

Step 3 Earth Surface is than radiate heat radiation back to space.

Step 4 Energy is than trapped inside the earth atmosphere which keeps the Earth warm.

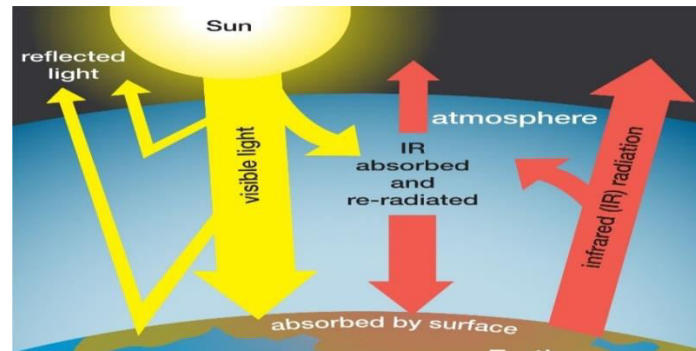


Figure 1: The Greenhouse Effect

The mathematical technique that has developed by Mr. Jean-Baptiste Joseph Fourier, for heat conduction which is a Fourier based solution in his book named “Analytical Theory of Heat”. In general theorem is only concerning the heating of air in closed spaces extend to a great variety of problems. It would be useful to revert to them when we wish to foresee and regulate the temperature with precision, as in the case of green-houses, drying-houses, sheep-folds, work-shops, or in many civil establishments, such as hospitals, barracks, places of assembly” [10].

Goods and Bad Effects of Greenhouse

The mechanism under which thermal radiation from earth’s surface is absorbed by atmospheric gases, and a part of this stored radiation is transferred back to earth surface and then warms up the temperature of earth. The major advantage is to keep manageable temperature for life to thrive on Earth, Function as filter by excess solar energy back to space. Greenhouse effect use to grow plants. Block harmful solar radiations. The greenhouse effect also allowed plants to maintain water level. Greenhouse structure can also be conserve and reuse the natural resources. Also, can enhance air and water quality. There some economic benefits of using Greenhouse are Declined cost of operations followed during farming. Enhance the overall productivity of same area used for cultivation. As the quality of production improves the overall income of farmer may increase [11].

Unfortunately increase in Greenhouse gases increase bad effect of greenhouse. Due to higher use of fossil fuel, there is Increase in level of CO_2 due to which the increasing amount of overall temperature of earth known as Global warming, which result in ice melting in polar region which in terns to Rising water level. Marine life eco system may destroy [11]. Also, the expansion of operating greenhouse system which may affect the overall costing of system even we have some poly sheet material for wall can be a cheaper solution still this may cost higher when we use glass material for wall.

Greenhouse Farming Technology

Greenhouse Farming which is a unique practice of growing corps within sheltered structured that covered by translucent or transparent material. The prime objective of greenhouse is to make favorable climatic condition and also to protect from various pests in a controlled environmental condition which may be controlled manually or automatically depending upon technology. Each greenhouse structure manages various aspects of crop production that includes Sunlight, Fresh air, Humidity, Temperature requirement, Fertilizers. Greenhouse farming structures are of various size type and controlling systems [12]. The major advantage of Greenhouse is the crop yield may grow around 10-12 times than that of outdoor crop production, Off-Season Production of vegetable and fruit crops, Disease-free production within a micro-ecosystem with ideal conditions.

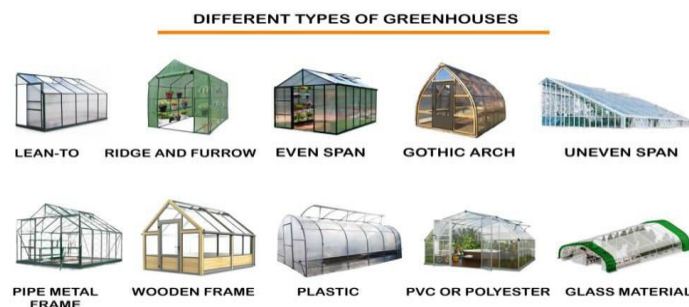


Figure 2: Different types of Greenhouse farming examples.

GLASSHOUSE – Covering walls of such kind of greenhouse structure is made of Glass such kind of greenhouse structures are used in cold and temperate climatic conditions [13].

Screen /Poly House – Such kind of Greenhouse structure are used in tropical areas which mainly protect pests and some weathering conditions structure walls are made of transparent or translucent plastic material with some sort of window for supply fresh air [14].

Shade House – Such kind of Greenhouse structure covering wall is made of woven material which helps fresh air, sunlight, and moisture can pass through it [15].

Crop Top Greenhouse – This kind of greenhouse have no side walls, or its structure be like an umbrella for plant.

Greenhouse can be divided into three main types listed in table 2 low technology, medium technology, and high technology greenhouse farms.

1. Low Technology Greenhouse (LTG) Farms

A simple greenhouse structure made wooden material with a roof covering with plastic sheet in cold and temperate climatic area which have low grade heating and no ventilation in it. Usually, vegetables and flowers are produced within this LTG [22] [23].

2. Medium Technology Greenhouse (MTG) Farms

Metal made structure with a roof covering of both with plastic and glass can be used MTG has higher efficiency in comparison of LTG. Normally MTGs are constructed in tropical and sub-tropical climate condition with the aim to produce vegetable flowers and decorative plans [22] [23].

3. High Technology Greenhouse (HTG) Farms

Galvanized Iron metal structure and glass covering greenhouse are known as High Technology Greenhouse (HTG), such kind of Greenhouse have higher amount of control over climatic condition with the help of some controlling subsystem within the Greenhouse. These types of greenhouses are preferred in colder environmental conditions to produce vegetable and flowers [22] [23].

Table 1: Types of Greenhouse Cultivation Technologies [22] [23]

Greenhouse Technologies	Low Technology Greenhouse (LTG)	Medium Technology Greenhouse (MTG)	High Technology Greenhouse (HTG)
Construction Material	Wood [14]	Metals [14]	Galvanized Iron[14]
Automation Level	Poor	Average	High
Crops Grown	Vegetable and Flowers	Vegetables, Flowers and Decorative Plants	Vegetables, Flowers and Decorative Plants
Cost (\$/m ²)	25-30 [24]	30-100 [24]	100-200 [24]
Suitable Climate	Cold or Temperate	Tropical or Sub-Tropical	Any climate

3. RELATED WORK

Arasu Sivagami (2021) [15] proposed an embedded system integrated with sensors based on nanomaterial is for closely monitoring and control microclimate parameters 24 hours a day to maximize production over the whole crop growth season by introducing greenhouse for the cultivation of plants or specific plant species. The system will also eliminate errors in human intervention to optimise production of crops. This system consists of sensors and actuators, an Analogue to Digital Converter (ADC) and a Raspberry Pi. The system will determine whether a defined threshold is passed by any climate parameter and systematically changes via the controller. The current work reduces human input through automated irrigation to optimally utilize a scarce resource, namely water. Climatic parameters for plant growth such as, moisture, humidity, temperature, water pressure in drip pipe, soil salinity etc. are monitored and optimized.

Nianpu Li (2019) [16] introduced a new design for IoT application on the greenhouse, which utilizes different technologies to present a new model for practical implementation in the IoT concept. This design can settle a new method to solve problems in Market Demand, Precision in Operation and supervision. Furthermore, this design can be used in many cases and assist farmers, cropper and planted people to develop their business.

Alaa Sagheer et al. (2021) [12] established a multi-tier cloud-based Internet of Things (IoT) platform to enhance the greenhouse microclimate. As a case study, we applied the IoT platform on cucumber cultivation in a soilless medium inside a commercial-sized greenhouse. The established platform connected all sensors, controllers, and

actuators placed in the greenhouse to provide long distance communication to monitor, control, and manage the greenhouse. The implemented platform increased the cucumber yield and enhanced its quality. Moreover, the platform improved water use efficiency and decreased consumption of electrical energy. Based on the positive impact on water use efficiency and enhancement on cucumber fruit yield and quality, the established platform seems quite suitable for the soilless greenhouse cultivation in arid regions.

A. F. Subahi and K. E. Bouazza (2020) [13] introduced a highly scalable intelligent system controlling, and monitoring greenhouse temperature using IoT technologies. The first objective of this system is to monitor the greenhouse environment and control the internal temperature to reduce consumed energy while maintaining good conditions that improve productivity. A Petri Nets (PN) model is used to achieve both monitoring of the greenhouse environment and generating the suitable reference temperature which is sent later to a temperature regulation block. The second objective is to provide an Energy-Efficient (EE) scalable system design that handles massive amounts of IoT big data captured from sensors using a dynamic graph data model to be used for future analysis and prediction of production, crop growth rate, energy consumption and other related issues. The design tries to organize various possible unstructured formats of raw data, collected from different kinds of IoT devices, unified and technology-independent fashion using the benefit of model transformations and model-driven architecture to transform data in structured form.

Chauhan and Gupta (2019) [14] five parameters which are necessary for the good quality product are discussed. An intelligent and very efficient monitoring and controlling system is suggested. These parameters are- soil pH level, light intensity in the greenhouse, temperature, humidity level and soil moisture level. These parameters have some specific range of values that is suitable for a particular crop. These are measured through different sensors like- soil pH sensor, DHT11 sensor for humidity and temperature, soil moisture sensor and LDR sensor for light intensity. These are interfaced with arduino platform. Some actuators like- cooling fan, water pump, exhaust fan etc are also connected to arduino that work according to the data given by sensors. All these work in the IOT (Internet of Things) environment and are monitored and automatically controlled.

PROBLEM STATEMENT

After analysis the earlier research work which is based on greenhouse, we found following advantages in previously development system.

For sensing environmental parameters, sensors are used. Some researchers have used single soil sensor, some of them have used two either humidity or soil moisture and temperature sensor, and some used soil moisture sensor, humidity sensor and light sensor too, in some case researchers presented a scheme in which soil moisture, humidity, temperature and CO₂ sensors are used. Even after having all these sensors further enhancement may be needed in a way that all possible sensors are clubbed together and develop a system, in which all possible addition sensing elements may be included for enhancement.

Communication medium is needed for transferring data from one device to another. Communication medium is selected according to feedback system developed, RF-module (2.4 GHz capable of bidirectional communication) is used for communicating from microcontroller to PC, GSM module is used for informing user about parameter and status of system, and the most advanced ZigBee is used in rest of the system. ZigBee is not only capable of bidirectional information transformation but it is also capable of performing some kind of calculation and actuation with the help of its GPIOs. Even after that ZigBee is used in a kind of system architecture in which ZigBee is directly connected to microcontroller which sends data to PC. In this kind of architecture, the overall system cost can increase. In case of Internet of Things (IoT) the devices locally communicate through Wi-Fi and can communicate through world by means of internet. Let us consider we are sensing a field in which more than a couple of sensors are needed for calculating various parameters, at various location in the same field, then we need to develop the identical hardware unit for all locations, and so the cost of overall system rises exponentially.

For controlling and viewing the environmental parameters on computer system we need some sort of Graphical User Interface (GUI). A properly designed and user-friendly software is needed but the previously existing systems have complex GUI and is in English language. As we all know that Indian economy depends on agriculture and also farmers are not well qualified to understand English language, so software is needed to design in Indian language. The previous systems were control by software automatically; there is no manual control over peripheral.

4. PROPOSED METHODOLOGY

Based on problem formulated after reviewing existing system, we concluded with the following enhancements for each and individual problem. Overall cost reduction of system can be achieved by using Wi-Fi

communication technology for communication figure 3 shows the system architectural design which consist of 4 major parts first is Field Unit – this unit consists of Sensor Node and Actuator Node of the Wi-Fi enabled Wireless sensor network used for sensing environmental parameter and actuate devices connected to control environmental conditions. Second is Network Gateway this is similar to gateway device in internet communication which act as communication point between two different network this is also use full for inter technology communication if the field sensor uses different communication technology. Third is Server System this holds the data of individual field sensor node data of each and every field of user and last is Access unit this can be any computer or mobile unit which is connected to the local or global network. And figure 4 shows the full architectural diagram of proposed system.

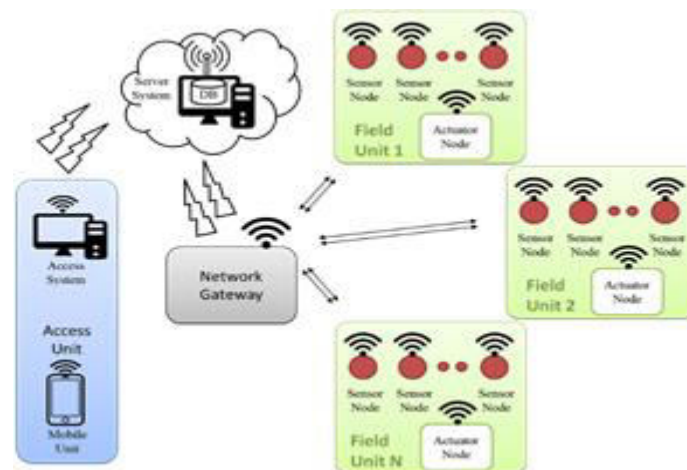


Figure 3: Proposed architecture of system

Let us discuss the Field Unit in detail – this unit is consisting of sensor node shown in figure 3.2 and actuation node shown in figure 3.3. Sensor node is consisted of two parts first is Wi-Fi enabled microcontroller which is responsible calculation regarding analog to digital conversion and then digital to convert into desired unit of parameter. It also holds three major information about the communication system – First is Server ID includes information about database, server which holds the database, and communication details, second is Field ID this holds information about the field of specific farmer and crop, third is Node ID this holds information regarding node unique ID by which individual node can be access through anywhere in the local / global network. Similarly, the Actuator node shown in figure 3.3 contains the information regarding Server, Field, Node specific information but in case of actuation node the microcontroller is responsible for control actuating peripherals connected to control physical peripherals of GHEC. In sensor node temperature and humidity sensor is used to sense temperature near field of sensing node whereas in actuator node the temperature and humidity is controlled using Air conditioner and steam supply unit, moisture sensor is used to detect moisture level in certain filed and water pump supply maintains the moisture level in that field, lights sensor is used to detect light level in dark/cloudy day mean while artificial light source in such case. Fertilizer controller is used to spry fertilizer in field whenever is needed.

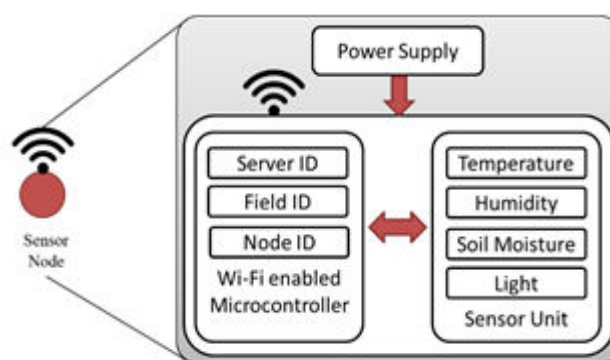


Figure 4: Proposed sub-system architecture for Sensor Node

The server node stores the web application designed in Hindi language and database for the system. Actuator node is another important part of system it accesses the web application and data. The web application is programmed for three level user control with user and node creation, alteration and deletion, application is also used for physical parameter input, manual & automatic control of peripheral devices connected to actuator node, and view the previous data in interactive graph.

Maintain Ideal Micro-Climate Conditions

IoT sensors allow farmers to collect various data points at unprecedented granularity. They provide real-time information on critical climate factors including, temperature, humidity, light exposure and carbon dioxide across the greenhouse. This data prompts relevant adjustments to HVAC and lighting settings to maintain the best conditions for plant growth while driving energy efficiency. In parallel, motion/acceleration sensors help identify doors that are unintentionally left open to ensure a strictly controlled environment.

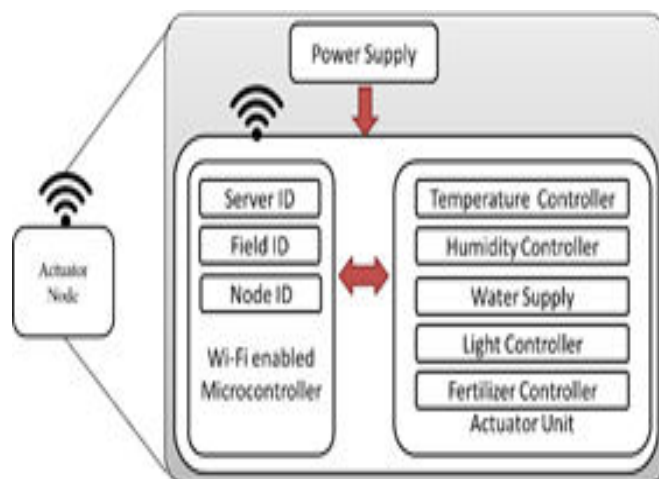


Figure 4: Proposed sub-system architecture for Actuator Node

Enhance Irrigation and Fertilization Practices

In addition to ambient parameters, smart greenhouses enable farmers to stay on top of their crop conditions. This ensures irrigation and fertilization activities are on par with the actual needs of cultivated plants for maximized yields. For example, readings on soil volumetric water content indicate whether crops are under water stress. Likewise, measurements of soil salinity give useful insights on fertilization requirements. Based on this data, sprinkler and spraying systems can be automatically turned on to address real-time crop demands while minimizing manual intervention.

Control Infection and Avoid Disease Outbreak

Crop infection is a persistent farming challenge, with every outbreak taking a heavy toll on the crop margins. Agrochemical treatments are available at hand, but farmers often don't know the best time to apply them. Applications done too frequently raise ecological, safety and cost concerns, while failing to use treatments could lead to detrimental disease outbreaks. With the help of a machine learning platform, data on greenhouse environments, external weather and soil characteristics reveal valuable insights into existing risks of pest and fungi. Leveraging this information, farmers can apply treatments exactly when needed to ensure a healthy crop at the lowest chemical expense.

Prevent Thefts and Improve Security

Greenhouses with high-value crops are a vulnerable target for thieves. As traditional surveillance networks with CCTVs are expensive to implement, many growers don't have an effective security system in place. In this context, IoT sensors in smart greenhouses provide an affordable infrastructure to monitor door status and detect suspicious activities. Connected with an automated alarm system, they instantly notify growers when a security issue arises.

Building Blocks of a Smart Greenhouse

So, what does it take to implement a smart greenhouse? There are a few key factors you should take into account:

- Low-energy, battery-operated sensors to capture various climatic, agronomic and security data points
- Reliable, cost-effective wireless connectivity to transmit data from cross-greenhouse sensors to a remote gateway
- A diagnostic, machine learning platform to derive intelligence from sensor data and visualizes it on preferred UIs to make informed decisions on farming activities. The platform can also be integrated directly into existing greenhouse control systems to trigger automatic actions on HVAC, lighting, sprinkler and spraying networks.

Dispersed over large geographic areas, commercial-level greenhouse complexes call for long-range wireless connectivity with strong penetration capability. Besides providing reliable data transfer, such a solution allows a gateway to be installed closer to the power source to reduce wire trenching. Scalability is another factor to consider, as it minimizes the number of gateways needed to save on hardware, installation and management costs. Above all, the connectivity must be highly power-efficient so that sensors can sit in for years with minimal maintenance involved.

5. Experimental Setup and Result Analysis

The proposed experimental orthogonal view of proposed peripheral installation for poly-house setup is shown in figure 5.13. Major component of the proposed solution is represented by English alphabets from A to E. Here in figure 5.13 A – represents the poly-house agriculture field, B represents the air conditional and blower arrangement, C represents the air duct arrangement, D represents the light arrangement system, E represents the controller node arrangement block.

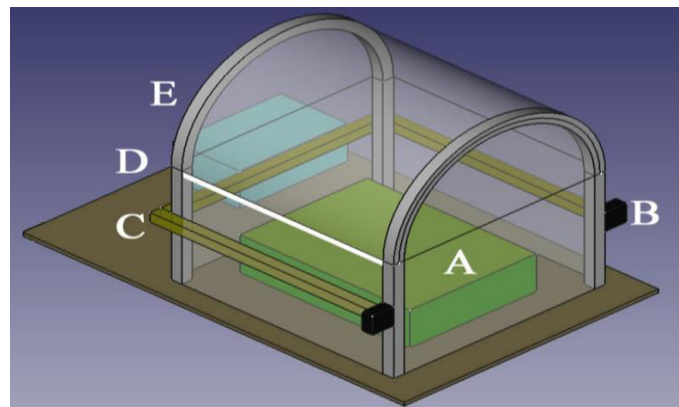


Figure 5: Experimental setup orthogonal view

Experimental layout for the experimental is shown in figure 6. Here we can easily view the schematic connection layout is visible. Peripheral devices LED light, AC fan, fertilizer pump, water pump each of device is responsible for its functioning and is controlled by actuator node which collects information from server system and actuate peripherals as per requirement of environment. Figure 5.15 contains the communication layout a server system contains the information collected from different sensor nodes of different poly house of various farms around the implementation area. Different mobile units can be connected to the server system for access and controlling the peripherals connected to actuator nodes of different poly-houses.

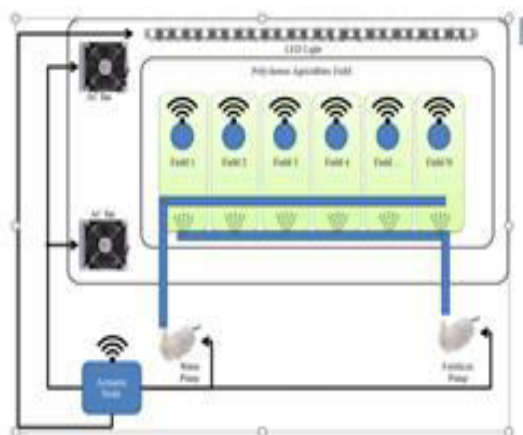


Figure 6: Structural arrangement of system



Figure 7: Communication layout of system

Green house is used to protect plants from extreme environmental conditions and also growing plants in controlled Environment. This paper presents the literature survey about the greenhouse automation system for the farmer which helps to monitor the activity of crop from anywhere and also helps to grow the crop properly. The control over the parameters is increased as the data is always sent to the cloud. In this work we also discusses about the green IoT, its components and applications.

As per experimental hardware setup described previously, we have implemented experimental setup while parameters are set as per the requirement of Wheat crop as shown in figure 8. There are 6 parts from A to E, A shows the major functioning hardware actuator node, and control panel of greenhouse system. Part B shows the

lightening assembly for controlling the Greenhouse effect, part C shows the sensor node of the system, part D, E & F shows the working in night duration of greenhouse system.

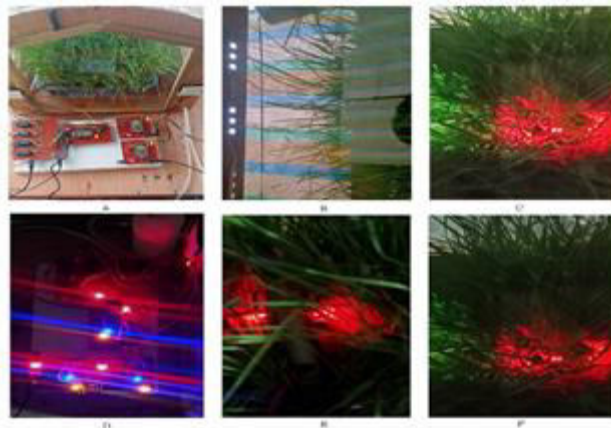


Figure 8: Scaled implementation of proposed system for Wheat crop

6. CONCLUSION

Low cost GHE monitoring and control system for Indian farmer developed on IoT Wi-Fi Sensor Network. The system is not only capable of sense temperature, humidity, soil moisture and light intensity but it can also control all these parameters by controlling different devices (like water pump, streamer, heater, roof sheds). A web-based control and monitoring application had been developed which is capable of working in two different modes, one is manual mode and another is automatic mode. The software is developed in Indian National language "Hindi".

The developed solution was able to maintain the database of received GHE parameter which date and time seen. The system has been tested functioning with our developed prototype greenhouse model. The developed solution is consuming less power and also cost is low. The maintenance and enhancement of system is also easy. The working model of the project for the prototype greenhouse has been test and found to work satisfactory.

In future work, since the system we have developed is very good for implementing in real life yet it needs some short of enhancements some of this are as followed; Current greenhouse system is developed for conventional farming the flexibility of system provides the opportunity to implemented in vertical farming, soil less farming, and more. We know that greenhouse gases are ozone (O_3), methane (CH_4), water vapor and nitrous oxide (N_2O), carbon dioxide (CO_2) etc. We can increase the number of sensors the presence of greenhouse gases like carbon dioxide (CO_2), methane (CH_4) etc. when the system is working in automatic mode the user sees the parameter changes when he/she is in front of central PC we can provide facility of informing user SMS about the parameter changes. We can enhance the system by implanting CCTV camera for image processing for detect insects in plants, diseases in plants – like Black spot Blight etc.

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DESIGN AND FABRICATION OF TELEPRESENCE ROBOT FOR MEDICAL AND HOMECARE**K.Shanthi¹, S.Adharsh Krishnan², S.Niranjan³, S.Subish⁴ and J.Vinoth⁵**¹Assistant Professor, Instrumentation and Control Engineering, Sri Krishna College of Technology,
Coimbatore-641042^{2,4}Student, Instrumentation and Control Engineering, Sri Krishna College of Technology, Coimbatore-641042**ABSTRACT**

As a result of the difficulties brought by COVID-19 and its associated lockdowns, many individuals and companies have turned to robots in order to overcome the challenges of the pandemic. In This project robot is mainly used for communication with the patient and by helping them during COVID Pandemic situation, In this used temperature sensor and Heart beat Sensor to monitor the health condition of patient without contact with patients in Hospital and It is more suitable also in picking and placing the Components. Compared with traditional human labour, robotic and autonomous systems have advantages such as an intrinsic immunity to the virus and an inability for human-robot-human spread of any disease-causing pathogens, though there are still many technical hurdles for the robotics over medical and related industry to overcome. The robot can be communicated along with the Wi-Fi association and the webpage, Arduino UNO R3 control based 20A microcontroller is connected with ESP8266 Wi-Fi module.

Keywords: *Arduino UNO R3, NodeMCU ESP8266 Wi-Fi Module, DS18B20 Temperature Sensor, Heartbeat Sensor*

INTRODUCTION

There are a few situations or conditions where direct association of people isn't feasible. In such cases, to make communications with powerful consideration and cognizance human activity is absurd. Accordingly, reacting to this general wellbeing crisis and effectively limiting its effect requires each wellbeing asset to be utilized. Telepresence alludes to a bunch of advances used to make a feeling of actual presence at a remote spot. Telepresence robots, specifically, permit human administrators to be for all intents and purposes present and to interface in a distant area through the robot versatility and bidirectional live sound and video takes care of. We can take this current situation COVID-19 as a best model. The COVID - 19 pandemic has caused a remarkable test for medical services frameworks around the world, Telepresence robot helps place us at distant area quickly, giving a virtual presence. The Telepresence robot can pick and place objects with the automated arm, which is utilized to give medication, Glass of water, and so forth... Telepresence robot helps place us at distant area in a flash, giving a virtual concocted a thought of telepresence robot. The clients can remotely control the robot's movement and associate with one another through a video screen and remotely control the robot's movement and cooperate with one another through a video screen. The fundamental goal of the undertaking is to plan and manufacture a telepresence robot with an automated arm to be utilized in inside for old individuals, which is equipped for controlling from a far off area inside the indoor climate by utilizing a laptop or desktop by which the client controls the telepresence robot by utilizing a webpage developed using php programming which is interfaced to the bot using esp8266 wifi module.

LITERATURE REVIEW**Evaluation of an Assistive Telepresence Robot for Elderly Healthcare**

The Telepresence robot framework intended to further develop the prosperity of older by supporting them to do day by day exercises autonomously, to work with social communication to beat a feeling of social separation and forlornness just as to help the expert guardians in regular consideration. To research the acknowledgment of the created robot framework, assessment concentrate on affected old individuals and expert parental figures, as two potential client bunches was conducted. Recently there is a developing interest for creating telepresence robot frameworks for medical services of old individuals. This isn't is actually to be expected assuming we think about that the total populace is quickly maturing. Every year the quantity of old on the planet is expanding, and the level of absolute populace addressed by the more seasoned individuals is developing. As per WHO unquestionably the quantity of individuals matured 60 years and over is relied upon to increment from 605 million to 2 billion somewhere in the range of 2000 and 2050 (implying that the total populace north of 60 years will twofold from around 11 to 22 %). Population maturing presents social, monetary and social difficulties to people, families, social orders and worldwide local area. It prompts expanded medical care for older, just as friendly consideration administration. This will have expanded weight in the medical care area for this class of individuals. In not so distant future, it will turn out to be more hard to give quality consideration administration

to older, as a result of the deficient medical care faculty, and the significant degree of hope of these administrations that should fulfill the needs for the old to draw out their independency.

Low Cost Delivery and Telepresence Robot for Covid-19 Crisis

Continuous COVID-19 emergency has made the requirement for social removing between clinical staff and patients, thusly, medical care mechanical technology is progressively significant as respects irresistible control. To limit the spread of Covid-19, "social removing" has turned into a significant need. To give social separating, the Centers for Disease Control and Prevention (CDC) has prescribed everybody to keep up with something like 6 feet among themselves as well as other people, to keep away from gatherings and avoid swarmed places. An undeniably involved answer for the making of social removing is medical services mechanical technology. Arising innovations in clinical robots have included robots for stock control, cleaning, conveyance, cleansing, medical procedure, telepresence, as buddies, mental treatment, recovery, and furthermore humanoid robots. For clinical coordinated operations errands, conveyance robots have been decided to assist with forestalling scattering of COVID-19. A few medical clinics have mentioned mechanized vehicle vehicles, which can gather and convey any materials, are not difficult to stack and dump by medical care staff, just as be modified for explicit areas for get and conveyance. The primary idea of telepresence automated capacity is to build up a gathering which isn't restricted distinctly to a meeting room, by amalgamating correspondence with a video-gathering framework, additionally called MRP framework. MRP frameworks by and large comprise of a web camera, intensifier, LCD screen, two-way correspondence, and preferably likewise have mobility. In medical care frameworks, telepresence robots have been utilized in numerous areas, for example, postoperative consideration units, ICU, life structures research centers, in careful educating also old set up offices. In this manner, the development of telepresence and conveyance robots is a proper innovation for the present COVID-19 emergency and the 'new typical' period.

Tele-Presence Robot for Medical Assistance in Hospitals

Medical caretakers, doctors, and other medical services experts are on the forefronts of the COVID-19 fight, and they are at a higher danger of contamination. Attendants, doctors, and other medical care experts are on the forefronts of the COVID-19 fight, and they are at a higher danger of disease. In the COVID-19 episode, a large number of specialists and attendants have become sick, and hundreds have kicked the bucket. The utilization of mechanical innovation and telemedicine to aid the fight against the COVID-19 flare-up has gotten a ton of coverage. In the area, more machines and intelligent gatherings mean less one-on-one touch, bringing down the danger of contamination for medical services staff. Utilizing robots can likewise lessen local area transmission and Personal Protective Equipment utilization. So a Tele-presence robot is recommended to beat the above issue. The proposed model, the Telepresence robot is basically PC on wheels. Their "faces" are frequently screens to show information or to fill in as a video course for a doctor to remotely converse with the patients. In the medical clinic settings, Tele-presence robots move uninhibitedly and autonomously. They can help patients at their bedsides, help in recovery, transport prescriptions and clean rooms. Tele-presence robot video screens can likewise serve a high level Skype-like assistance and a specialist is in remote spot, yet needs to take a point by point, ongoing glance at a patient to check whether they're genuinely more grounded. The patient can show upon the robot's screen and converse with the specialist so that progress can be assessed the same way it would be with in-person rounds. The Tele-presence framework is accomplished by a tablet PC joined to the front of the Tele-worked robot for proficient visual correspondence between medical services staff and patients from a distance. The patient's temperature is checked progressively utilizing profoundly exact infrared innovation. The proposed model utilizes non-contact proficient temperature screening process utilizing IR Temperature sensor and in this manner keep away from the use of defensive individual hardware.

SYSTEM OVERVIEW

Here the Wi-Fi module gets the contribution from the client and sends it to the Arduino UNO R3 which gets an immediate power supply from the external source. It sends the control activities to the relay which triggers the DC motors of the wheels and riser drivers which is powered using 12v 7A lead acid battery. The mechanical arm is constrained by the Arduino from which the sign is gotten from the NodeMCU. Power supply for the mechanical arm is given by 12v 1.3 A lead acid battery. Fig 1 shows the basic network connection of the block diagram. The screen riser is utilized to control the stature of the screen which is constrained by the riser driver. Temperature sensor and heartbeat sensor are connected to the NodeMCU ESP8266 wifi module.

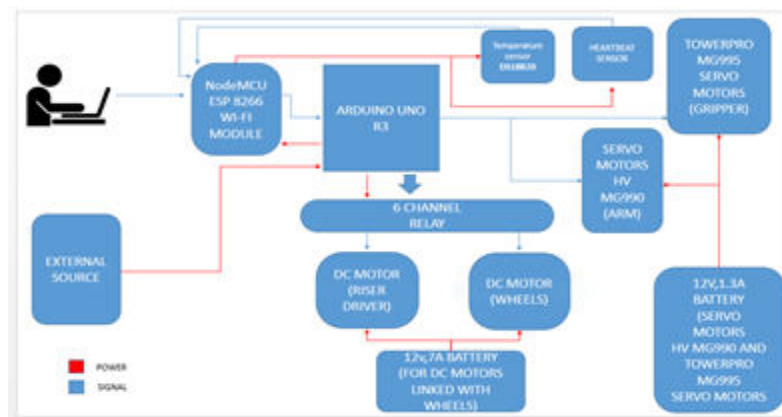


Fig 1: Block diagram of Telepresence robot

Arduino Uno R3

The Arduino Uno R3 is the most recent variant after the Duemilanove with a superior USB interface chip. Like the Duemilanove, it not just has an extended safeguard header with a 3.3V reference and a RESET pin (which takes care of the issue of how to get to the RESET pin in a safeguard) AND a 500mA wire to secure your PC, USB port, yet in addition a programmed circuit to choose USB or DC power without a jumper! The Uno is pin and code-viable with the Duemilanove, Diecimilla and more established Arduinos so the entirety of your safeguards, libraries, code will in any case work. The R3 (third modification) of the UNO has a couple of minor updates, with a move up to the USB interface chip and extra breakouts for the i2c pins. IO-Ref pin. Arduino is an open-source gadgets prototyping stage in light of adaptable, simple to-utilize equipment and programming. It planned for craftsmen, fashioners, specialists, and anybody keen on establishing intelligent articles or conditions.

Nodemcu Esp8266 Wi-Fi Module

The ESP8266 itself is a self-contained WiFi networking solution offering as a bridge from existing micro controller to WiFi and is also capable of running self-contained applications. This module comes with a built in USB connector and a rich assortment of pin-outs. With a micro USB cable, you can connect NodeMCU devkit to your laptop and flash it without any trouble, just like Arduino. It is also immediately breadboard friendly.

Php Webpage

PHP code is typically handled on a web waiter by a PHP mediator carried out as a module, a daemon or as a Common Gateway Interface (CGI) executable. On a web server, the consequence of the deciphered and executed PHP code - which might be any sort of information, like produced HTML or paired picture information - would frame the entire or part of a HTTP reaction. Different web format frameworks, web content administration frameworks, and web structures exist which can be utilized to coordinate or work with the age of that reaction.

In the webpage we have incorporated the operations of the wheels of the bot which has the toggle buttons for the forward and reverse motions, Monitor Riser driver which has the toggle buttons for the upward and downward motions, robotic arms of the robot and the gripper angular rotation also for the gripper's mouth piece movement.

Working

The input will be given by the client from the php webpage to the NodeMCU ESP8266 wifi module. It transfers the signals to the Arduino UNO R3 which gets the power from the external source. It transfers the power to the 6-channel relay which transfers the signal to the DC motors for both the wheels and monitor riser driver. The wheels and monitor riser gets the power from the 12V, 7A lead acid battery. The Arduino also transfers the signals to HV servo motors which is used for robotic arm and towerpro 995mg servo motor which is used for hand grippers. Both grippers and arm gets the power from 12V, 1.3A lead acid battery. These grippers, robotic arm, wheels and monitor riser are operated in a php webpage. Additionally temperature sensor and heartbeat sensor are placed in a bot which gets power from NodeMCU ESP8266 wifi module and transfers the user's accurate temperature and heartbeat rate to the Client's php webpage through the NodeMCU ESP8266 wifi module.

RESULTS AND DISCUSSION

Thus with the help of php webpage that we have designed for this telepresence bot we were able to achieve the video from the user and movements of the bot and also the movements of monitor riser drivers. Fig 2 shows the

real time view of the bot. The robotic arm that we had incorporated in this bot can help us by carrying things upto moderate weighted products Along with the timed collection of temperature and hearbeat rate of the user (i.e patient)on the webpage. Fig 3 shows the user side webpage.



Fig 2: Real Time View of the Bot



Fig 3: User Side Webpage

CONCLUSION

By seeing the present pandemic situation, we may get an idea that direct human interaction might be difficult at different situations and these medical related homecare telepresence robots can be evidently helpful in the future with further research and developments and might reduce need of the human presence at health prone areas.

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DESIGN AND IMPLEMENTATION OF ANF-PLL BASED DETECTION METHOD FOR OFFSHORE WIND POWER CONVERTER UNDER DIFFERENT POWER QUALITY PROBLEMS**¹G. Kishore, ²P. Kalyan Kumar Reddy, ³G. Gangadhar Reddy, ⁴B. Tulasi Reddy and ⁵Mr. M. Mahesh**^{1,4}UG student, EEE, AITS, Rajampet⁵M. Tech, Assistant professor, EEE, AITS, Rajampet. AITS- Annamacharya Institute of Technology and Sciences, Rajampet, A.P.**ABSTRACT**

When the offshore wind converters are connected to the grid by high voltage direct current, the voltage sag will lead to the disconnection of wind turbines. Therefore, the research of low voltage ride through (LVRT) is increasingly important, whose premise is to detect the grid voltage amplitude quickly and accurately. Firstly, this paper briefly concludes several traditional methods of detecting voltage sag, among which DQ transformation based on synchronous rotating frame (SRF) is more suitable for offshore wind power converter due to its accuracy and timeliness. This paper then introduces the principle of DQ transformation based SRF phase locked loop (SRF-PLL) as well as its improvement scheme in detail, compares and analyzes the characteristics of delayed signal cancelation (DSC), double second-order generalized integrator (DSOGI) and adaptive notch filter (ANF). Finally, an idea of selecting and improving the traditional method of detecting voltage sag is proposed. This paper distinguishes the differences between the existing traditional detection methods and the improved DQ transformations, and provides an idea for selecting and improving the detection method of grid voltage sag suitable for LVRT of offshore wind power converters.

Keywords— ANF (Adaptive notch filter)-PLL, DQ transformation, phase locked loop (PLL), voltage sag detection method, wind power converter.

I. INTRODUCTION

When the offshore wind farm is connected to the grid by high voltage direct current, wind power converters and the grid are decoupled due to the DC line. If there is a fault in the grid, the unbalanced active power will increase the DC bus voltage, which may lead to the disconnection of the wind power converters. Therefore, low voltage ride through (LVRT) is a necessary function when offshore wind farms are connected to the power grid on a large scale, whose prime premise is the rapid and accurate detection of voltage sag.

There are many traditional methods to detect voltage amplitude fault in power system, including voltage sudden change detection method, peak voltage method, RMS method, wavelet transform and DQ transformation based on synchronous rotating frame (SRF).

Compared with other traditional detection methods, DQ transformation based on SRF, which has both efficiency and accuracy, is suitable for LVRT of offshore wind power converters. This paper first introduces the basic principle of DQ transformation, and then selects several improved DQ transformation methods for comparative analysis. Delayed signal cancelation (DSC), double second-order generalized integrator (DSOGI) and adaptive notch filter (ANF) are the selected improved DQ transformation.

II. Traditional Detection Methods of Grid Voltage Sag

This section first briefly introduces the principles and characteristics of several traditional detection methods of grid voltage sag. After comparison, it is found that the SRF-based DQ transformation has both efficiency and accuracy, and is suitable for LVRT of offshore wind power converters. Then, the topological structure and mathematical principles of the phase locked loop (PLL) based on DQ transformation are analyzed in detail.

A. Several Traditional Detection Methods

The voltage sudden change detection method in the instantaneous detects the voltage sag by comparing the actual voltage value obtained by sampling with the standard sinusoidal digital signal, but the set standard voltage value has a great influence on the detection accuracy.

The peak voltage method detects the grid voltage sag by comparing the voltage in a cycle, therefore has a whole cycle delay. The principle of peak voltage is simple, but the detection speed is too slow.

The RMS method detects the RMS value of a sampling period. Although the detection time can be reduced to half a cycle by moving average method, it is still too long for LVRT.

The wavelet transform can analyze the voltage signal simultaneously in time domain and frequency domain by selecting the appropriate primary function. Wavelet transform is quite accurate in judging voltage sag time, but different primary functions have great influence on the analysis results.

DQ transformation is based on synchronous rotating frame. Through park transformation, the grid voltage in three-phase rotating coordinate system is converted to DC voltage in static two-phase coordinate system, so as to achieve the purpose of rapid and accurate detection of grid voltage sag.

Compared with other traditional detection methods of grid voltage sag, the SRF-based DQ transformation has both efficiency and accuracy, simple structure and easy improvement, so is suitable for LVRT of offshore wind power converters. Therefore, this paper chooses the conventional DQ transformation and several improved DQ transformations, and analyzes their topological structure and mathematical principles in detail.

B. Basic Principle of DQ Transformation

Fig.1 shows the conventional phase locked loop based on three-phase synchronous reference frame (SRF-PLL) using DQ transformation.

Three phase grid voltage can be expressed as

$$\begin{aligned} u_a &= A_u \sin \omega t \\ u_b &= A_u \sin(\omega t - \frac{2}{3}\pi) \\ u_c &= A_u \sin(\omega t + \frac{2}{3}\pi) \end{aligned}$$

where A_u is the voltage amplitude, ω is the fundamental angular frequency of grid. After Park transformation, the d and q-axis component can be expressed as

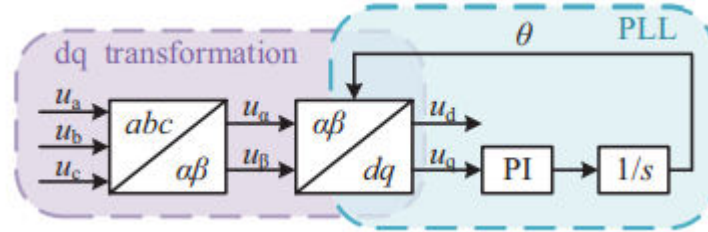


Fig.1: Topology of SRF-PLL

$$\begin{aligned} u_d &= A_u \sin(\omega t - \theta) \\ u_q &= -A_u \cos(\omega t - \theta) \end{aligned}$$

where θ is phase angle. When $\omega t - \theta = \pi/2$, the d- and q-axis component can be expressed as

$$\begin{cases} u_d = A_u \\ u_q = 0 \end{cases}$$

where u_d reflects the amplitude of voltage sag, and u_q is used as the input of PLL to realize phase synchronization.

When the grid voltage drops symmetrically in three phases, it is equivalent to the decrease of A_u in formula (1). According to (3), the d- and q-axis components only including direct flow can still be detected.

The unbalanced grid voltage is equivalent to the negative sequence fundamental component in the grid. At the same time, considering that the grid voltage contains high-order harmonics. Since the zero-sequence component is zero in both d- and q-axis after Park transformation, three-phase grid voltage including harmonics can be expressed as

$$\begin{aligned} u_a &= \sum_{i=1}^n A_i^+ \sin(i\omega t + \varphi_i) + \sum_{j=1}^m A_j^- \sin(j\omega t + \varphi_j) \\ u_b &= \sum_{i=1}^n A_i^+ \sin\left(i\omega t + \varphi_i - \frac{2}{3}\pi\right) + \sum_{j=1}^m A_j^- \sin\left(j\omega t + \varphi_j + \frac{2}{3}\pi\right) \end{aligned}$$

$$u_c = \sum_{i=1}^n A_i^+ \sin\left(i\omega t + \varphi_i + \frac{2}{3}\pi\right) + \sum_{j=1}^m A_j^- \sin\left(j\omega t + \varphi_j - \frac{2}{3}\pi\right)$$

where A_i^+ is the voltage amplitude of the positive-sequence i th order component, A_j^- is the voltage amplitude of the negative sequence j th order component, φ is the initial phase angle of the grid voltage.

After Park transformation and phase locked with $\omega t - \theta = \pi / 2$, the d- and q-axis components are calculated as

$$u_d = \sum_{i=1}^n A_i^+ \cos[(i-1)\omega t + \varphi_i] - \sum_{j=1}^m A_j^- \cos[(j+1)\omega t + \varphi_j]$$

$$u_q = \sum_{i=1}^n A_i^+ \sin[(i-1)\omega t + \varphi_i] + \sum_{j=1}^m A_j^- \sin[(j+1)\omega t + \varphi_j]$$

It can be seen from (5) that the positive-sequence k th order component of grid voltage becomes $(k-1)$ order in u_d and u_q ; at the same time, the negative-sequence k th order component becomes $(k+1)$ order component in the dq coordinate system. Therefore, after Park transformation the positive-sequence fundamental becomes direct current, and the negative sequence fundamental becomes the second order harmonic. As a result, u_d and u_q calculated by the conventional dq transformation cannot be directly used for amplitude detection and phase synchronization when the grid voltage drops asymmetrically.

III. Comparison of Several Improved DQ Transformations

In this section, several typical improved dq transformations are compared and analyzed, including DSC, DSOGI, ANF. Firstly, the principle and mathematical analysis of these methods are introduced, and then the simulation model is built in MATLAB/Simulink to get the corresponding detection results.

Fig.2 shows the grid voltage used in the simulation experiment. The three-phase grid voltage reaches steady state before the drop, and the voltage amplitude is 1p.u. When $t=0$, the voltage amplitude of phase a will be reduced to 0.1p.u.; when $t=20$ ms, 16th order positive- and negative sequence harmonics with amplitude of 0.05p.u. will be injected into the grid.

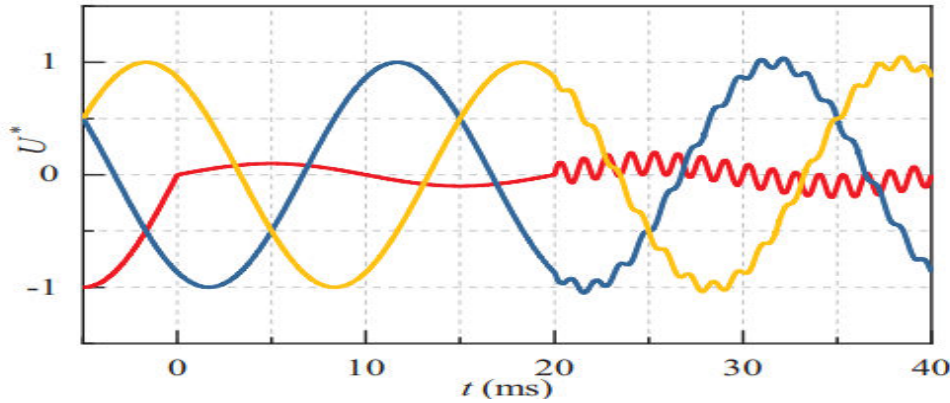


Fig.2: Three-phase grid voltage under asymmetric fault

A. Delayed Signal Cancellation

Fig.3 shows the topology of DSC-PLL. In the $\alpha\beta$ coordinate system, DSC calculates the current positive- and negative-sequence components through the delay data of $T/4$ cycle, so as to eliminate the second-order harmonic in dq component.

The DSC unit can perform time delay and phase sequence separation for u_α and u_β . When the grid voltage is unbalanced, the $\alpha\beta$ components before and after $T/4$ delay can be expressed as

$$u_\alpha(t) = A_1^+ \sin\omega t + A_1^- \sin\omega t$$

$$u_\beta(t) = -A_1^+ \cos\omega t + A_1^- \cos\omega t$$

$$u_\alpha\left(t - \frac{T}{4}\right) = -A_1^+ \cos\omega t - A_1^- \cos\omega t$$

$$u_{\beta}\left(t - \frac{T}{4}\right) = -A_1^+ \sin \omega t + A_1^- \sin \omega t$$

The $\alpha\beta$ components after phase sequence separation can be expressed as

$$u_a^+(t) = \frac{1}{2} \left[u_{\alpha}(t) - u_{\beta}\left(t - \frac{T}{4}\right) \right] = A_1^+ \sin \omega t$$

$$u_{\beta}^+(t) = \frac{1}{2} \left[u_{\beta}(t) + u_{\alpha}\left(t - \frac{T}{4}\right) \right] = -A_1^+ \cos \omega t$$

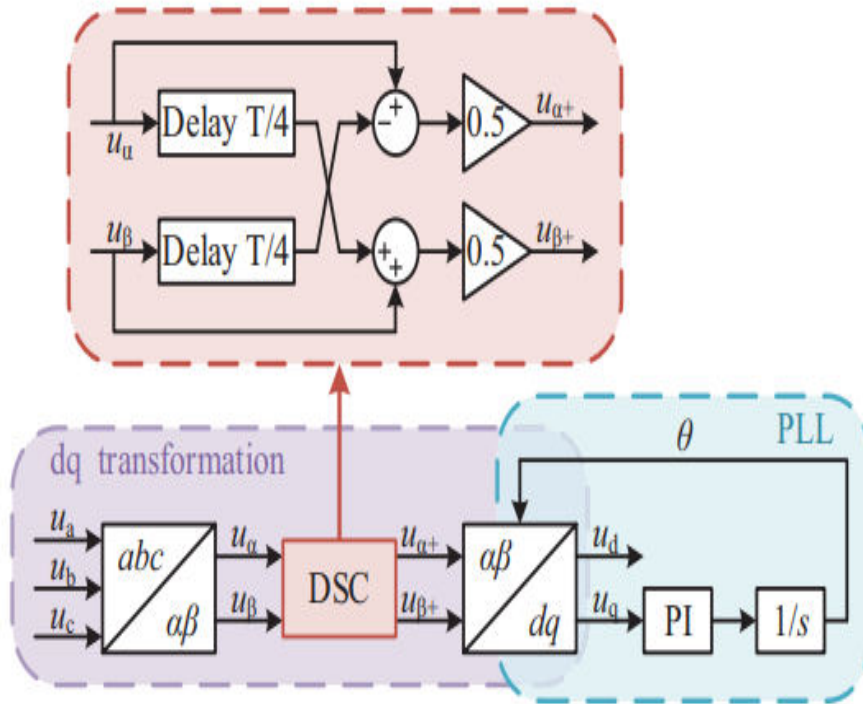


Fig.3: Topology of DSC-PLL

The DSC unit eliminates the negative-sequence component in u_{α} and u_{β} , thus eliminating the second-order harmonic in dq component after Park transformation.

When the grid voltage is as shown in Fig.2, Fig.4 shows the detection results of u_d and u_q by DSC-PLL.

It can be seen from Fig.4 that DSC-PLL can detect the change of amplitude when the grid voltage drops asymmetrically, which costs about 5ms.

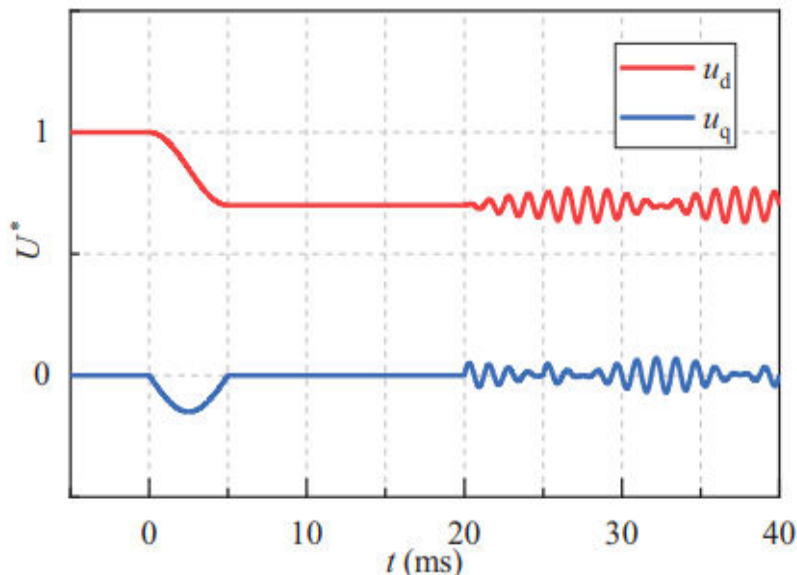


Fig.4: Detection results of DSC-PLL under unbalanced grid voltage

B. Double Second-Order Generalized Integrator

Fig.5 shows the topology of DOGI-PLL, which contains two SOGI based quadrature signals generators (SOGI-QSG).

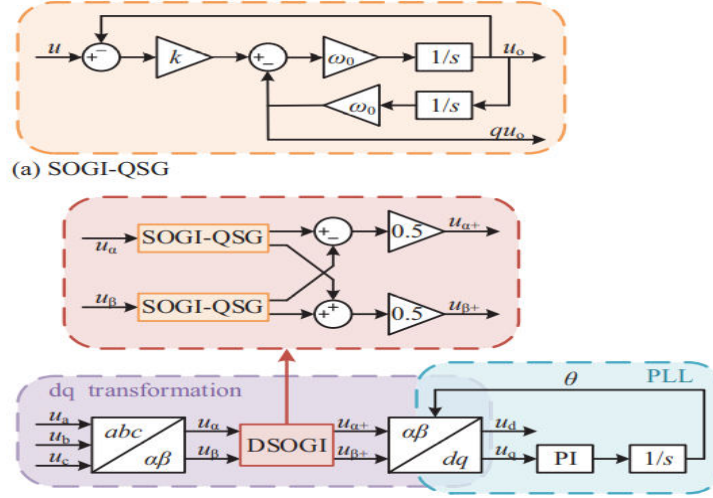


Fig.5: Topology of DSOGI-PLL

In Fig.5, q represents a 90-degrees phase lag in the time domain; ω_0 is the resonance frequency of SOGI-QSG, taken as the grid frequency 100π ; k is the gain coefficient, taken as 1.414. When the input signals are u_α and u_β , the output of SOGI-QSG can be expressed as

$$\begin{aligned} u_{\alpha 0} &= A_1^+ \sin \omega t + A_1^- \sin \omega t \\ qu_{\alpha 0} &= -A_1^+ \cos \omega t - A_1^- \cos \omega t \\ u_{\beta 0} &= -A_1^+ \cos \omega t + A_1^- \cos \omega t \\ qu_{\beta 0} &= -A_1^+ \sin \omega t + A_1^- \sin \omega t \end{aligned}$$

After phase sequence separation calculation, the positive sequence $\alpha\beta$ component can be expressed as

$$\begin{aligned} u_\alpha^+ &= \frac{1}{2}(u_\alpha - qu_\beta) = A_1^+ \sin \omega t \\ u_\beta^+ &= \frac{1}{2}(u_\beta + qu_\alpha) = -A_1^+ \cos \omega t \end{aligned}$$

Then we can get the accurate u_d and u_q after Park transformation.

When the grid voltage is as shown in Fig.2, Fig.6 shows the detection results of u_d and u_q by DSOGI-PLL.

It can be seen from Fig.6 that DSOGI-PLL can detect the change of amplitude when the grid voltage drops asymmetrically, which costs about 10ms. Compared with the results of DSC-PLL, DSOGI-PLL has a stronger ability to suppress high-order harmonics, but needs longer detection time.

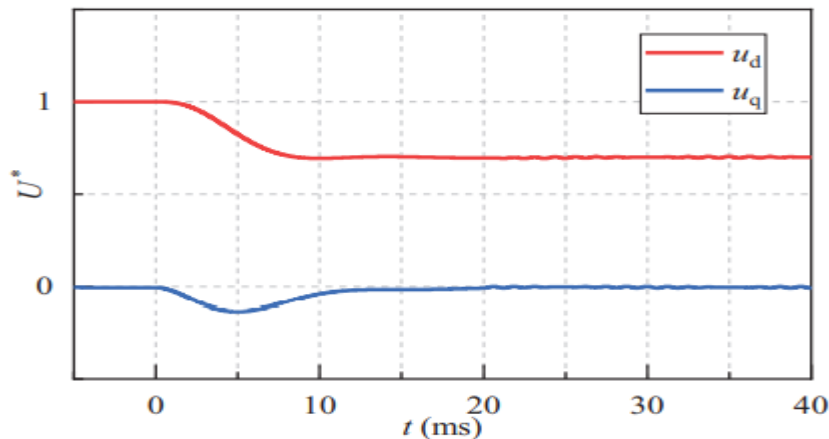


Fig.6. Detection results of DSOGI-PLL under unbalanced grid voltage

C. Adaptive Notch Filter

Fig.7 shows the topology of ANF-PLL, which uses ANF to generate two orthogonal outputs, so as to eliminate the second harmonic in dq component. Since there is only one ANF unit, ANF-PLL is relatively simple in structure.

ANF works as a quadrature signal generator. When the input signal is u_q and the resonance frequency is 2ω , the output of ANF unit can be expressed as

$$u_{q0} = A_1^- \sin 2\omega t$$

$$qu_{q0} = -A_1^- \cos 2\omega t$$

After phase sequence separation calculation, the positive sequence dq component can be expressed as

$$u_d^+ = u_d - qu_{q0} = A_1^+$$

$$u_q^+ = u_q - u_{q0} = 0$$

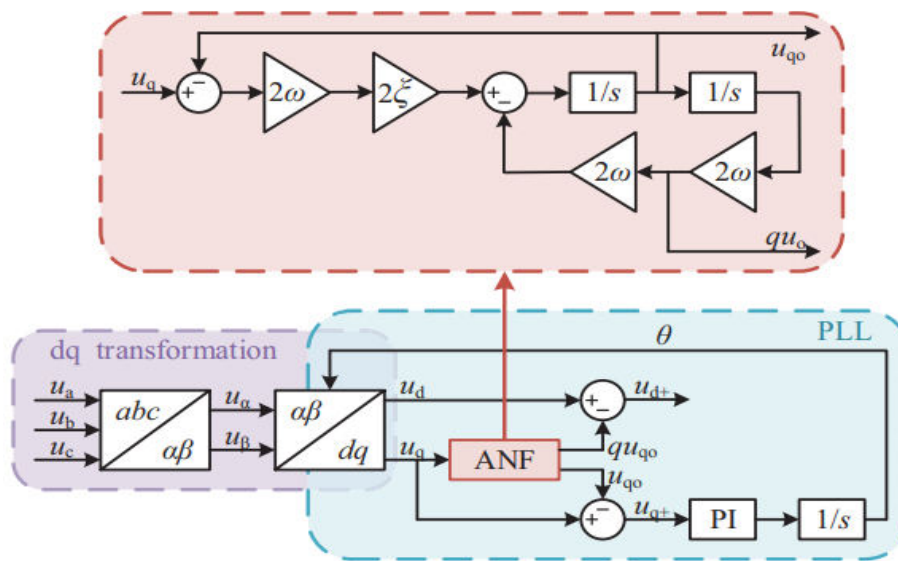


Fig.7: Topology of ANF-PLL

When the grid voltage is as shown in Fig.2, Fig.8 shows the detection results of u_d and u_q by ANF-PLL.

It can be seen from Fig.8 that ANF-PLL can detect the change of amplitude when the grid voltage drops asymmetrically, which costs about 7.5ms. Compared with the results of DSC-PLL and DSOGI-PLL, ANF-PLL has no ability to suppress high-order harmonics.

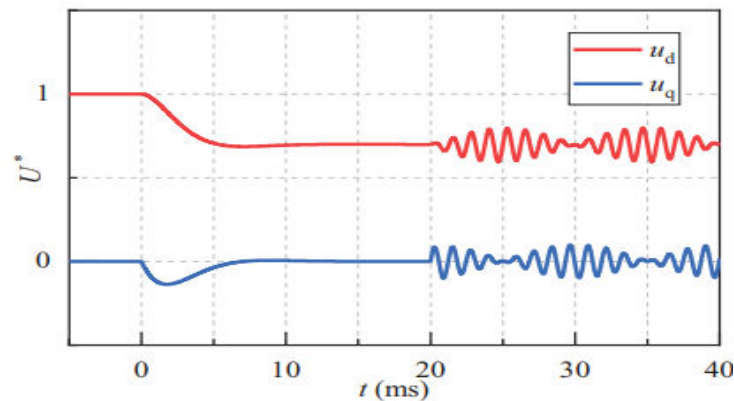


Fig.8: Detection results of ANF-PLL under unbalanced grid voltage

D. Comparison of DSC, DSOGI and ANF

Furthermore, the detection speed and harmonic suppression ability of the above three improved dq transformations are compared and analyzed.

1) Detection Speed

When the a-phase voltage drops to 10%, u_d and u_q detected by DSC, DSOGI and ANF are shown in Fig.9.

It can be seen in Fig.9 that DSC is the fastest and DSOGI is the slowest. For the detection of d-axis component, DSC needs 5ms, ANF needs about 5ms and DSOGI needs about 8ms. However, there are overshoot and oscillation in the detection results of ANF and DSOGI. For the detection of q axis component, DSC still needs 5ms. ANF needs 7ms and there exists oscillation. DSOGI-PLL needs longer detection time and its phase locking effect is not as accurate as that of DSC-PLL and ANF-PLL.

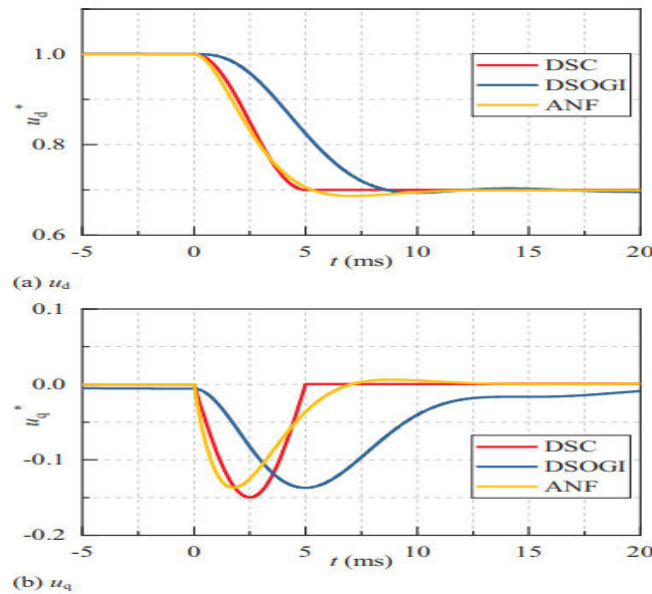


Fig.9: Comparison of detection speed

2) Harmonic Suppression Capability

When there is 16th order positive- and negative-sequence harmonics with amplitude of 0.05p.u. in the grid voltage, the harmonic amplitudes in u_d and u_q detected by different methods are shown in Fig.10.

It can be seen from Fig.10 that when 16th order positive and negative-sequence harmonics are injected into the grid, 15th and 17th order harmonics will appear in u_d and u_q after Park transformation, which also corresponds to the calculation result of (5).

Different improved DQ transformations have different degree of harmonic suppression. DSC can suppress high-order harmonics slightly, DSOGI can almost completely filter out high-order harmonics, while ANF cannot do anything about it. Table 1 shows the comparison of three improved DQ transformations.

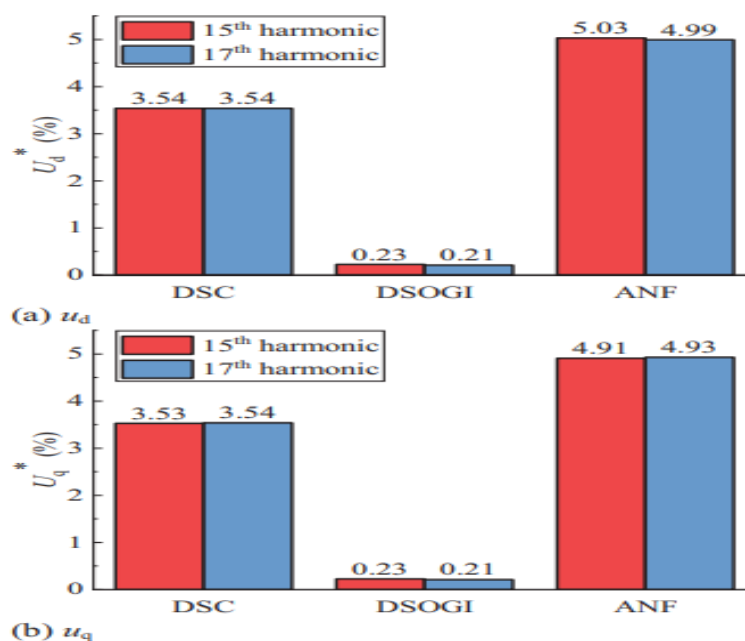


Fig.10: Comparison of harmonic suppression ability

Table I: Comparative Analysis of Improved Dq Transform

Type	characteristics		
	Topology	Detection speed	Harmonic suppression
DSC	Simple	Fast	Weak
DSOGI	Complex	Slow	Strong
ANF	Comparatively Simple	Comparatively fast	None

IV. CONCLUSION

The timely and accurate detection of grid voltage amplitude is very important for offshore wind farm to realize LVRT. In order to find a detection method of grid voltage sag suitable for LVRT of offshore wind power converters, this paper distinguishes the differences between the existing traditional detection methods as well as the improved DQ transformation methods, and provides an idea for selecting and improving detection methods. This paper first discusses the RMS method, wavelet transform and other traditional methods of power grid voltage sag detection. Among them, DQ transformation based on SRF is suitable for offshore wind power converter due to its accuracy and timeliness. This paper then introduces the principle of conventional as well as improved DQ transformations in detail, compares and analyzes the topology, detection speed and harmonic suppression ability of DSC-PLL, DSOGI-PLL and ANF-PLL, which provides an idea for the selection of grid voltage sag detection method of offshore wind power converter. In the subsequent work, certain improvements will be made based on the DSC-PLL to enhance the ability of high-order harmonic suppression without reducing the detection speed and making the structure too complex.

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DEVELOPMENT OF A CAD MODEL SIMPLIFICATION FRAMEWORK FOR FINITE ELEMENT ANALYSIS

Vivek Gedam and M KrishnaProfessor, Mechanical Engineering Department, Gyan Ganga Institute of Technology and Sciences, JBP
(482003) (M.P)**ABSTRACT**

In this paper we are trying generate a simplification framework for both part and assembly CAD models for finite element analysis model preparation. At the part level, a rule-based approach for suppressing holes, rounds, and chamfers is presented. Then a tool for suppressing multiple specified part models at once is described at the assembly level. Upon discussion of the frameworks, the tools are demonstrated on several different models to show the complete approach and the computational performances. The work presented here is expected to significantly reduce the manual time consuming activities within the model simplification stage. This is accomplished through multiple feature/part suppression compared to the industry Standard of suppressing one feature/part at a time. A simplified model speeds up the overall analysis, reducing the meshing time and calculation of the analysis values, while maintaining and on occasion improving the quality of the analysis.

Keywords: framework, CAD models, finite element analysis, meshing time, suppressing

• INTRODUCTION

The generated 3D CAD models are used for downstream applications within the design and manufacturing process. Finite element analysis (FEA), is one of the downstream applications, has emerged as an important engineering analysis tool and is extensively used for structural, thermal, and modal analyses to ensure that the design of the model will meet the specifications required from the operation of the model.

1.1 Finite Element Analysis (FEA)

FEA is a numerical technique for calculating approximate solutions of complicated equations used to calculate the analysis results. It does this by generating a mesh, grid of nodes, over the entire model. The density of the mesh varies throughout the model, using having a higher density at fillets, corners, and high stress areas. The mesh contains the structural and material properties, which define how the structure reacts to the conditions implemented within the analysis. At each node an equilibrium equation is generated and the equations are solved to obtain the results in the analysis.

.1. Importing of 3D Models

Importing the detailed 3D models, such as the one shown in Fig. 1.1, into the FEA software often presents several challenges.

- First, the meshing time rapidly increases with the complexity of the model.
- Second, it may take a long time to analyze the large FEA mesh that results from the detailed CAD models.
- Third, the presence of a small feature may lead to a poor quality mesh and hence may lead to erroneous analysis results.

In extreme cases, the automated meshing may fail on very complex models, requiring manual meshing of the model. Utilizing a more powerful computer cannot solve all the issues associated with analyzing complex CAD models.

○ MESHLESS METHOD

Meshless methods have been proposed as an alternative to FEA, which use the geometry of the object directly for the calculations. These methods are not as widely used within the community.

Two different types of approaches can be taken to perform automated model 3 simplification for FEA. The first approach is geometry based and utilizes the geometric operators to simplify the parts [1]. Unfortunately, encoding the preferences of an analyst in this approach is very difficult and can lead to erroneous and inconsistent results [2]. The second approach is knowledge based. In this case, the preferences and knowledge used by the analyst are explicitly encoded as simplification rules. This approach captures analysts' knowledge in terms of rules that express the characteristics of features/parts that should be considered for suppression.

○ Challenges in Importing the Detailed 3D Models

Importing the detailed 3D models, such as the one shown in Fig. 1.1, into the FEA software often presents several challenges.



Figure 1.1: Napier Sabre 24 Cylinder Aircraft Engine [3]

- First, the meshing time rapidly increases with the complexity of the model.
- Second, it may take a long time to analyze the large FEA mesh that results from the detailed CAD models.
- Third, the presence of a small feature may lead to a poor quality mesh and hence may lead to erroneous analysis results.

In extreme cases, the automated meshing may fail on very complex models, requiring manual meshing of the model. Utilizing a more powerful computer cannot solve all the issues associated with analyzing complex CAD models.

2. OBJECTIVE AND DEFINED SOLUTION

The objective and defined solution of this thesis revolve around developing a simplification tool for complex CAD models in preparation for FEA. The FEA types that are focused on within the framework are structural and modal. This tool is divided into two primary parts: part model simplification through feature suppression and assembly model simplification through part suppression and part simplification. For development of these tools a knowledge based approach has been utilized.

2.1 Part Model Simplification for Finite Element Analysis (Proe Has A Pro/Toolkit API)

The main focus of the approach is to design an automated tool that assists a user in identifying the features capable of suppression.

How it Works

A representation was developed that allows the suppression rules to be expressed in a neutral format and these rules are expressed as a binary decision tree. The developed language has a very rich library, which allows the user to edit the rules if necessary. Upon learning the rules, they are applied for identification of suppressible features within the test parts. Features that are found to be suppressible are further examined based on their parent child relationships. Lastly, the expert verifies the suppressibility of the features and the CAD model is simplified accordingly.

- For example, holes, fillets, and chamfers often do not significantly affect the analysis results. However, the presence of a single small hole in the model can significantly increase the size of mesh and also lower the quality of mesh element. So, such cosmetic features are prime candidates for suppression.
- Feature dimensions play a major role in determining whether they should be suppressed or not. Often features with small sizes are prime candidates for suppression.
- Features that lie close to either the point of load application or the displacement constraints should not be eliminated.
- In CAD models, feature references can be used to define placement of other features.

The rule language was generated based upon the four attributes discussed earlier; feature type, feature dimensions, topological distance, and feature references. The feature dimensions and topological distance are values that are relative to the overall size of the 3D model. To acquire a representative rule base for 3D models, these values must be normalized to eliminate the correlation between the overall model size and the feature values. To accomplish this task the feature values were divided by the average of the sides of the overall models

bounding box. This normalizes the data and removes the dimensional bias of the of the feature value with respect to the overall model size.(5)

The following functions supported by our representation framework:

Feature Type (feature id): This function returns the type of the feature identified, by variable feature id

Feature Parameter Value (feature id, parameter name): This function returns the value of the feature parameter specified by variable parameter name.

Find Features (expression): This function returns the list of features that meet the criteria specified by the variable expression.

For example, expression $((\text{Feature Type}(\text{this feature}) == \text{HOLE}) \wedge (\neg (\text{Label} == \text{BOUNDARY CONDITION}) \wedge (\text{DIAMETER} < 10)))$ returns all features in the model that are of type HOLE, do not have label as BOUNDARY CONDITION, and have DIAMETER values smaller than 10. Values used in the expression are assumed to have the same units as the units being used in the CAD model.

OTHER FEATURES

- Feature Bounding Box (feature id): This function returns the bounding box of the feature.
- Model Bounding Box (): This function returns the bounding box of the CAD model.
- Max Distance between a Feature and Feature List (feature id, feature list): This function returns the maximum distance of the feature defined by variable feature id with the features in the feature list.
- Min Distance between a Feature and Feature List (feature id, feature list): This function returns the minimum distance of the feature defined by variable feature id with the features in the feature list.
- Parent Features (feature id): This function returns the list of features that are used as a reference for constructing the feature defined by variable feature id.
- Child Features (feature id): This function returns the list of features that use the feature defined by variable feature id as a reference.

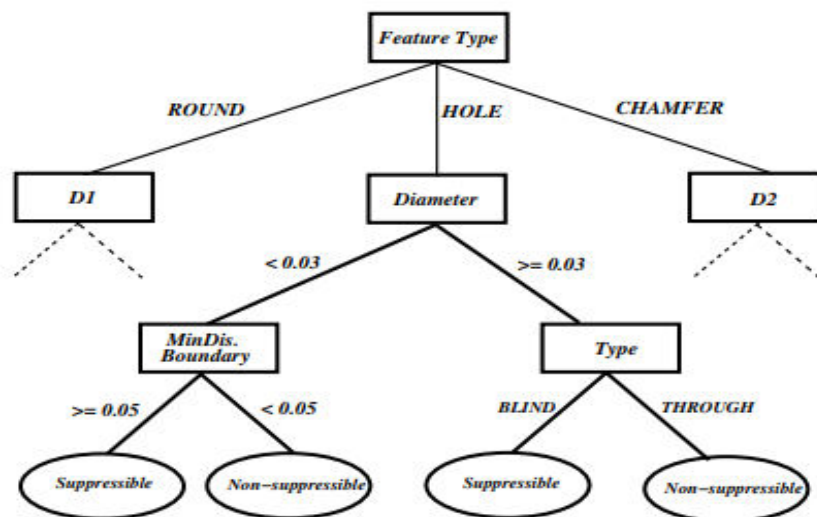


Figure 1.1 Overview of Part Model Simplification (3)

2.2 Assembly Model Simplification for Finite Element Analysis (Pro/Toolkit API)

The main focus of the assembly approach is to design a framework that assists the user in the simplification of complex CAD assembly models, consisting of numerous part models; similar to the part simplification framework.

Parameters included DESCRIP, PART NAME, and MATERIAL.

- The DESCRIP parameter often provides part information
- The generation of the PART NAME is usually standardized throughout the industry, grouping similar parts.
- The part material is dependent upon the requirements of the part within the overall assembly

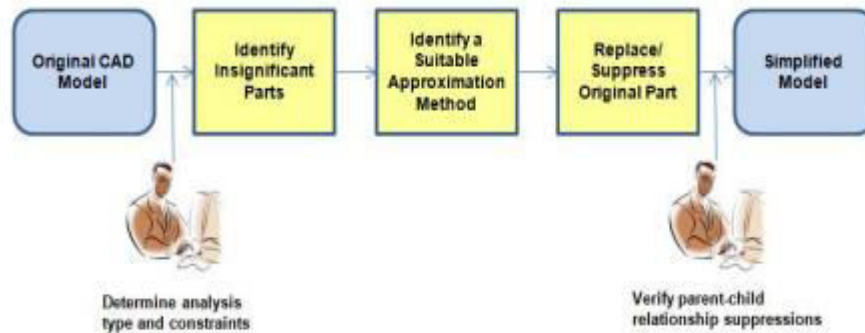


Figure1.2: Overview of the assembly approach (7)

The framework has been implemented within the ProE CAD system

2.3 .1 Part Suppression

In order to assist in the simplification process of the assembly models, the Pro/Toolkit API in ProE was utilized to generate a model suppression tool, just as in the part simplification framework. For recap, this tool is an add-on module in ProE, accessible through the menu systems in the ProE environment. In the API, the design model is stored by ProMdl, a data handle to retrieve the complete information of the design model.

2.3.2 Part Utilization

Defining the intended purpose of the part within the overall assembly model; e.g. structural stability, thermal enhancement, ergonomic aspect, or part attachment method; can facilitate the classification of the part's criticality for analysis. The PART NAME and DESCRIP parameters can aid in the identification of the part's purpose within the assembly. Generally, the PART NAME has a common string, specifying the group type to which the part belongs; for example the MS* string refers to a type of fastener and then the DESCRIP parameter contains key words to assist in specifying the intended purpose, such as bolt or screw.

2.3.3 Material

In addition to the part's intended purpose, material selection plays a role in determining the extent of the part criticality, from the analysis results point of view. The analysis response of a part is highly dependent upon its overall shape and dimensions, but the magnitude of this response is a result of the material; i.e. the material properties

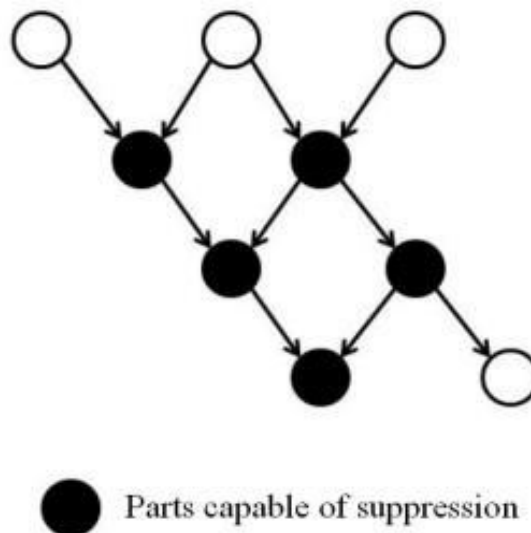


Figure 1.3: Example of the generated parent-child relationship graph (6)

This model is only valid for assembly models generated using only parts and no minor assembly models. When minor assembly models are used within the overall assembly, the parent references of the minor assembly are not necessarily used as the reference for inclusion into the overall model. If the parent is not used, then it is not seen as a child to the parts from which the minor assembly is referenced. Then suppression of the part model of the overall assembly used for referencing generates an error because the parents of the referenced part are not suppressed, but the references for the part into the overall model are suppressed.

3. RESULTS AND DISCUSSION

To illustrate the framework described, assembly models have been simplified for both a structural and a modal analysis. Simplification of the models was accomplished by part suppression, based upon the MATERIAL or PART NAME attribute value, and part simplification discussed in the previous chapter. Upon model simplification a finite element analysis is conducted for both the simplified and original models, with the help of Pro/Mechanical. After conducting the FEA, the analysis results were compared between the simplified and original models in terms of mesh quality(number of tetra elements and maximum aspect ratio), mesh generation time, and either mode values or maximum Von Mises stress, depending on the analysis type.

4. CONCLUSION

A framework for simplifying CAD part models was developed with the utilities provided within ProE. The approach contains several key aspects. First, numerous features can be suppressed at one time, compared to the industry's current simplification process of suppressing one feature at a time. Second, a rule basis has been learned through expert demonstration with only conservative error, which can evolve as more parts are simplified.

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EFFECT OF PLYOMETRIC TRAINING ON FOOT REACTION TIME AND PASSING SKILL OF FOOTBALL PLAYERS

Mr. Pintu Debnath and Dr. Aditya Kumar Das ²

Research Scholar and Assistant Professor, Faculty of Physical Education & Yoga, ICAFI University Tripura, India

ABSTRACT

Background: The purpose of this study was to examine the “Effect of plyometric training on foot reaction time and passing of football players”.

Methods: Total twenty subjects were selected for the studies from the ICAFI University Tripura, who have participated at least inter- college and state level football tournament. The age range was between 18 to 25 years. Experimental group underwent plyometric training Group (PTG, n=20). The plyometric training program underwent three days in a week for five weeks. The experimental group underwent plyometric training exercises. The pre-test and post-test data were selected through Nelson hand reaction time test for foot reaction time and Mor – Cristian General Soccer Ability Test for passing.

Results: The analyses of data were used Paired samples t-test with the help of IBM SPSS software 20. The level of significant was fixed at 0.05 levels of confidence. The result shown that the experimental group significantly improved when compare with pre test and post test. On comparing foot reaction time and passing skill on plyometric training shows that the post test means of foot reaction time and passing time significantly difference.

Conclusion: Plyometric Training group particularly evident for improvements in foot reaction time and Passing skills of football players. The result of the study determined that the Plyometric training exercises have a positive effect on foot reaction time and passing skill of men football players.

Keyword: Plyometric Training, Foot Reaction Time, Passing Skill and Football.

INTRODUCTION

Football is the most popular game in the world that requires more fitness component ability and skills ability for better performance. It can be enhance by different types of scientific and systematic training methods where one of the best training method is plyometric training. plyometric training is the important training methods of football players which enables to players move faster and enhance the muscles strength where all bio motor skills are affected. During match the high demand activities are also performed in a specific context. Basically the main aims of the players to develop the performance like tactics, technical performance and psychological capacity. The success of sporting event constantly leads the coaches, the player's performance analyze and evaluate by sports researcher and coaches for improving the performance. At the time of match the performance analysis by difference scales. This scale provides the outcomes of competitive matches as well as given the information regarding the training process. It is the main part of the decision making processes of players and it requires testing process for different events. The foot reaction time and skill related performance of football player's measure to take the nelson reaction time test and passing test before and after the training method. These component and skill are very essential to develop to the football players which are closely related to high level of performance. The main purpose of the study was the effect of plyometric training on skill related performance of football players. The component and Skill play an importance roles for enhance the sports performance of football players as well as with other disciplines players performance. Whenever we see the difference competition and their performance it was very less than modern competition. It is possible only when we follow the scientific and systematic training methods.

Foot reaction time is an important component of physical fitness and it is the ability of a person to move immediately in minimum time. Foot reaction time can improve by the difference types of training methods namely resistance training, plyometric training and speed training. In this paper researcher was determine how fitness component and skills related performance are affected by five weeks plyometric training program of men football players. Reaction time is an integral part of sports and it related to strength of the muscles and proper function of nerves system. A player has good function of foot reaction time ability when he/she has more strength of muscles and has good function of nerves system. People have two types of muscle fibers like slow-twitch (type-I) muscle fiber which is help the athlete for long time activity and fast twist (type- II) muscle fibers which is help the athlete faster movement. Plyometric training improves the athlete's nervous system and strength ability which are directly related to improve the fitness component and skills of each player. A good

fitness component and skill can help the athletes to enhance the high level of performance. Research studies shown that the plyometric training, when applied it with periodized training program can enhance the muscle power, leg strength nervous system and acceleration which can highly related to improving the skills of players foot reaction time and Passing skill and these skill help to the football players to improve the performance level. Foot reaction is an important component for football player to move the foot immediately when a player moving with football and when opponent players try to defense. Passing skill also play an important role at the time of competition. Proper passing skill helps a player to move faster than opponent plays to the direction with the ball.

Statement of the Problem

The main problem of the study was to find out the “Effect of plyometric training on foot reaction time and passing Skill of football players”.

Subjects

Total twenty (20) subjects were selected for the studies who have participated at least inter- college and state level football tournament. The age range was between 18 to 25 years. All subjects were underwent plyometric training program (PTP, n=20).

Study Design

Total 20 (twenty) subjects were selected for the studies from the ICFAI University Tripura, who have participated at least inter- college and state level football tournament. The age range was between 18 to 25 years. All subjects were underwent plyometric training program (PTP, n=20). plyometric training group underwent for five weeks for three days in a week. The pre-test and post-test data were selected through Nelson hand reaction time test for foot reaction time and Mor – Cristian General Soccer Ability Test for passing skill. The analyses of data were used Paired samples t-test with the help of SPSS software. The level of significant was fixed at 0.05 levels of confidence.

Training Programme

The study was formulated as a true random group design, consisting of a pre-test and post-test. In the training period, the plyometric training group underwent three days in a week for five weeks. Experimental group performed one hour in the morning session, started with warm up, and continued by some plyometric exercises which are fixed by the researcher. At the beginning of the training, the training were conducted with three set and 80% intensity and after first week three sets and 95% intensity were added up to five weeks.

STATISTICAL ANALYSIS

Data were analyzed by using IBM SPSS statistic 20. Paired samples t-test was used to find the difference between the Mean and Standard Division of pre and post test. The significance level was at 0.05 level of confidence.

RESULT AND DISCUSSION

Table-1, Shows that the mean and standard deviation of differences between the Pre and Post test of experimental group.

Sl. No	Variables	Groups	Test	Mean	SD	Std. error mean	df	‘t’ Value
1	Foot Reaction Time	Experimental	Pre test	.6442	.05206	.01164	19	3.341
			Post test	.5906	.04326	.00967		
2	Passing	Experimental	Pre test	5.0000	1.52177	.34028	19	-6.474
			Post test	6.7000	1.38031	.30865		

*Significant at 0.05 level.

From the above table, researcher has done his experiment with single pre-test and post test design and has taken test before and after the plyometric training. From the above table researcher has found that the mean value of foot reaction time is (Pre test .6442 and Post test .5906), SD value is (Pre test .05206 and Post test .04326) before and after training respectively. The obtain “t” ratio value of foot reaction time is 3.341, on foot reaction time it is greater than the tabulated value of 2.093 with degree of freedom 19 at 0.05 level of confidence. The result of the study shown that there was significant difference in foot reaction time after taking plyometric training among men football players.

The mean value of passing is (Pre test 5.0000 and Post test 6.7000), SD value is (Pre test 1.52177 and Post test 1.38031) before and after training respectively .The obtain “t” ratio value of passing is -6.474, on passing it is

greater than the tabulated value of 2.093 with degree of freedom 19 at 0.05 level of confidence. The result of the study shown that there was significant difference in passing after taking plyometric training among men football players.

The Graphical Representation of Mean Comparison of Foot Reaction Time and Passing is Shown at Figure-1

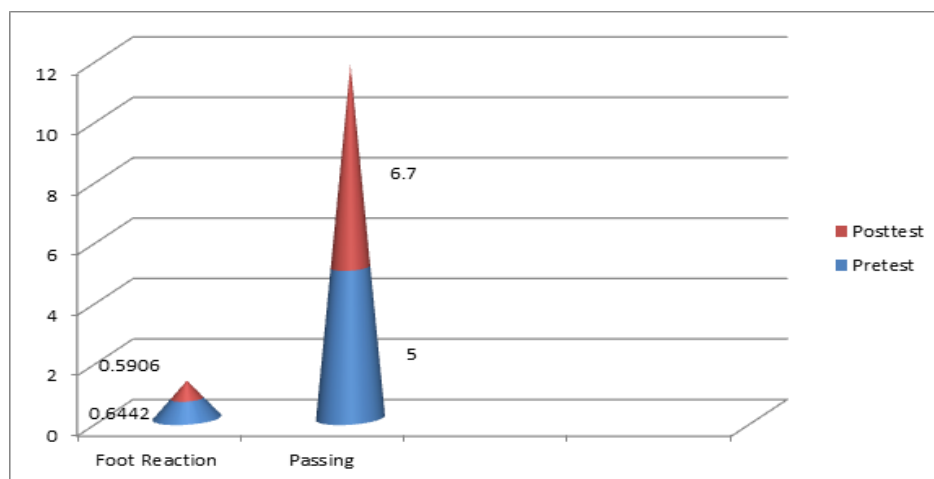


Fig: 1- Significant mean difference of foot reaction time and passing skill of men Football Players

Above groups shown that the performance of plyometric training has two items namely foot reaction time and passing in that football player have performed accordingly. Researcher has used pre and post test to check their performance in different item. Pre test has been taken before plyometric training has been scheduled after that five weeks plyometric training and post test has been conducted in the ground.

In foot reaction time variable shows decrease of men football players' time from 0.6442 to 0.5906. The data shows that before plyometric training men football players were more time in foot reaction time while after plyometric training it has been decreases the time which shows that improvement of football players.

In passing variable shows improvement of men football players from 5.0000 to 6.7000. The data shows that before plyometric training men football players were less performance in passing while after plyometric training it has been increases the numbers which show that improvement of football players.

CONCLUSION

The result of the study has shown that the plyometric training decrease the time of foot reaction time and increased passing skill of men football players. It was concluded that five weeks plyometric training program significantly improved of men football players when compared after pre-test and post-test. It was prove that the plyometric training is best training method for improving the foot reaction time and passing skill of men football players.

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EFFECT OF YOGIC TRAINING ON FLEXIBILITY FOR B. Ed. STUDENTS: A QUASI-EXPERIMENTAL STUDY**Dr. Sapam Sanatombi Devi**

MU/LI (Affin.)/CDC/2014/504 dated 07/01/2020, Zip code-795148

Assistant Professor, Department of Health, Yoga and Physical Education, Slopeland College of Teachers Education, Khongjom, Manipur, India

ABSTRACT

Aim: The study aimed to investigate the effect of yogic training on the flexibility for Bachelor of Education (B. Ed.) students.

Methodology: A total of fifty female subjects were purposively selected from B. Ed. students of Slopeland College of Teachers' Education, Manipur, India whose ages ranged from 21-25 years. It was hypothesized that yogic training would result significant flexibility to the subjects. The yogic training was regularly practiced for one hour, five days a week for nine weeks. The data were collected by using Sit and Reach Test (one of the linear flexibility test which helps to measure the extensibility of the hamstrings and lower back). For statistical analysis, descriptive analysis and paired sample t-test were employed to see the characteristic of data and mean differences between pre-test and post-test respectively.

Results: The Mean and Standard Deviation of Flexibility for pre-test and post-test were 40.75 ± 6.12 and 43.10 ± 4.99 , respectively. And the value of range, standard error, and variance of Flexibility for pre-test and post-test were 34.80, 0.86 & 37.49 and 30.83, 0.70 & 24.99 respectively. The p-value found a significant difference in the mean comparison of Flexibility between pre-test and post-test. The calculated 't' value was 4.83, greater than the tabulated 't' = 1.67 at a 0.05 level of confidence. Significant difference were found between pre-test and post-test mean comparison of flexibility, and the p-value is = 0.000, ($p > 0.05$). There was a significant difference in flexibility after nine weeks of yogic training compared to baseline data. Thus, regular yogic training results in improvement of flexibility.

Conclusion: The study is concluded that a significant difference was found extensibility of the hamstrings and spine among B. Ed. female students. Regular yogic training help to increase the range of movement, which is beneficial for prevention of injuries, less pain, balance, increase strength, and greater physical performance.

Keywords: B. Ed. students, flexibility, mean, standard deviation, and yogic training.

INTRODUCTION

In the present era, yoga has become an integral part of man's life. In this scientific age, man has reached the moon and is trying for a higher target in space. Likewise, in yoga, we are trying to achieve higher performance through critical thinking, and scientific training. Nowadays, yoga is not limited to self-satisfaction, but it has got a wide range of importance. A nation highlights its prestige in society and country on the international front through yoga. That is why; the concerned persons utilize so many scientific means and methods for great success.

YOGA

The word Yoga comes from the root word 'Yuj,' which means to unite. Thus, Yoga can be defined as a means for uniting the individual consciousness with the universal consciousness. Maharishi Patanjali defines in his second aphorism "yogah citta vrtti nirodhah," meaning 'Yoga is a process of gaining control over the mind by cessation of the modifications of the mind.' It means total control of all mental processes: 'Citta' is derived from the root word 'cit,' means 'enlighten' 'to make aware'; Vrtti is derived from the root word 'vrt' means 'enlighten' 'to make aware'; 'Vrtti is derived from the root word 'vrt' means 'to behave with the suffix'; 'ti' means 'process of movement.' So, the meaning of 'citta-vritti' is the behavioral mode of citta or modification. Yoga is bringing to complete cessation the functional modification of citta. By controlling the mind, one can reach the original state, "Tada drashtuh swarupe avasthanam." Then the Seer establishes himself in his original state. This technique of 'mind control' prescribed by Maharishi Patanjali has tools to develop the mind's concentration and focus with increased thoughts. Another Yoga master, Vasistha, emphasizes Yoga's second aspect as "Manah prashamanopayah Yoga ityabhidheyate." Yoga was known as a skilful trick to calm down the mind. According to Swami Vivekananda, Yoga is a conscious process to accelerate the evolution into single life, a few years or just a few days by controlling the behaviour internally as well as externally; this state can be achieved by following work or Karma Yoga, by Bhakti Yoga (Worship), by Jnana Yoga (knowledge) and by psychic control or Raja Yoga (Chidananda, M. B. T., 2010, pp.6-7). Most of them perform yogic exercises for a short period,

and when the health improves they continue the yoga practice. For this reason, the effective results of yogic practices cannot be determined perfectly. Many scientists, doctors, psychologists etc. all over the world are extensively studying the beneficial aspect of yoga which give us encouraging results of positive health through yoga (Clarke, H. H. and Ravishankar, N. S., 2009, p.13).

Nowadays, modern yoga has changed and given a new model. It is now recognized as an integral part of education and can no longer be divorced from it. Millions of men and women practiced yoga for its own sake. Perfection of players in skills and technique is very much dependent on an effective way of training practice and some suitable exercise for the development of general strength and power, flexibility, coordination, and agility in related games and sports. So fitness training is very much needed regarding player's position because – "A person physically fit in all respect does not exist" (Waitehd, N., 1975, p.12).

FLEXIBILITY

Flexibility is an essential component of physical fitness, which helps synchronize various movements. Moreover, flexibility is an integral part of life, even for the ordinary person who can avert a possible injury resulting from a fall while performing his daily course. In general, flexibility means the range of movements around the skeleton joints of the body. The flexibility is not a public body character, but it is specific to everybody's region. If a person has a high flexibility shoulder region, it closes not necessarily mean that they have good knee flexibility or hip flexibility. Even it is possible that one shoulder joint is more flexible than the other. Excellent physical fitness enables the person to have free body movements and better coordination that requires less work and handles more significant stress with lesser risk of injury (Devinder K. Kansal, 1996, p. 22).

Flexibility is the range of joint motion, i.e., the degree of movement achieved at the various body joints. Flexibility is limited by the coordination of the ligaments and fascia (layer of connective tissue) surrounding the joints. Joint structure and muscular extensibility defined the range of collective action as, of course, disease and injury. Flexibility is specific to each common, and an individual having good ankle flexibility does not necessarily have good hip flexibility. Flexibility is improved with warm-up exercises. 10 to 14 minutes of warm-up is necessary to achieve maximum flexibility. Adult men 18 to 71 years of age display a negative trend of flexibility with increasing age. Using 22 different measures of flexibility, a peak for general flexibility is reached at 23.5 years of age, and after that, a general downward trend is exhibited. Weight training, rather than decreasing flexibility, actually increases flexibility at the specific joints at which action takes place.

With the general population, average flexibility declines with age, attributable to lessened physical activity. Inflexibility may be regarded as an age discriminator. The evidence also points to the individual's selection and adaptation to the sport in which he participates. Swimmers requiring maximum ankle flexibility develop this quality while engaging in swimming activity.

Certain sports demand a high degree of specific joint flexibility as a requirement for a high level of performance. Ankle and shoulder flexibility for swimming, wrist flexibility for baseball and handball, and ankle flexibility for basketball are common examples. The range of joint motion, plus strength applied to the movement, with the coordination developed by experience, leads to a more forceful kick in swimmer, speed, distance in throwing, and height in jumping.

Maintenance and improvement of overall joint flexibility can be accomplished by stretching exercises, coupled with strengthening exercises, especially in the shoulder, hip, and knee joints; specific flexibility improvement for sports purposes indicates the need for progressive resistance exercises for a sustained period performed through the whole range of joint movement to affect strength increases as well as flexibility improvements (Michael S. Yuhass, 1977, p.17).

The body's movement is characterized by stretching the muscle and ligaments that oppose the motion. Flexibility is one of the prerequisites to efficient training and essential to the physical fitness of an individual. When we speak of flexibility, "It refers to the ability of an individual to move the body and its part through as wide a range of motion as possible without undue strain to the articulations and muscle attachments (Barry L. Johnson, 1977, p.198).

Flexibility is the ability of an individual to move the body and its parts through as wide a range of motion as possible without undue strain to the articulation and muscle attachment.

Studies have already proven that yoga can improve physical fitness components such as speed, agility, strength, coordination, flexibility, balance, endurance, power, and reaction time. But there is no such randomized control trial on the effect of only yogic training on flexibility. With this in mind, the present study aimed to determine

whether flexibility can be improved through the regular practice of yoga. Yogic practices are becoming more popular in the curriculum of Indian schools, colleges, universities, and every community of the societies in the world. Yoga is the alternative and most effective program used to treat many health conditions, including inhibiting body weight gain, reducing cholesterol levels, normalizing blood pressure, improving immune function and many more.

Researchers felt the need of the hour to conduct research on flexibility among B.Ed. students. Therefore, the researcher compared the pre-test and post-test results of yogic training to the female B. Ed. students of Slopeland College of Teachers Education, Manipur, India.

REVIEW OF RELATED LITERATURES

The study of relevant literature is essential to know the work done in training programs to enhance the ability of yoga practitioners. The researcher made every necessary step to locate and collect the literature relevant to the study. The researcher had gone through many reviews but finds the following very much related to the current study. Tran; M. D., et al. (2001) studied the effects of hatha yoga practice on the health-related aspects of physical fitness. The findings of their study indicated that regular hatha yoga practice could elicit improvements in the health-related aspects of physical fitness, including muscular strength and endurance, flexibility, cardiorespiratory fitness, body composition, and pulmonary function. Amandeep, S. (2019) studied the effect of selected yogic practices on the flexibility and agility of soccer players. The study concluded that the yogic practices undertaken for this study for eight weeks duration resulted in the development of flexibility and agility of soccer players. Suseela; V., et al. (2017) studied the effect of yogic practices on flexibility among Annamalai University students. They found that there was a significant improvement in flexibility compared to the pre-test. Iftekher; Md., et al. (2017) studied effects of yoga on flexibility and balance: A quasi-experimental study. The study concluded that regular yoga training improve the balance and flexibility of shooting athletes even within short period of time (six weeks), also improve the athletic performance that demands high flexibility and balance.

Based on the above literature, the present study was designed to determine the effect of yogic training on flexibility among the selected female students of Slopeland College of Teachers Education, Manipur.

OBJECTIVE

Keeping in view the researcher's interest, the main objective of this study was to find out the effect of yogic training on the flexibility for B. Ed. students of Slopeland College of Teachers Education, Manipur, India.

HYPOTHESES

Based on the review of related literature, discussion with the experts, and researchers' personal experience, the following hypotheses were formulated:

- There might be a significant difference between pre-test and post-test on flexibility of B. Ed. students after yogic training.
- There might be a significant effect of yogic training on flexibility between pre-test and post-test for B. Ed. Students.

SIGNIFICANCE

The present study will be helpful to every individual to increase the flexibility. As flexibility is an important component of physical fitness, it has many positive effects on the body. For instance, flexibility improves mobility, posture, muscle coordination, reduces the risk of injuries and muscle soreness. It also leads to a better overall shape. Rather than these, some of the significance of this present study is mention below:

- The present study will be beneficial to yoga practitioners, physical educationists, trainers, players, and coaches, to enhance their physical performance.
- The present study will serve as a foundation for future research in yoga.
- The findings of this study were helpful to the students to know their level of flexibility.
- This study will help the players achieve their high performance at the time of competition by improving the desired level of flexibility.
- The present study will help suggest a developmental program for yogic practitioners in a better way in different conditions.

METHODOLOGY OF THE STUDY

Researchers used the action research design to determine the effect of yogic training on Flexibility for the subjects.

SELECTION OF SUBJECTS

For this study, a total of fifty female B. Ed. students from Slopeland College of Teachers Education, Manipur, India, whose ages ranged between 21 to 25 years, were selected.

TRAINING PROGRAM

This training program includes a total of sixty minutes of yogic training which composed of om chanting and prayers for ten minutes (five in the beginning and five in the end of the training session), selected yogic suksham and sthula vyayam for ten minutes, quick relaxative technique for ten minutes (five each between the training session), yogic asanas for fifteen minutes, and pranayama for fifteen minutes. The yogic training was applied for nine weeks, five times a week. With increasing the scale and number of yogic exercises, the intensity of yogic exercise also increases. Researcher has composed the routine so that it does not exceed the previously set maximum exercise intensity. And also, when practising each move, training is focused more on safety than accuracy, suggested a bit of movement change in parts that were tough to follow. The detailed yogic training program content is shown in table no. 3.

CRITERION MEASURES

These subjects were imposed on nine weeks of yogic training. A quasi-experimental research was used for this present study. The required data were collected by using Sit and Reach test. The pre-test was taken before the training program, and the post-test was after giving the yogic training to the subjects.

Sit and Reach Test:

The Sit and Reach Test was used to measure the maximum extensibility of the hamstrings and spine by using Sit and Reach Box. The procedures are as follows:

Purpose: To assess the flexibility of the spine and length of the hamstring muscles.

Equipment: Sit and Reach Box.

Procedure

- The subjects were asked to remove shoes and place their feet against the testing box while sitting on the floor with straight knees. If the subjects were not unable to straighten their knees, then their friends were allowed to help her.
- Then the subjects were asked to place one hand on top of the other so that the middle finger of both hands kept together at the same length.
- Then the subject was instructed to lean forward and place her hands over the measuring scale lying on top of the Box.
- Then the subject was asked to slide her hand along the measuring scale as far as possible without jerking and to hold the farthest position for at least two second.
- The higher the score usually indicates higher levels of body flexibility.

Scoring: The tester observed the rating scale, and it was noted down. Each subject was given three trials and taking the highest score was recorded as the final score in centimeters. The rating scale is shown in following table no. 1.

Table No.1 Rating scale for females

Fitness category	Females (cm)
Excellent	> 45.5
Good	45.5 – 38.0
Average	37.5 – 29.0
Below Average	28.5 – 20.0
Not very flash	< 20.0

<https://www.ptdirect.com/training-delivery/client-assessment/sit-and-reach-test-a-test-of-flexibility>

TRAINING PROGRAMME
Table No. 2: Weekly Training Programme

Sl. No.	Particulars	Duration
1.	Number of weeks	9 weeks
2.	Number of sessions per week	5 days
3.	Duration of each training	1 hour
4.	Quick Relaxative technique	5 × 2 = 10 minutes
5.	Selected Yogic Suksham and Sthula Vyayam	10 minutes
6.	Om Chanting/prayers	5 × 2 = 10 minutes
7.	Asanas	15 minutes
8.	Pranayamas	15 minutes

Table No. 3: Yogic Training Schedules

Sl. No.	DAYS	TIME	REPITATION	YOGIC EXERCISES
1.	Monday	5	1	Om Chanting
		10	1	Selected Yogic Suksham and Sthula Vyayam
		5	1	Quick Relaxation Technique (QRT)
		15	2	ASANAS Tadasana, Utkasana, Garudasana, Bhujangasana, Salabhasana, and Viparitakarni
		5	1	QRT
		15	3	PRANAYAMA Nadi Sudhi, Nadi Shodhana, Ujjayi, Bhramari, Sitali and Sitkari
		5	1	Gayatri Mantra (Om Bhur Bhuva Swaha)
2.	Tuesday	5	1	Om Chanting
		10	1	Selected Yogic Suksham and Sthula Vyayam
		5	1	QRT
		15	2	ASANAS Ardhakati Chakrasana, Trikonasana, Vakrasana, Pavanamuktasana, and Naukasana
		5	1	QRT
		15	3	PRANAYAMA Suryanuloma Viloma, Ujjayi, Bhramari, Sitali and Sitkari
		5	1	Gayatri Mantra (Om Bhur Bhuva Swaha)
3.	Wednes day	5	1	Om Chanting
		10	1	Selected Yogic Suksham Vyayam and Sthula Vyayam
		5	1	QRT
		15	2	ASANAS Vajrasana, Paschimottanasana, Halasana, Akarna- Dhanurasana, Ardha Matsyasana, and Chakrasana
		5	1	QRT
		15	3	PRANAYAMA Anuloma - Viloma, Bhramari, Sitali, and Sitkari
		5	1	Bhajan (Guru Stotram)
4.	Thursda y	5	1	Om Chanting
		10	1	Selected Yogic Suksham Vyayam and Sthula Vyayam
		5	1	QRT
		15	2	ASANAS Vrikshasana, Veerabhadrasana, Dhanurasana, Matsyasana, and Sarvangasana
		5	1	QRT
		15	3	PRANAYAMA Nadi Sudhi, Nadi Shodhana, Ujjayi, Bhramari, Sitali and Sitkari
		5	1	Bhajan (Guru Stotram)

5.	Friday	5	1	Om Chanting
		10	1	Selected Yogic Suksham Vyayam and Sthula Vyayam
		5	1	QRT
		15	2	ASANAS Trikonasana, Paschimottanasana, Vakrasana, Sarvangasana, and Matsyasana
		5	1	QRT
		15	3	PRANAYAMA Kapalbhati, Trataka, Bhramari, Sitali and Sitkari
		5	1	Shanti Mantra (Om Sahana Vavatu)
6.	Saturday	Rest	Rest	Rest
7.	Sunday	Rest	Rest	Rest

STATISTICAL ANALYSIS

After giving nine weeks of yogic training, the post-test data was collected to see the results on the flexibility of the subjects. Then to analyse the collected data, descriptive analysis and paired sample t-test were used to find out the characteristics of the data and the mean difference of the yogic training at 0.05 level of confidence. The collected data was entered into an excel sheet and statistical analyses were conducted using the IBM SPSS software (version 21).

ETHICAL APPROVAL

The study was approved by the Institutional Human Ethics Committee of Manipur University, Canchipur, Imphal, Manipur (India) with Ref. No. MU/IHEC/2020/025 and subject informed consent was obtained from the subject participants.

Analysis and Interpretation of Data

The collected data were statistically analyzed using descriptive analysis and paired sample t-test to find out the characteristics of the data and mean comparison to see the significant effect of the yogic training. The results are shown in table no. 4 and 5 respectively.

Table No. 4: Descriptive analysis of pre-test and post-test on Flexibility

Variable	N	Range	Min.	Max.	Mean	S.E.	S.D.	Variance
Pre-test	50	34.80	19.53	54.33	40.75	0.86	6.12	37.49
Post-test	50	30.83	22.43	53.26	43.10	0.70	4.99	24.99

Table no. - 4 shows that the Mean (M) and Standard Deviation (SD) of flexibility for pre-test and post-test were 40.75 ± 6.12 and 43.10 ± 4.99 respectively, and the value of range, standard error and variance of pre-test and post-test were 34.80, 0.86 & 37.49 and 30.83, 0.70 & 24.99 accordingly.

Table No. 5: Mean comparison of pre-test and post-test on Flexibility

Variable	N	Mean	M.D.	S.D.	S.E.M.	t-value	p-value
Pre-test	50	40.75	2.37	3.49	0.49	4.83	0.000*
Post-test	50	43.10					

*Significant at 0.05 level, where tabulated $t_{(0.05) 49} = 1.67$

From the above table no. – 5, it reveals that there was a significant difference in means comparison of flexibility between pre-test and post-test as the calculated ‘t’ value was found to be 4.83, which was greater than tabulated ‘t’ = 1.67, 49 degree of freedom and the p-value is 0.000 is smaller than 0.05 level of confidence.

The Graphical Representation Means Difference of Flexibility Between Pre-Test and Post-Test is Shown Below at Figure-1.

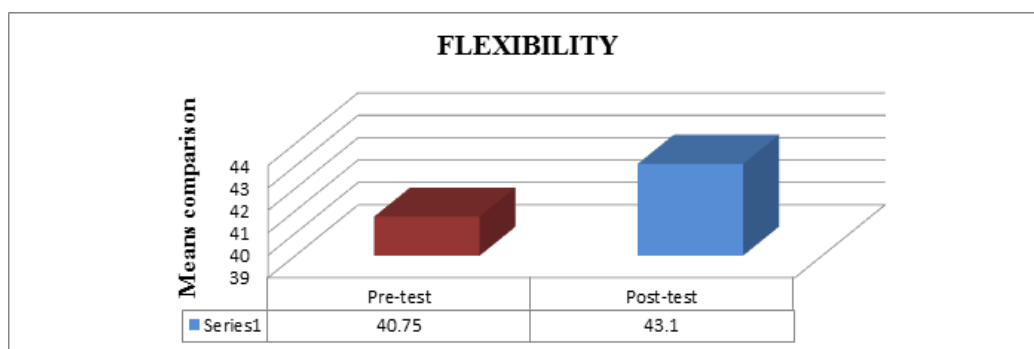


Figure 1: The Means Difference of Flexibility between pre-test and post-test.

RESULTS

The study summarizes pre and post-intervention changes in the variable, i.e., Flexibility. The descriptive analysis results of the pre-test and post-test on Flexibility, the Means (M) and Standard Deviation (SD) 40.75 ± 6.12 and 43.10 ± 4.99 , respectively. Respective range, standard error, and variance were 34.80, 0.86 & 37.49 and 30.83, 0.70 & 24.99 accordingly (Table No. 4). Means comparison of test results on Flexibility between pre-test and post-test were found significant, as the calculated 't' value was found to be 4.83 (Table No. 5), which was greater than tabulated 't' = 1.67, 49 degrees of freedom at a 0.05 level of confidence, and the p-value is = 0.000, ($p < 0.05$). Therefore, a significant change is found in Flexibility's Means.

DISCUSSION

Yoga is considered to provide a high quality of life for every individual. Yoga, which has become popular since the ancient Indian period and is used as an alternative development method in many disciplines in the world, has also begun to be practised recently by many individuals all over the world. Therefore, in this study, the aim is to investigate the effect of yogic training on flexibility. Yoga is considered a global phenomenon and an essential part of modern civilization. Regular practise of yoga helps in cultivating strict discipline and enables one to become a better person. Yoga is a way of life. As actual mental and physical relaxation, it must be practised regularly and diligently, with thorough preparation and all safety considerations in mind. It is also important to remember that any outcomes are entirely dependent on the individual, the nature of the condition, and the consistency with which yogic practise is performed. (Gupta, A. K. pp.7-8).

The objective of the present study was to assess the effect of yogic training on flexibility for B. Ed. students. The findings of the study revealed that there were significant differences in pre-test and post-test, which were proved by the application of appropriate statistical techniques namely the descriptive analysis (to know the characteristics of the data), and paired sample t-test (means comparison). The level of significance used in the statistical analyses was 0.05.

Yoga is a type of art and exercise that is performed to strengthen the mind and body. Yoga exercises aimed at improving the characteristics of athletes ensure that the person is disciplined by increasing his/her physical capacity (Sahu, D. P. and Samanta, D., 2016, pp.29-31). It is considered that yoga that physically affects flexibility and balance, as well as positive changes in the mind, has a positive effect on improving physical performance when it is practised regularly (Iftekher N. S. Bakthiar, N., and Rahaman, S., 2017, pp. 276-281). Yoga is quite important to athletes because regular yoga practise affects emotional control, mental readiness, physical strength and balance, and make angles of movement with the widest angles (Kulkarni, S. V., 2017, pp.91-96).

Yoga plays a vital role in maintaining good health and range of movement. The present study significantly improves flexibility in mobility, muscle coordination, reduces the level of risk of injuries, reduces body fat, and muscle soreness after nine weeks of yogic training for B. Ed. college students. Yoga involves a variety of physical activities, changes of postures, repeated contractions, and relaxations of the body; this might cause an increase in the range of movement. Many researchers noted similar observations where more flexibility was noted after yogic training. A decrease in the field of motion in our body can elevate the risk factors for injuries, obesity, cardiovascular disease, diabetes, and many other complications. Regular yoga practice may reduce the risk of injuries and muscle coordination which is essential to maintaining a disease-free lifestyle. Common yoga practice helps to maintain a normal healthy lifestyle and increased physical fitness.

TESTING OF HYPOTHESES

At the beginning of the study, a hypothesis was formulated based on statistical analysis in flexibility. Testing of hypothesis is shown briefly in table no. 6: -

Table No. 6: Testing of Hypotheses Based on Statistical Findings

Sl. No.	Hypotheses Formulated	Decision
1.	There might be a significant difference between pre-test and post-test on flexibility of B. Ed. students after yogic training.	Hypothesis accepted
2.	There might be a significant effect of yogic training on flexibility between pre-test and post-test of B. Ed. Students.	Hypothesis accepted

FINDING

The statistical analysis finding revealed that there was a significant difference in flexibility level after nine weeks of yogic training. This considerable difference occurred may be attributed to the fact that the subjects for this study belonged to B. Ed. college students who regularly underwent the systematic and regularly attained the yogic training program. And they are more interested in Yoga as they are as young and energetic; therefore, they could perform effectively in any condition.

The study's finding shows a significant difference found between the pre-test and post-test on flexibility. As the calculated 't'- value = 4.83 was greater than the tabulated 't'- value = 1.67 and p-value = 0.000, ($p < 0.05$). However, a significant difference between pre-test and post-test data was found. Flexibility Mean values are represented as bar diagrams (Figure no. 1) to understand the results better.

Hence, the study clearly shows that nine weeks of the yogic training program significantly effect on the flexibility compared to prior training data. But the present study's findings suggest that yoga can be used as a practical lifestyle by increasing the range of movement of our whole body parts and better body shape. Thus, regular yoga practice may help bring more flexibility in the body and maintain a disease-free lifestyle.

CONCLUSION

Flexibility is an important component of physical fitness and has many positive effects on the body. For instance, it improves mobility, posture, muscle coordination, and reduces the risk of injuries and muscle soreness. It even leads to a better overall "shape". Flexibility is important to every individual which lead to the pace of acquiring and perfecting movement is shortened. Other motor abilities namely, strength, speed, and endurance can be developed effectively. Amplitude of movement is greater and therefore, less effort is needed to perform a movement. Because of more effort, an individual will get easily tired. The course of movement is of improved quality. (Uppal, A. K., 2009 p. 110). Therefore, within the limitations of the present study and based on findings, the following conclusions are drawn:

- Nine weeks of yogic training were found effective. Almost all female B. Ed. students of Slopeland College of Teachers Education, Manipur, India got health benefits like more flexibility, increased body range of movement, fitness, and wellness.
- The positive effect was found on flexibility, so it can be practiced by the individuals who want to have more flexibility in the body (under the guidance of a yogic expert).
- For more effectiveness, the study can also be done on different age categories in a larger group.
- It is also concluded that a significant difference was found in spine and hamstring muscles flexibility among female college students.

Hence, yogic training is helpful to the youths to enhance the flexibility towards the spine and length of the hamstring muscles. Improved flexibility produces a wide range of physical benefits and can have a positive effect on the overall well-being in the society.

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EXPERIMENTAL AND ANALYTICAL STUDIES ON THE EFFECT OF STEEL AND GLASS FIBERS ON THE FLEXURAL BEHAVIOR OF REINFORCED CONCRETE HOLLOW BEAM

Mrs. Kalpana A K¹ and Dr. R. Nirmala²

¹PG Student, ²Assistant Professor, Department of Civil Engineering, Sathyabama University, Chennai 600119, India

ABSTRACT

Light weight aggregates & Hollow sections are the solution to reduce self weight with reduced cross sectional size and weight. By material optimization, we can reduce the dead loads which contribute to seismic effect in high rise structures. Main Disadvantage to be addressed due to reduction in size means lower Moment of Inertia which leads to lower strength & higher deformations. To overcome this, fibres like steel fibers, glass fibers, synthetic fibers, and natural fibers, etc., added to concrete in hollow sections enhance concrete tensile strength and enhance its structural behaviour. And the durability of concrete can be improved by adding fibres and they act as crack arrestors and prevent propagation of cracks and also prevent water and other harmful ions entering into concrete.

In this research, an attempt is made by adding steel and glass fibers to the concrete in hollow beams which are tested and compared with conventional concrete in terms of workability, strength and durability properties. M25 grade concrete is utilized and 5% fibers (Steel fiber 2% and glass fiber 3%) are introduced into the fiber reinforced concrete mix.

The experimental investigation were done by casting the test specimens, viz., 150x150x150mm cube, 150mmx300mm cylinder for testing the compressive strength, split tensile strength and Beams 300mmx300mmx1000mm are also casted for testing flexural behaviour with and without fiber for 28 days of curing to determine the mechanical properties of concrete. Based on the results it is attempted to show the superior crack resistance, improved tensile strength of Fiber reinforced concrete section over the conventional concrete section with no fibers added.

Keywords – Compression Test, Conventional concrete (CNC – with 0% fiber), Fiber Reinforced Concrete (FRC), Flexural Test, Hollow beam, Split Tensile Test.

I. INTRODUCTION

The Serious disadvantage of Reinforced Concrete is Heavy weight & loads on the structural member and thus more bearing stresses transferred to soil which leads to deeper foundations & heavy structural members. Solution to reduce weight of structures is use of light weight aggregates & optimised structural sections, i.e., Hollow sections which are lighter compared to solid sections. By material optimization, we can reduce the dead loads which contribute to seismic effect in high rise structures.

To overcome the above, effective use of Fibre reinforced concrete, i.e., discontinuous, discrete, uniformly dispersed fibers such as steel, glass, polypropylene or graphite, when added to concrete enhances the concrete tensile strength and its structural behaviour. Use of Fibre reinforced concrete add to the stiffness and crack-control performance by preventing the micro-cracks from propagating and widening and also by increasing ductility due to their energy-absorption capacity.

In this research, steel and glass fibers are used in Fibre reinforced concrete hollow beams.

II. LITERATURE REVIEW

1. Jeyakumar. A, Ravikumar. M. S, Nalanth. N (2019) investigated the Hollow reinforced beams reinforced with hybrid steel Fibers. The flexural behaviour of hollow beams based on the effect of Carbon fiber reinforced polymer (CFRP) has also been explored.
2. Ahmmad Abbass, Sallal Abid & Mustafa (2019) prepared eight square cross-sectional beam specimens, four solid and four hollow, were prepared with four different steel fiber contents of 0, 0.5, 1.0, and 1.5%. The test results show that splitting tensile strength increases with fiber content increase
3. Fatih Altun, & Tefaruk Haktanir, (2016) studied nine RC beams of outer dimensions of 300 × 300 × 2000 mm, six of which are box beams, designed and produced steel fiber concrete, (SFRC) at a dosage of 30 kg/m³, are tested under bending in a two-point beam-loading setup. Studies revealed that toughness of steel fiber reinforced (SFR) concrete increases more than two-fold as compared to plain concrete of the same recipe

4. Pattraporn Manavithayarak and Patra Sukmoung (2018) added steel fiber and glass fiber into concrete mixture in order to improve the shear strength of the precast concrete dry joints. Their research is an attempt to improve the shear capacity of the precast segmental box girderdry joints.
5. Dwarakanath And Nagaraj (1998) studied 20 numbers of 1.8m long reinforced concrete beams with steel fibers were tested under flexural static loading. Mid-span deflections and curvatures at salient points such as cracking, and ultimate points were compared.

The literature available on fiber reinforced concrete hollow beams provides ample information on the load-deflection behaviour and concluded that fiber increases the strength and provides economical section when compared to conventional concrete. So in the current research, it is concluded to cast at site cube and cylinder test specimens and hollow beam test specimens with and without fibers to investigate the effect on compressive, tensile and flexural strength parameters in different curing periods.

III. SCOPE

- In this study, an attempt is made by using steel and glass fibers added to the concrete mix in hollow beams which are tested and compared with conventional concrete mix hollow beam in terms of workability, strength and durability properties.
- The experimental investigation are done by casting the cube and cylindrical test specimens for testing the compressive strength and split tensile strength respectively. Three Beams 300mmx300mmx1000mm with and without fiber are casted for testing flexural behaviour for 28 days of curing
- Based on the results it is attempted to show the superior crack resistance, improved tensile strength of Fiber reinforced concrete section over the conventional concrete section with no fibers added.

IV. OBJECTIVE

- To establish the advantage of the fiber reinforced concrete as a positive substitute to address the reduction in strength and performance resulting from the reduction of the section size of hollow concrete beam compared with solid concrete beam
- To study and compare the flexural behaviour of Conventional concrete hollow beam with fiber reinforced concrete hollow beams by subjecting the beams to bending experiments in a two point beam- loading setup till the ultimate failure of the tensile reinforcement.
- To compare the results obtained from analysis using ETAB software with the experimental test result.

V. Materials Used For Concrete Mix

The materials used in this investigation are ordinary portland cement of 53 Grade, coarse aggregate of crushed rock with a maximum size of 20 mm, fine aggregate of clean river sand and portable water. 8 mm diameter HYSD bars were used as main reinforcement and as stirrups. Grade of concrete adopted is M25 grade. Steel and glass fibers available in local market are used to prepare the Fiber reinforced concrete. The steel fibers are produced by chopping off the wire and cutting of the thin flat sheet. The steel fiber of the Hook end is used. Glass fiber is made up of 200-400 individual filaments which are lightly bonded to make up a stand which are chopped into various lengths. Glass fibers of length of 25mm are used. For casting and curing the specimen, fresh and pure water that is free of organic debris, silt, oil, and acid material is employed.



Figure 1: Materials used in concrete mix in order : Cement, Coarse aggregate, Fine aggregate, Steel Fiber and Glass fiber

VI. MIX PROPORTION DETAILS

IS: 10262-1982, IS: 10262-2009, and IS: 456-2000 are recommendations for concrete mix design.

In Table 1, the concrete mix proportion of M25 grade concrete are mentioned.

Table1: Mix Proportion Details

Mix Proportion Details By Weight	
Concrete mix	M25 Grade
Cement	426.78kg/m ³
Fine particle material(sand)	492.87kg/m ³
Coarse particle material	1154kg/m ³
Mix proportion– 1:1.15: 270	

VII.Experimental Investigation

The experimental investigation is carried out on the fresh concrete and hardened concrete test specimens to study the strength characteristics of hollow beams with and without fiber. The experiment results enables ascertaining the workability and strength related properties such as cube compressive strength, cylinder split tensile strength and beam flexural strength of the hollow beams with and without fiber after adequate curing period.

i) Test on Fresh Concrete – Slump Cone Test

This test is performed to check the consistency and workability .of freshly made concrete.


Fig.2: Concrete mixing with fiber and slump cone test

ii) Test on Hardened Concrete

Both standard and steel-fiber reinforced concrete are used to cast the samples. After 24 hours of casting, the specimens are de-moulded and cured for 28 days. The instance compressive strength, split tensile strength, and flexural strength are all tested using total 42 specimens.

Preparation of Test Specimen – Total 42 Nos.

CNC – Conventional concrete M25 with 0% fiber

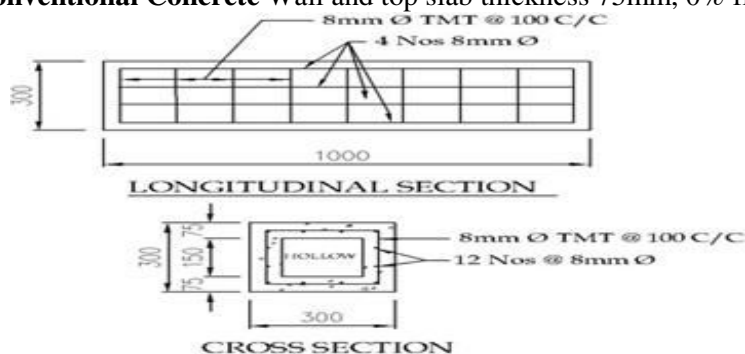
FRC – Fiber Reinforced concrete M25 concrete with 2% steel fiber & 3 % glass fiber

- NO OF CUBES (size 150x 150 x 150 mm) – 18 Nos. for 7 days, 14 days and 28 days CURING = 6 Nos each (CNC 3 Nos & FRC 3 Nos)
- NO OF CYLINDERS (size 150 mm dia& 300 mm in length)) – 18 Nos. for 7 days, 14 days and 28 days CURING = 6 Nos each (CNC 3 Nos & FRC 3 Nos)
- NO OF BEAMS (1000 mm x 300 mm x 300 mm) – 6 Nos FOR 28 DAYS CURING = 6 Nos (CNC 2 Nos & FRC 4 Nos)

REINFORCEMENT DETAILS OF TEST BEAMS

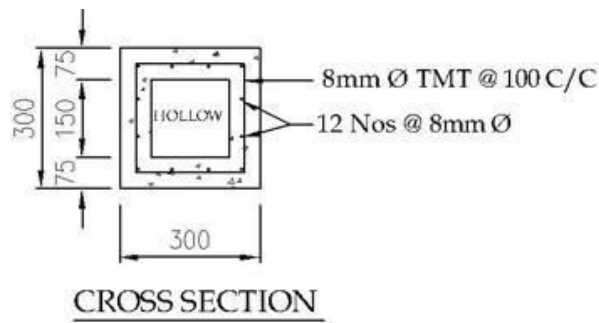
All the beams are of size 300 mmx 300 mm x1000 mm size using M25 Grade of concrete, Fe500 steel. Main reinforcement: 12 Nos. of 8 mm dia bars & Stirrups: 8 mm dia bars @ 100mm are provided in all beams.

a) TEST BEAM 1 - Conventional Concrete Wall and top slab thickness 75mm, 0% fiber



b) TEST BEAM 2 – Fiber Reinforced - MIX 1

Side wall and top slab thickness 75mm, 5% fiber Reinforced (2% steel fiber and 3% Glassfiber)



C) TEST BEAM 3 – Fiber Reinforced - MIX 2

Side wall and top slab thickness 90 mm, 5% fiber Reinforced (2% steel fiber and 3% Glassfiber)

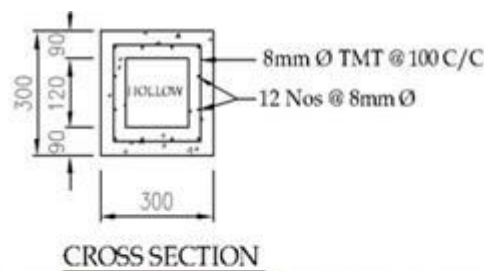


Fig.3 : RC Beam Casting

Stability of Compression Test

The ability of a material to withstand failure in the form of cracks determines its compressive strength. Table 2 shows the details of the compression strength test of cubes.

Table 2: Compression strength Test Details

Description	Details
Type of test	Stability of compression test
Type of specimen used	Cubes
Total no of specimen used	9
Specimen's size (lxbxd)	150mmX150mmX150mm
Stability of compression test formula	Maximum stress at the specimen can bear/The specimen's top surface area



Fig.4: Cube Compression strength test setup

Stability of Tension Test

The ability of concrete to withstand a tensile force or stress is referred to as its tensile strength. Table 3 shows the details of the tension strength test of cylinders.

Table 3: Split Tension Test Details

Description	Details
Type of test	Stability of tension test
Type of specimen used	Cylinders
Total no of specimen used	9
Specimen's size (diameter and length)	150mmX300mm
Stability of tension test formula	$T_{sp}=2P/\pi DL$


Fig.5: Cylinder split tensile strength test setup

Stability of Flexural Test

The lateral load resistance can be determined in the flexural strength test. The axial load (Two point loading system) is applied on the hollow beam simply supported at both ends. The Load is applied until it fails and the first crack load and ultimate load are noted. Table 4 shows the details of the flexural strength test of beams.

Table 4: Flexural Strength Test Details

Description	Details
Type of test	Stability of flexural test
Type of specimen used	Beams
Total no of specimen used	9
Specimen's size (lxbxd)	1100mmX200mmX200mm
Stability of flexural test formula	$F= PL/(bd^2)$


Fig 6: Flexural Strength Test setup – Failure mode of beam under

Rupture

VIII. Finite Element Analysis of Rc Beam

The ETAB Software is used for finite element numerical analysis of the beam. Numerical analysis of two beams are done ,ie., Hollow beam size 300 mm x 300 mm x 1000 mm,interior hollow 150 mm x 150mm and solid beam size 300 mm x 300 mm x 1000 mm with simply supported end conditions under two point loadings. The grade of concrete used is M25 and grade of steel is FE 500 steel.

IX. RESULTS AND DISCUSSIONS

i) Experimental Results

All the specimens were tested successfully and the results of slump value, compressive strength, tensile and flexural strength of test specimens are summarized in Table 5, 6, 7 & 8 CNC – Conventional concrete M25 with 0% fiber

FRC – Fiber Reinforced concrete M25 concrete with 2% steel fiber & 3 % glass fiber

Table 5: Slump Value of Concrete mix with and without fiber

Specimen	Slump Result
Conventional concrete	100mm
Fiber reinforced concrete	63 mm

Table 6: Cube specimens-Comparison of 7, 14 & 28 days Compressive Strength

%Fiber	7 Days N/mm ²	14 Days N/mm ²	28 Days N/mm ²
Conventional	22.29	26.74	28.88
Fiber reinforced concrete	25.04	30.29	37.11
% increase in strength	13.95 %	13.27%	28.49%

Table 7: Cylinder specimens-Comparison of 7, 14 & 28 days Tensile Strength

%Fiber	7 Days N/mm ²	14 Days N/mm ²	28 Days N/mm ²
Conventional	3.25	3.89	4.03
Fiber reinforced concrete	3.75	4.67	5.33
% increase in strength	15.38%	20.05%	32.25%

Table 8: % increase in Flexural Strength of Fiber beam over conventional mix

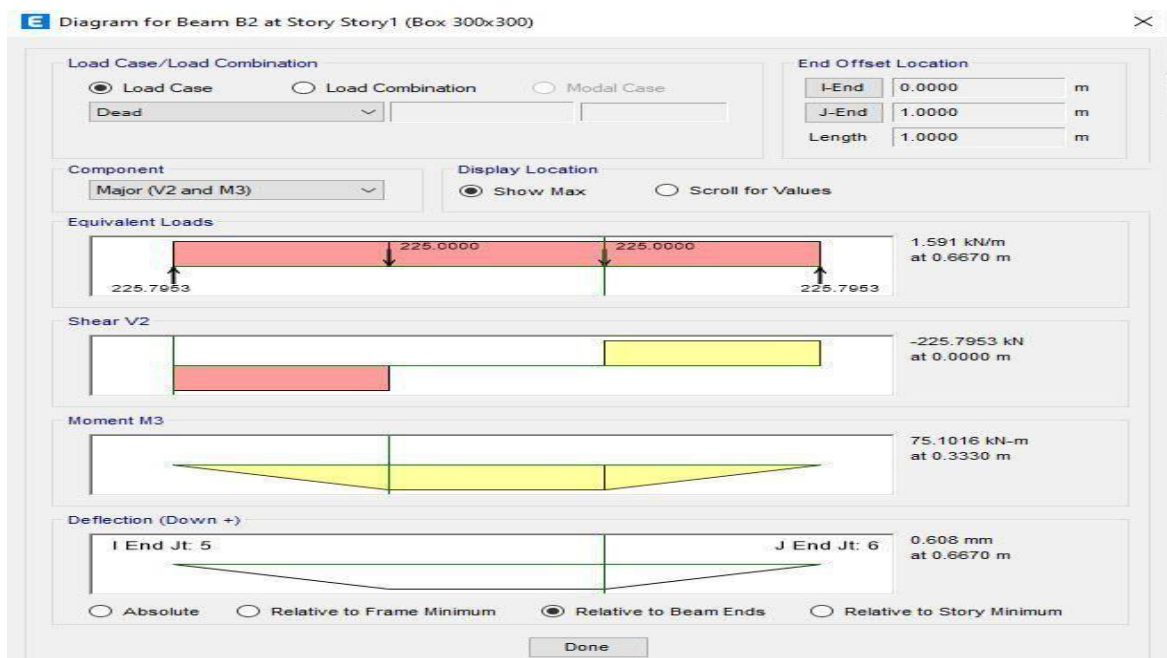
%Fiber	28 Days N/mm ²	% Increase in strength over conventional mix
Conventional(Test beam 1)	9.07	--
Mix-1(Test beam 2)	12.04	32.75 %
Mix-2 (Test beam 3)	13.33	46.97 %

ii) NUMERICAL – FE results are shown below

a) Shear Force, Bending Moment and Deflection – Hollow Beam

Maximum failure at 225kN.

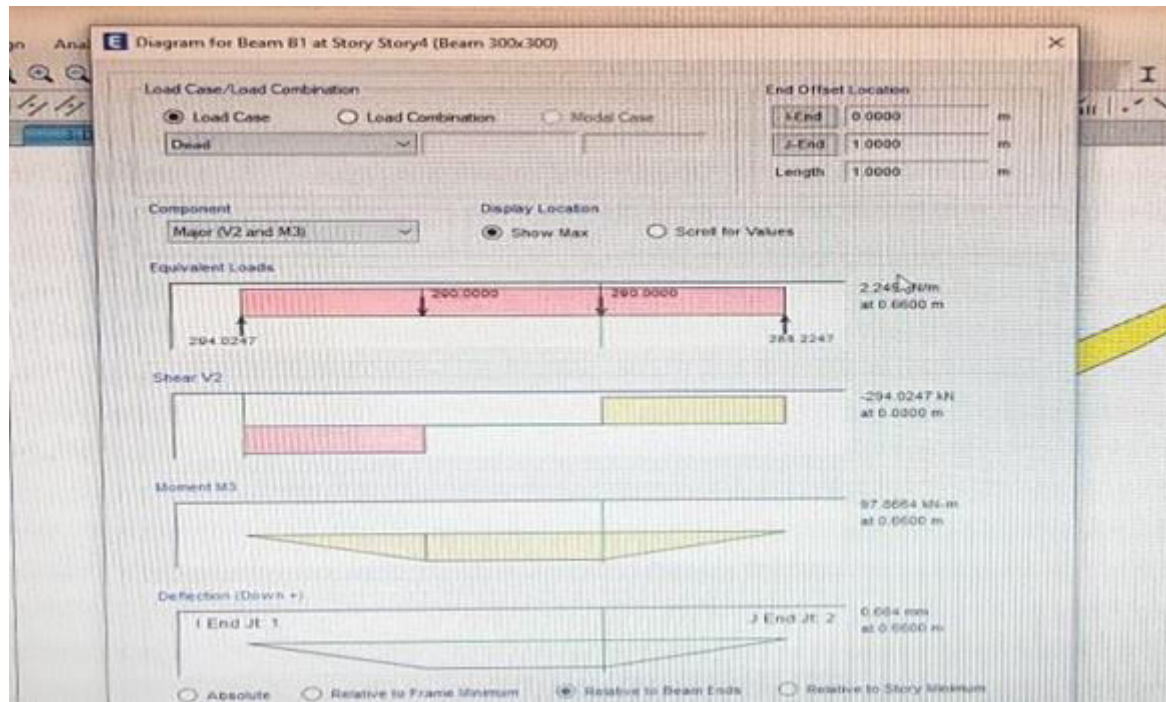
Maximum Deflection is 0.608mm at 0.667m of beamMaximum Moment 75kN-m.



b) Shear Force ,Bending Moment and Deflection – Solid Beam

Maximum failure at 290kN.

Maximum Deflection is 0.664mm at 0.66m of beamMaximum Moment 97kN-m.



iii) Load VS Deflection Relationship

Comparison between load and deflection behaviour of both experimental and numerical analysis of hollow beams with and without fibers are done successfully and the results were plotted graphically. We could observe that almost the experimental value of conventional beam values are almost same for both analytical and experiment procedures

The experimental procedure shows us that fibers added can effectively achieve high strength with minimum increase of whole weight of the concrete.

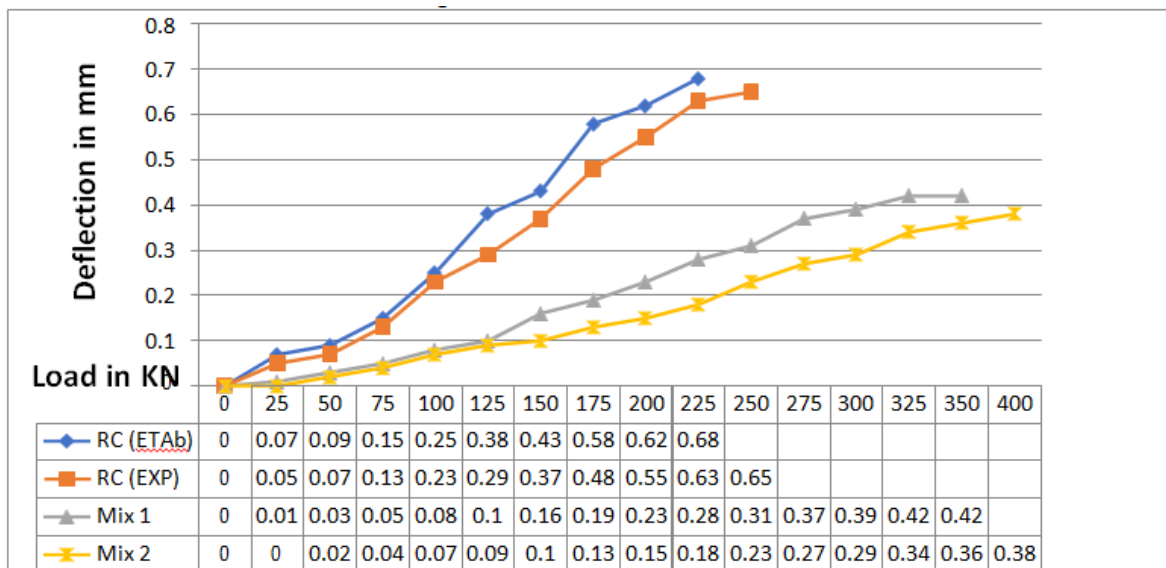


Fig 7: Comparison of Load and deflection behaviour of Conventional concrete (RC) without fiber, Mix 1 and MIX 2 with fiber

Based on the test findings, the following are observed

- The addition of 5% fiber (2% steel fiber and 3% glass fiber) increased the compressive strength and split tensile strength of normal conventional concrete upto 28.50% and 32.25% respectively. The addition of 5% fiber increased the flexural strength of hollow beams of same cross sections, i.e., from 9.07 N/Sq.mm of Test beam 1 conventional concrete with nil fiber to 12.04 N/Sq.mm of Test beam 2 with 5% fiber, i.e., 32.75% increase.
- In case of increase in cross section area of the hollow beams, i.e., Test beam 3 by 12% over Test beam 2, the

flexural test increased from 32.75% to 46.97%, ie., 14.22% increase.

- The 290 KN ultimate load capacity of a 225 Kg solid beam of size 300 x 300x1000mm with nil fiber is well achieved in the 150 Kg hollow Test beam 2 with 5% fiber, ie., Ultimate load 320 KN of reduced cross section hollow beam size 300 x 300x1000mm with internal hollow 150x150 mm
- The hollow Test beam 2 with 5% fiber addition is optimum to achieve the ultimate strength of solid beam with conventional concrete. In general, the flexural behaviour of fibrous beams was superior to that of beams without fiber because of the crack bridging action of fibers and peak load capacities increased due to the incorporation of fibers in hollow beams and it helps to increase stiffness under service loads. It also helps to reduce the deflection.

The flexural strength of beam experimental result successfully validated with software Etab also.

X. CONCLUSION

It is concluded that the durability of concrete can be improved by adding Fibers in concrete which forms a three-dimensional random distribution network structure which inhibit the micro-crack generation and development and prevent water and other harmful ions entering into concrete. Fiber-reinforced concrete has better toughness than the plain concrete. Less cracks are emerged under impact load. Hence, it is imperative that Hollow sections are the solution to reduce self weight with reduced cross sectional size and weight. By material optimization, we can reduce the dead loads which contribute to seismic effect in high rise structures.

Additional cost of fibers and poor workability and segregation may lead to reluctant usage in construction industry. With experience, knowledge and practice the design engineers need to produce a optimum fiber content concrete for specific usage and emphasize the benefits of fiber usage at minimum cost investment. Resistance to change though however small it disturbs our society. Hence we are always reluctant to accept even the best. Its high time that we overcome the resistance and reach for the peaks. Hence, FRC opens a new hope to developing and globalizing the quality and reshaping the face of the "True Indian Structures".

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FIBONACCI DIVISOR CORDIAL LABELING OF HERSCHEL GRAPH IN CONTEXT OF VARIOUS GRAPH OPERATIONS

A. H. Rokad

Assistant Professor, ISHLS Department, Indus University, Ahmedabad-382115, Gujarat- India

ABSTRACT

A Fibonacci divisor cordial labeling of a graph G with vertex set $V(G)$ is a bijection $f: V(G) \rightarrow \{F_1, F_2, \dots, F_p\}$, where F_i is the i^{th} Fibonacci number such that if each edge uv is assigned the label 1 when $f(u) \nmid f(v)$ or $f(v) \nmid f(u)$ and 0 otherwise, then the number of edges labeled with 0 and the number of edges labeled with 1 differ by at most 1. A graph that admits Fibonacci divisor cordial labeling is called a Fibonacci divisor cordial graph. In this paper, I prove that Herschel graph H_s , fusion of any two adjacent vertices of degree 3 in a Herschel graph H_s , duplication of any vertex of degree 3 in a Herschel graph H_s , switching of a central vertex in the Herschel graph H_s , joint sum of two copies of H_s , degree splitting of Herschel graph H_s are divisor cordial graphs.

Keywords: Divisor cordial labeling, fusion, duplication, switching, joint sum, degree splitting.

AMS Mathematics Subject Classification (2010): 05C78.

INTRODUCTION

By a graph, I mean a finite undirected graph without loops or multiple edges. For standard terminology and notations related to graph theory I refer to Harary[3]. A labeling of graph is a map that carries the graph elements to the set of numbers, usually to the set of non-negative or positive integers. If the domain is the set of edges, then I speak about edge labeling. If the labels are assigned to both vertices and edges, then the labeling is called total labeling. Cordial labeling is extended to divisor cordial labeling, prime cordial labeling, total cordial labeling, Fibonacci cordial labeling etc.

For dynamic survey of various graph labeling, I refer to Gallian [1]. Another variation of cordial labeling known as Fibonacci divisor cordial labeling, was introduced by Sridevi et al. [4] in 2013. Rokad and Godasara [6] have discussed the Fibonacci cordial labeling of some special graphs.

Definition 1. A Herschel graph H_s is a bipartite undirected graph with 11 vertices and 18 edges.

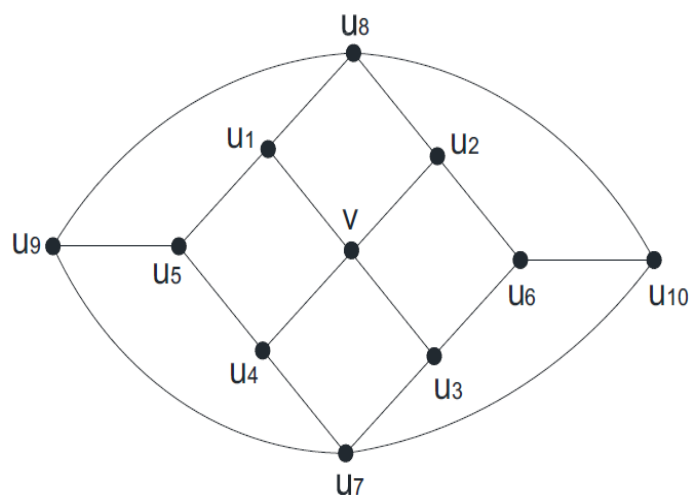


Figure (A)

In this paper, I always fix the position of vertices $v, u_1, u_2, \dots, u_{10}$ of H_s as indicated in the above Figure (A), unless or otherwise specified.

Definition 2. Let u and v be two distinct vertices of a graph G . A new graph G_1 is constructed by fusing (identifying) two vertices u and v by a single vertex x in G_1 such that every edge which was incident with either u (or) v in G now incident with x in G_1 .

Definition 3. Duplication of a vertex v_k of a graph G produces a new graph G_1 by adding a vertex v_k' with $N(v_k) = N(v_k')$. In other words, a vertex v_k' is said to be a duplication of v_k if all the vertices which are adjacent to v_k are now adjacent to v_k' .

Definition 4. The graph obtained by connecting a vertex of first copy of a graph G with a vertex of second copy of a graph G is called joint sum of two copies of G .

Definition 5. Let $G = (V(G), E(G))$ be a graph with $V = S_1 \cup S_2 \cup S_3 \cup \dots \cup S_t \cup T$ where each S_i is a set of vertices having at least two vertices of the same degree and $T = V \setminus \bigcup S_i$. The degree splitting graph of G denoted by $DS(G)$ is obtained from G by adding vertices $w_1, w_2, w_3, \dots, w_t$ and joining to each vertex of S_i for $1 \leq i \leq t$.

MAIN RESULTS

Theorem 1. The Herschel graph H_5 is a Fibonacci divisor cordial graph.

Proof: Let $G = H_5$ be a Herschel graph and let v be the central vertex and u_i ($1 \leq i \leq 10$) be the remaining vertices of the Herschel graph. Then $|V(G)| = 11$ and $|E(G)| = 18$.

I define the labeling $f: V(G) \rightarrow \{1, 2, \dots, |V(G)|\}$ as follows.

$$f(v) = F_1, f(u_1) = F_{10}, f(u_2) = F_3,$$

$$f(u_3) = F_6, f(u_4) = F_4, f(u_5) = F_9,$$

$$f(u_6) = F_7, f(u_7) = F_{11}, f(u_8) = F_2,$$

$$f(u_9) = F_8, f(u_{10}) = F_5.$$

from up pattern of labeling, the vertices with labeled 0 = the vertices with labeled 1 = 9.

Hence the absolute difference of vertices with label 0 and the vertices with label 1 is atmost 1.

Thus Herschel graph H_5 is a Fibonacci divisor cordial graph.

Example 1. Fibonacci divisor cordial labeling of Herschel graph H_5 is shown in Figure 1.

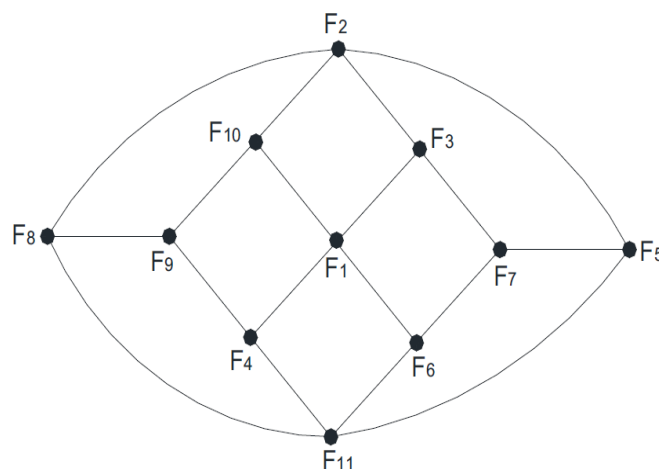


Figure 1

Theorem 2. The fusion of two adjacent vertices of degree 3 in the Herschel graph is a Fibonacci divisor cordial graph.

Proof: Let H_5 be the Herschel graph with $|V(H_5)| = 11$ and $|E(H_5)| = 18$. Let v be the central vertex of the Herschel graph and it has 3 vertices of degree 4 and 8 vertices of degree 3. Let G be the graph obtained by fusion of two adjacent vertices of degree 3 in the Herschel graph of H_5 . Then $|V(G)| = 10$ and $|E(G)| = 17$.

I define the vertex labeling $f: V(G) \rightarrow \{1, 2, \dots, |V(G)|\}$ as follows.

Case 1. Fusion of u_6 and u_{10} .

Suppose that u_6 and u_{10} are fused together as a single vertex u .

$$f(v) = F_1, f(u) = F_3,$$

$$f(u_1) = F_{10}, f(u_2) = F_7, f(u_3) = F_6,$$

$$f(u_4) = F_9, f(u_5) = F_4, f(u_7) = F_8,$$

$$f(u_8) = F_5, f(u_9) = F_2.$$

Case 2. Fusion of u_6 and u_2 .

Suppose that u_6 and u_2 are fused together as a single vertex u .

$$f(v) = F_1, f(u) = F_9,$$

$$f(u_1) = F_6, f(u_3) = F_{10}, f(u_4) = F_7,$$

$$f(u_5) = F_3, f(u_7) = F_8, f(u_8) = F_5,$$

$$f(u_9) = F_2, f(u_{10}) = F_4.$$

Case 3. Fusion of u_6 and u_{10} .

Suppose that u_6 and u_3 are fused together as a single vertex u .

$$f(v) = F_1, f(u) = F_9,$$

$$f(u_1) = F_6, f(u_2) = F_{10}, f(u_4) = F_7,$$

$$f(u_5) = F_3, f(u_7) = F_8, f(u_8) = F_5,$$

$$f(u_9) = F_2, f(u_{10}) = F_4.$$

Case 4. Fusion of u_5 and u_9 .

Suppose that u_5 and u_9 are fused together as a single vertex u .

$$f(v) = F_1, f(u) = F_3,$$

$$f(u_1) = F_7, f(u_2) = F_{10}, f(u_3) = F_9,$$

$$f(u_4) = F_6, f(u_6) = F_4, f(u_7) = F_8,$$

$$f(u_8) = F_5, f(u_{10}) = F_2.$$

Case 5. Fusion of u_5 and u_4 .

Suppose that u_5 and u_4 are fused together as a single vertex u .

$$f(v) = F_1, f(u) = F_9,$$

$$f(u_1) = F_{10}, f(u_2) = F_6, f(u_3) = F_7,$$

$$f(u_6) = F_3, f(u_7) = F_8, f(u_8) = F_5,$$

$$f(u_9) = F_4, f(u_{10}) = F_2.$$

Case 6. Fusion of u_5 and u_1 .

Suppose that u_5 and u_1 are fused together as a single vertex u .

$$f(v) = F_1, f(u) = F_9,$$

$$f(u_2) = F_6, f(u_3) = F_7, f(u_4) = F_{10},$$

$$f(u_6) = F_3, f(u_7) = F_8, f(u_8) = F_5,$$

$$f(u_9) = F_4, f(u_{10}) = F_2.$$

from up pattern of labeling, the vertices with labeled $0 = 9$ and the vertices with labeled $1 = 8$.

Hence the absolute difference of vertices with label 0 and the vertices with label 1 is atmost 1.

Hence, the fusion of any two adjacent vertices of degree 3 in the Herschel graph is a Fibonacci divisor cordial graph.

Example 2. Fibonacci divisor cordial labeling of fusion of u_5 and u_9 in H_8 is shown in Figure 2.

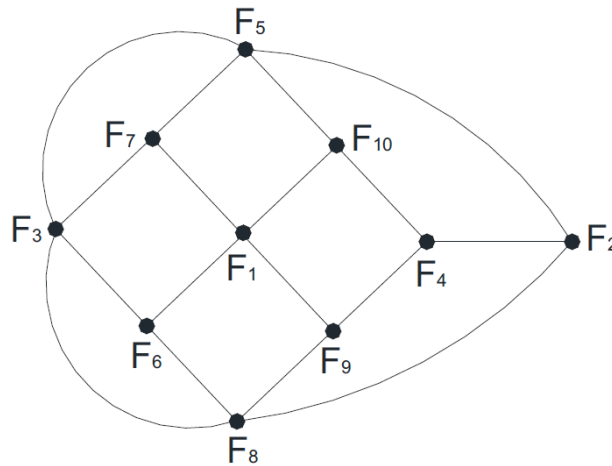


Figure 2

Theorem 3. The duplication of any vertex in a Herschel graph is a Fibonacci divisor cordial graph.

Proof: Let H_S be the Herschel graph with $|V(H_S)| = 11$ and $|E(H_S)| = 18$. Let v be the central vertex and u_k' be the duplication of the vertex u_k in the Herschel graph H_S . Let G be the graph obtained by duplicating the vertex u_k of degree 3 and degree 4 in H_S . Then $|V(G)| = 12$ and $|E(G)| = 21$.

I define the vertex labeling $f: V(G) \rightarrow \{1, 2, \dots, |V(G)|\}$ as follows.

Case 1. Duplication of central vertex v and vertex u_k , where $k = 1, 4, 9$.

$$f(v) = F_1, f(u_k') = F_2,$$

$$f(u_1) = F_3, f(u_2) = F_4, f(u_3) = F_{12},$$

$$f(u_4) = F_6, f(u_5) = F_7, f(u_6) = F_9,$$

$$f(u_7) = F_8, f(u_8) = F_{11}, f(u_9) = F_5,$$

$$f(u_{10}) = F_{10}.$$

Case 2. Duplication of central vertex v and vertex u_k , where $k = 2, 3, 10$.

$$f(v) = F_1, f(u_k') = F_2,$$

$$f(u_1) = F_{12}, f(u_2) = F_6, f(u_3) = F_3,$$

$$f(u_4) = F_4, f(u_5) = F_9, f(u_6) = F_7,$$

$$f(u_7) = F_{11}, f(u_8) = F_8, f(u_9) = F_{10},$$

$$f(u_{10}) = F_5.$$

Case 3. Duplication of central vertex v and vertex u_5 .

$$f(v) = F_1, f(u_5') = F_2,$$

$$f(u_1) = F_3, f(u_2) = F_4, f(u_3) = F_{12},$$

$$f(u_4) = F_8, f(u_5) = F_7, f(u_6) = F_9,$$

$$f(u_7) = F_6, f(u_8) = F_{11}, f(u_9) = F_5,$$

$$f(u_{10}) = F_{10}.$$

Case 4. Duplication of central vertex v and vertex u_6 .

$$f(v) = F_1, f(u_6') = F_2,$$

$$f(u_1) = F_4, f(u_2) = F_3, f(u_3) = F_8,$$

$$f(u_4) = F_{12}, f(u_5) = F_9, f(u_6) = F_7,$$

$$f(u_7) = F_6, f(u_8) = F_{11}, f(u_9) = F_{10},$$

$f(u_{10}) = F_5$.

from up pattern of labeling, the vertices with labeled 0 = 11 and the vertices with labeled 1 = 10.

Hence the absolute difference of vertices with label 0 and the vertices with label 1 is atmost 1.

Hence, the duplication of any vertex in a Herschel graph is a Fibonacci divisor cordial graph.

Example 3. Fibonacci divisor cordial labeling of the duplication of the vertex u_9 in H_8 is shown in Figure 3.

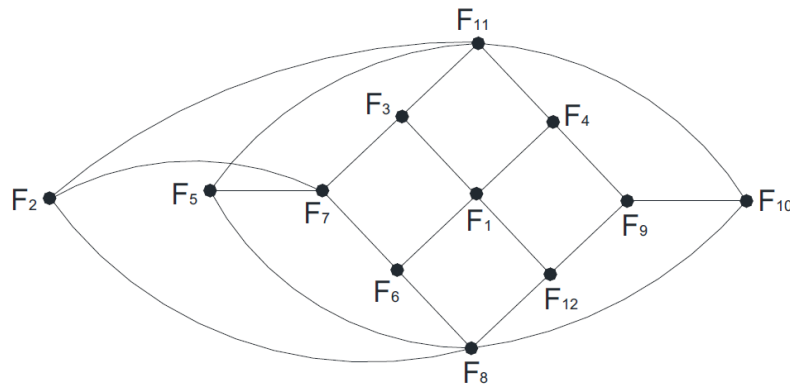


Figure 3

Theorem 4. The switching of a central vertex v in the Herschel graph H_8 is a Fibonacci divisor cordial graph.

Proof: Let H_8 be the Herschel graph with $|V(H_8)| = 11$ and $|E(H_8)| = 18$. Let v be

the central vertex and G be the new graph obtained by switching the central vertex v . Then

$|V(G)| = 11$ and $|E(G)| = 20$.

I define the labeling $f: V(G) \rightarrow \{1, 2, \dots, |V(G)|\}$ as follows.

$f(v) = F_1$

$f(u_1) = F_{10}, f(u_2) = F_7, f(u_3) = F_6,$

$f(u_4) = F_4, f(u_5) = F_9, f(u_6) = F_3,$

$f(u_7) = F_2, f(u_8) = F_{11}, f(u_9) = F_8,$

$f(u_{10}) = F_5$.

from up pattern of labeling, the vertices with labeled 0 = the vertices with labeled 1 = 9.

Hence the absolute difference of vertices with label 0 and the vertices with label 1 is atmost 1.

Thus, the switching of a central vertex v in the Herschel graph H_8 is a Fibonacci divisor cordial graph.

Example 4. Fibonacci divisor cordial labeling of switching of a central vertex v in H_8 is shown in Figure 4.

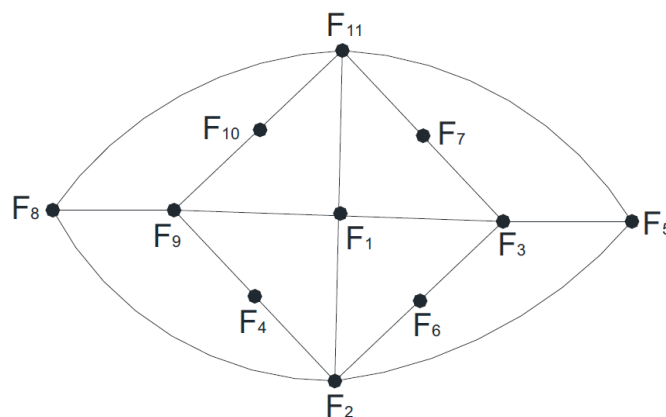


Figure 4

Theorem 5. The graph obtained by joint of two copies of Herschel graph H_8 is a Fibonacci divisor cordial graph.

Proof . Let G be the joint of two copies of Herschel graph H_s . Let $\{u, u_1, u_2, \dots, u_{10}\}$ and $\{v, v_1, v_2, \dots, v_{10}\}$ be the vertices of first and second copy of Herschel graph H_s respectively. Then $|V(G)| = 22$ and $E(G) = 37$.

I define the vertex labeling $f: V(G) \rightarrow \{1, 2, \dots, |V(G)|\}$ as follows.

$$f(u) = F_1$$

$$f(u_1) = F_{22}, f(u_2) = F_{20}, f(u_3) = F_{13},$$

$$f(u_4) = F_{18}, f(u_5) = F_{14}, f(u_6) = F_6,$$

$$f(u_7) = F_{19}, f(u_8) = F_9, f(u_9) = F_4,$$

$$f(u_{10}) = F_3.$$

and

$$f(v) = F_1$$

$$f(v_1) = F_8, f(v_2) = F_{17}, f(v_3) = F_{11},$$

$$f(v_4) = F_{12}, f(v_5) = F_{21}, f(v_6) = F_8,$$

$$f(v_7) = F_7, f(v_8) = F_{16}, f(v_9) = F_{10},$$

$$f(v_{10}) = F_{15}.$$

from up pattern of labeling, the vertices with labeled 0 = 18 and the vertices with labeled 1 = 19.

Hence the absolute difference of vertices with label 0 and the vertices with label 1 is atmost 1.

Thus, the graph obtained by joint of two copies of Herschel graph H_s is a Fibonacci divisor cordial graph.

Example 5. Fibonacci divisor cordial labeling of the joint of two copies of Herschel graph H_s is shown in Figure 5.

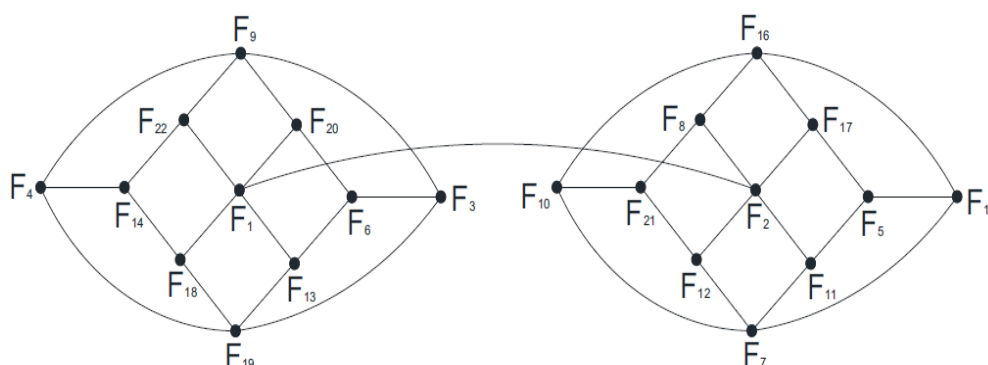


Figure 5

Theorem 6. $DS(H_s)$ is Fibonacci divisor cordial graph.

Proof . Consider H_s with $V(H_s) = \{v, u_i : 1 \leq i \leq 10\}$. Here $V(K_{1,n}) = V_1 \cup V_2$, where V_1 = vertices of degree 3 and V_2 = vertices of degree 4. Now in order to obtain $DS(H_s)$ from G , I add w_1 and w_2 corresponding to V_1 and V_2 . Then $|V(DS(H_s))| = 13$ and $|E(DS(K_{1,n}))| = 28$.

I define the labeling $f: V(G) \rightarrow \{1, 2, \dots, |V(G)|\}$ as follows.

$$f(v) = F_8, f(w_1) = F_1, f(w_2) = F_2.$$

$$f(u_1) = F_{13}, f(u_2) = F_3, f(u_3) = F_9,$$

$$f(u_4) = F_{12}, f(u_5) = F_6, f(u_6) = F_4,$$

$$f(u_7) = F_{11}, f(u_8) = F_7, f(u_9) = F_5,$$

$$f(u_{10}) = F_{10}.$$

from up pattern of labeling, the vertices with labeled 0 = 15 and the vertices with labeled 1 = 14.

Hence the absolute difference of vertices with label 0 and the vertices with label 1 is atmost 1.

Thus, $DS(H_8)$ is Fibonacci divisor cordial graph.

Example 6. Fibonacci divisor cordial labeling of $DS(H_8)$ is shown in Figure 6.

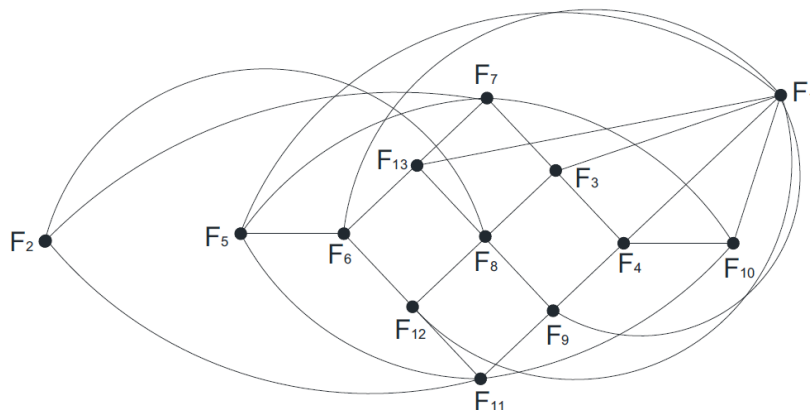


Figure 6

CONCLUSION

In this paper I have find six new results of Herschel graph. To find new families admitting divisor cordial graph is an open problem.

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GENDER DIVIDE IN EDUCATION IN INDIA: A STUDY ON FEMALE EDUCATION

Dr. Richa Mehta

Associate professor Lady Irwin College University of Delhi

ABSTRACT

Educating girls is crucial for the upliftment of society and the nation. Investing in girls' education transforms community and country. As per the Right to Education (RTE, 2009), every child between the age group of 6 to 14 years has the right to free and compulsory education. Despite various developmental goals and beneficial programs and schemes, the gender ratio gap has been reduced in past decades. However, education in India has not improved and reached the targeted figures; gender disparity in education exists. This condition involves many issues and difficulties faced by girls in a society that needs to be addressed for curbing gender disparity and achieving equality in education. This qualitative paper focuses on Female Education in India (existence of inequality), the importance of female education, and methodologies/ strategies to achieve gender equality in education. The research uses secondary sources for the collection and analyzing the data. Farrington and Chertok (1993), in their Conflict Theory, have mentioned that men are the dominating part of society; they form rules for success and opportunity in the community as to women. This mindset needs to be addressed and ultimately abolished from society for the betterment of the nation.

Keywords: Girl education, Right to Education, NEP 1986, Conflict Theory, Gender divide

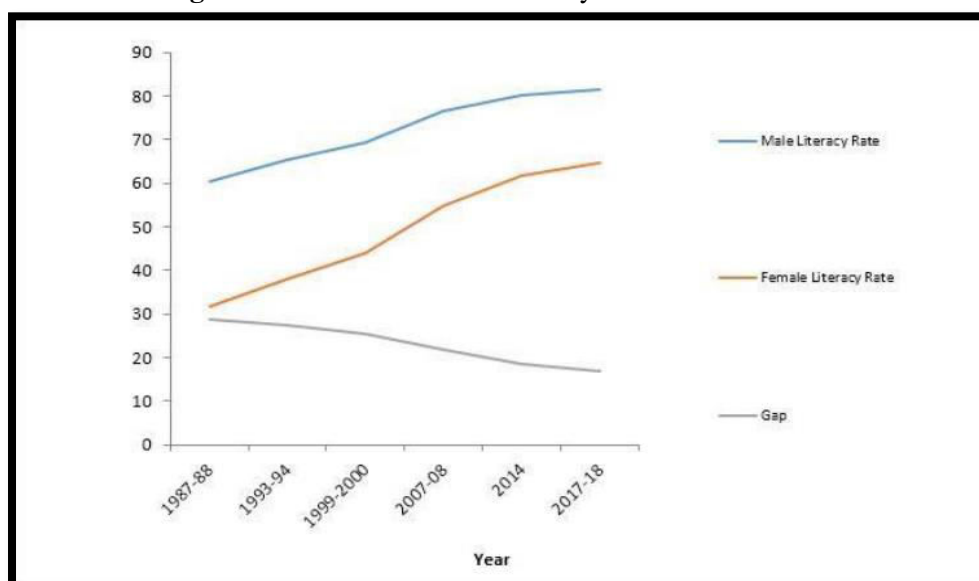
INTRODUCTION

Children worldwide have equal rights to get educated by going to school regardless of race and regional differences. Quality education requires a safe and friendly environment, motivating teachers, and flexibility in the teaching process. Also, timely assessment should help the child develop in the right direction. The purpose of education includes intellectual, civic and political; socialization and economical. Somehow, these purposes get hampered due to less involvement of females in education. Society majorly comprises males and females as two wheels of a cart moving together for the upliftment of the nation. Girls face many issues and problems when it comes to education, so they lag in different spheres of life.

The Government has implemented various policies to increase and encourage female education in India. According to the National Policy of Education (NPE) 1986, the main objectives include- "to provide opportunities to the housewives/ females" and "everyone should have access to quality education irrespective of sex."

The number of females is approximately 59% of the total population in India. But there is an extensive literacy gap between males and females, which is shown in Figure 1. This literacy gap will ultimately lower the development of the nation.

Figure 1: Male and Female Literacy rate from 1987-2018



Source: National Sample survey @Observer Research Foundation's India Data Labs

The figure shows, about three decades ago, the adult male literacy rate in India was almost twice that for adult females. While, the gap has tapered significantly over the years but still male literacy rate is more than female literacy rate by 17%.

Table 1: Year-wise enrolment in higher education in India (AISHE,MHRD)

Year	2011-12	2013-14	2015-16	2017-18
Total	2,92,84,331	3,23,36,234	3,45,84,781	3,66,42,378
Male	1,61,73,473	1,74,95,394	1,85,94,723	1,92,04,675
Female	1,30,10,858	1,48,40,840	1,59,90,058	1,74,37,703
% Female	44.58	45.90	46.23	47.59

Higher education statistics published by AISHE, MHRD (Table 1) from 2011-12 to 2017-18 show a different and elevated trend. The total number of males enrolled has increased by 18.7% in 6 years, whereas the number of females enrolled has increased by 34%, a massive rise. The compound annual growth rate for overall enrolment is 3.87 per cent, with males accounting for 2.9 per cent and girls accounting for 5%. Women's participation increased from 44.6 per cent in 2011-12 to 47.6 per cent in 2017-18. Women are enrolling in higher education in greater numbers than ever before.

LITERATURE REVIEW

1. P. Arokiasamy et al. in the paper "Gender bias against female children in India: Regional differences and their implications for MDGs", the recorded data for gender bias in school attendance in different states of India through NFHS-2, 1998-99. Female deprivation rate is very high in states like Rajasthan, Bihar, Uttar Pradesh, Gujarat, Andhra Pradesh, Jammu and Kashmir and Orissa in 1998-99. The record shows 20-40% short attendance for girls compared to boys in these states. Whereas 5-10 % short attendance for females is recorded in states like Assam, Punjab, Gujarat, Maharashtra, Karnataka and Tamil Nadu. These school attendance differences are minor in the age group 6-10 years but high in the age above 10 years due to the significant dropout rate in girls compared to boys in this age group.
2. According to Amtul Waris et al., their paper titled "Gender gaps and Women's Empowerment in India – Issues and Strategies" mentioned the gender gap in the educational sector. According to their finding, there is a wider gender disparity in the literacy rate. In 2011 the literacy rate was 82.14% for men and 65.46% for women, including seven years old and above. There is a positive increase in the female literacy rate, i.e., 11.8% faster than the male literacy rate (6.9%) from 2001-to 2011.

He also found the data regarding children's school attendance. There were only two-thirds girls and three fourth boys of age group 6 to 17 years attending the school, in numbers 889 girls per 1000 boys. There was no gender gap in urban area schools, while in rural areas, female attendance started decreasing with an increase in age. Gender disparity is more prevalent in rural areas than in urban, and it declines with an increase in household wealth. The higher education rate is low for both genders; women are only 27%, and men are only 39%.

3. Dr Radhika Kapur, in the qualitative paper titled "Gender Inequality in Education " focused on the importance of infrastructural facilities. Due to poor infrastructure, high school dropout rates are recorded, especially for girls. Furniture, technologies, equipment, restrooms, civic amenities, transportation, playground and many more, including environmental conditions, comprise of school infrastructure. Mainly in urban areas, schools have better infrastructure than rural areas, which is the primary reason for the high number of girls leaving the school as their age increases. Dr Radhika also mentioned the discriminatory treatment that girls receive. The girls and women of lower socioeconomic status or backward society are significant victims of discrimination based on gender. These discriminations are depicted in the acquisition of education, employment opportunities, empowerment opportunities, and property right in the decision making. Discouraged from participation in social, economic, cultural and political activities. While others are engaged in household chores and looking after other family members' needs.

OBJECTIVES OF STUDY

- To analyse gender divide in education in India with reference to Conflict Theory and importance of female education
- Implement framework/ Strategies for encouraging Female education in India

METHODOLOGY

This study is based on qualitative research which involves collecting and analysing non-numerical data (e.g., text, video, or audio) to understand concepts, opinions, or experiences. It is used to collect in-depth view into problems and generate new ideas for research. Qualitative research is commonly used in the humanities and

social sciences and is used to understand how people experience the world. The article attempts to analyse gender divide in education and uses secondary sources of data collection. Many research article, journals, research papers, internet, etc has been included in this study to have data from past decades. This study specially includes studies related to girl child or female education in India and conflict theory. The important points from studies papers have been mentioned in the form of findings of this study.

FINDINGS OF THE STUDY

The findings are discussed in 2 sections;

- Relation of Conflict theory with gender divide in education and related statistics
- Strategies for promoting Female Education in India

Section 1- Conflict theory and Gender Divide in Education

Conflict theory views education's aim as maintaining social inequality and giving power to those who dominate society. Society is where the struggle for dominance among social groups (like women versus men) fights for scarce resources. According to conflict theory, social issues occur when the dominant category exploits or suppresses the lower/ subordinate category. Friedrich Engels, a German sociologist, reviewed family structure and gender roles. Engels suggested that the owner-worker relationship seen in the labour force is also seen in the household, with women assuming the worker's role without sufficient wages. This condition is because women depend on men to attain wages, even worse for women who rely entirely on their spouses for economic support. Contemporary conflict theorists suggest that when women start earning, they acquire control and power in the family structure and create a more democratic environment in the home. However, they may still have to manage the majority of the domestic work, as mentioned earlier.

This theory itself is self-sufficient to frame the gender divide in India. Hence, this predetermined mindset should change to bring change in educational conditions. Few statistical data is presented below to contribute to the study's findings.

According to the Right to Education Forum and Centre for Budget Policy Studies, with support from the World Bank and UNICEF -SOURCE (2019-20), these are the key points:

- While the Sustainable Development Goals aspire to achieve gender equality for all girls and women. India is home to numbers of 'out-of-school' children, with girls accounting for a significant portion of them, according to a report on International Day of Education and National Girl Child Day on Friday (January 24, 2020).
- According to a status report, ten years after the Right to Education (RTE) Act was enacted, approximately 40% of teenage girls between the ages of 15 and 18 are not in school, and 30% of girls from the poorest families have never attended a classroom.
- The low RTE compliance rate in India (12.7%) is mostly due to a lower school funding trend, which has dropped from 4.14 per cent in 2014-15 to 3.40 per cent in 2019-20.
- According to Article 21A of the Constitution, the RTE Act of 2019 mandates compulsory schooling for children aged 6 to 14.

According to the research, the education and empowerment score is also linked to per-child spending. Kerala is the most generous, paying Rs 11,574 per kid per year, while Bihar is the least generous, spending only Rs 2,869. With an annual spend of Rs 17,921 per kid, Himachal Pradesh ranks second among 17 big states.

- Women in India still have a literacy rate of 65 per cent.

The More Significant Gap in Literacy Rate between Men & Women in Bihar & Telangana

According to Bharath Kancharla, "NFHS-5: Gender and Urban-Rural divide observed in access to School Education", the National Family and Health Survey 2019-20 (NFHS-5) include data for 17 states and 5 Union territories. The survey estimates 131 key indicators across various categories; literacy is one of them. Key points of the report are:

- The data record only for those who completed standard 9 or higher and who can read a whole sentence or a part of a sentence. Usually, respondents belong to the age group of 15-49 years.
- Among 22 States/Union territories, Kerala, 98.2% for men and 98.3% for women, record the highest literacy rate.

- North Eastern States data are recorded in phase1, and all of these states have a good rate of performance on literacy except Assam being the least performer with 84.3% for men and 77.2% for women being literate.
- Bihar, Andhra Pradesh & Telangana are the three states with lower literacy rates among men and women.
- A low-level literacy rate was recorded in Bihar and Telangana, but then a high difference in literacy levels among men and women. It is 78.5% for men while only 57.8% for women in Bihar, i.e., a difference of 20.7%.
- In Telangana, it is 66.6% for women with an 18% less than men literacy rate.
- States like Gujarat, Jammu & Kashmir, and Ladakh have a good literacy rate of up to 90% for men, but they also have a wide gap in literacy among men and women.

The Lower Literacy among Women in Some States is High in the Case of Rural Women

Aside from the disparity in literacy rates between men and women, there is also a significant divide between urban and rural populations. In the case of women, the disparity is more pronounced. Women in urban areas perform well in most states, with literacy rates comparable to males in such states. The lower literacy rates among women are primarily due to rural women's lower literacy.

- In Bihar, although women's literacy is lower, the situation is better in urban regions, where 75 per cent of women are literate, compared to 54.5 per cent in rural areas.
- In Telangana also, urban women have a literacy rate of 81 per cent, compared to 58.1 per cent in rural areas.
- Gujarat and Andhra Pradesh are two additional states where rural women's literacy is significantly lower than urban women.

Section 2: Strategies for Promoting Female Education in India

- Awareness- Everyone should be told about the importance of education and various tools such as posters, roleplays, awareness programs, etc. should be used to generate information and knowledge.
- Encouragement- Individuals and society should be motivated and encourage themselves to attain education to improve society.
- Government Policies- The government has introduced numerous policies and is still adding to them. Schemes such as Beti Bachao, Beti Padhao; RTE 2009- compulsory education; introduction of STEM education for girls; etc.

Initiatives by the Government to Close the Gender Gap in All Aspects of Social, Economic, and Political Life

The government of India has taken initiatives to reduce the gender gap and promote female education. The guideline was posted on 25th March 2021 by PBI, Delhi, under the Ministry of Women and Child Development(<https://pib.gov.in/pressreleasepage.aspx?prid=1707475>) World Economic Forum's Global Gender Gap Index Report 2020 found that India ranks 112th out of 153 nations, with a score of 0.668 out of 1.

The Global Gender Gap Index Report 2018 founds that India was rated 108th out of 149 nations, with a score of 0.665. As a result, India's performance has improved marginally from 0.665 in 2018 to 0.668 in 2020.

The Global Gender Gap Index (GGGI) is divided into four categories: (1) Economic involvement and opportunity, (2) Educational achievement, (3) Health and survival, and (4) Political empowerment.

According to the GGGI computational approach, the highest performance score on these four dimensions is 1. In the GGGI Report 2020, India received a score of 0.354 in economic engagement and opportunity, 0.962 in educational achievement, 0.944 in health and survival, and 0.411 in political empowerment

This Ministry has adopted a two-pronged strategy to improve India's ranking in this index:

1. Monitoring performance through engagement with the GGGI Publishing Agency, the World Economic Forum
2. Identifying reform areas and reform actions in consultation with concerned Ministries and Departments.

Educational Acquisition: In the school education system, several measures and efforts have been done, such as the National Curriculum Framework (NCF) 2005 and flagship programmes like Samagra Shiksha, as well as the following Right to Education Act (RTE). In Educationally Backward Blocks, Kasturba Gandhi Balika Vidyalayas (KGBVs) have been established (EBBs). Gender sensitization is also carried out, which involves the

implementation of a gender sensitization module as part of in-service training, the construction of girls' restrooms, the construction of female teachers' living quarters, and curricular revisions.

Articles by the Indian Constitution to Remove the Gender Gap

Apart from these strategies, every individual should know the gender pay gap (Amtul Waris et al. "Gender gaps and Women's Empowerment in India – Issues and Strategies"), which focuses on various articles of the Indian constitution, which is mainly constituted to remove gender gap.

- Article 14: In the political, economic, and social arenas, men and women must have equal rights and opportunities.
- Article 15(1): Prohibits discrimination based on religion, race, caste, sex, or other factors against any person.
- Article 15(3): Special provision allowing the government to discriminate in favour of women.
- Article 16: Equality of opportunity for all people regarding public posts.
- Article 39(a): The State shall direct its policy toward equally providing the right to a living for all citizens, men and women.
- Equal compensation for equal work for men and women (Article 39(d))
- Article 42: The state must provide for reasonable and humane working conditions, including maternity leave.

CONCLUSION

Education is human right and every one should have access to it. Education is the building block for development of self, community and country. Both males and females should have equal access to the education. With the data presented in the article, it can be concluded that situation have directed in positive way only, as there is increase in number of females in acquiring education. The change can be seen from 1986 to 2011 to 2018-19, which has progressed in a positive way. Few areas are still lagging behind and need to promote female education specially rural India for the betterment of society.

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 15. Year-wise enrolment in higher education in India (data from AISHE, MHRD)

HYBRID BASED ENERGY STORAGE SYSTEM FOR BATTERY ON MICRO GRID

¹A. Chakravarthi, ²N. Govardhan, ³K.Purushotham and ⁴D. Dileep teja^{1,2}UG student, EEE, AITS, Rajampet, Guide-Dr.K. Dananjayababu, M. Tech, Assistant professor, EEE, AITS, Rajampet. AITS- Annamacharya Institute of Technology and Sciences, Rajampet**ABSTRACT**

A control algorithm for a standalone solar photovoltaic (PV)-diesel-battery hybrid system is implemented in this paper. The proposed system deals with the intermittent nature of the energy generated by the PV array and it also provides power quality improvement. The PV array is integrated through a DC-DC boost converter and controlled using a maximum power point tracking (MPPT) algorithm to obtain the maximum power under varying operating conditions. The battery energy storage system (BESS) is integrated to the Wind generator (DG) set for the coordinated load management and power flow within the system. The admittance based control algorithm is used for load balancing, harmonics elimination and reactive power compensation under three phase four-wire linear and nonlinear loads. A four-leg voltage source converter (VSC) with BESS also provides neutral current compensation. The performance of proposed standalone hybrid system is studied under different loading conditions experimentally on a developed prototype of the system

Keywords- solarenergy,windenergy,mppt(o&palgorithm), dc-dc converter,rectifier,microgrid.

I. INTRODUCTION

Global transition to renewable energy resources is well suited to meet the need for power in remote areas which lack grid and road infrastructure. The support for the use of renewable energy resources is increasing as global warming is a major environmental concern and it offers an alternative for future energy supply. Amongst the available renewable energy resources, solar photovoltaic (PV) power generation is gaining wide acceptance and it is used for various applications such as household appliances, remote missions, data communications, telecommunication systems, hospitals, electric aircrafts and solar cars . The utilization of the PV power generation is for the reason that it has many advantages such as it gives clean power, it is portable in nature and can be employed for various small scale applications. However, considering the large fluctuations in the output of PV power, it is imperative to integrate other power sources like a diesel generator (DG) set, battery storage, fuel cells etc. The performance analysis of standalone systems with PV and DG based sources .The design and operation of standalone DG-SPV-BES using a peak detection based control approach.

II. EXISTING SYSTEM

A two stage power control strategy is proposed to smoothen the power output of a grid connected PV power plant. A unique energy management system is proposed for a grid interactive residential microgrid with energy storage.

In the conventional PV inverter technology, the simple and the low-cost advantage of the fly back topology is promoted only at very low power as micro-inverter. In the applications of inverters, the inverters with five level inversion topology can produce output not as the high step-up output voltage and with high number of switches. Conventional inverter with more number of switches.

In this model, wind turbine shaft is mechanically connected with permanent magnet synchronous (drive Train PMSG) which is connected to grid through three phase series RLC branch.

Waveform of voltage and current is sinusoidal and the simulation waveform for output mechanical power and torque (Te & Tm) is also shown which are showing normal behaviour after attaining a good value for system.

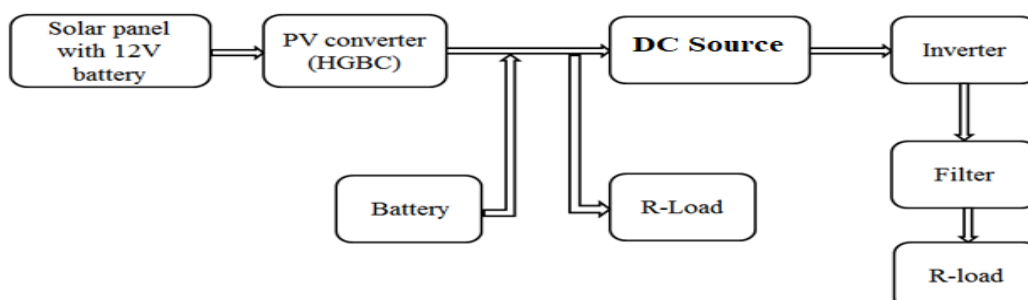


Fig.1: Block diagram of solar energy battery storage system

III. PROPOSED SYSTEM

A control algorithm for a standalone solar photovoltaic (PV)-diesel-battery hybrid system is implemented in this paper. The proposed system deals with the intermittent nature of the energy generated by the PV array and it also provides power quality improvement. The PV array is integrated through a DC-DC boost converter and controlled using a maximum power point tracking (MPPT) algorithm to obtain the maximum power under varying operating conditions. The battery energy storage system (BESS) is integrated to the diesel engine generator (DG) set for the coordinated load management and power flow within the system. The admittance based control algorithm is used for load balancing, harmonics elimination and reactive power compensation under three phase four-wire linear and nonlinear loads. A four-leg voltage source converter (VSC) with BESS also provides neutral current compensation. The performance of proposed standalone hybrid system is studied under different loading conditions experimentally on a developed prototype of the system.

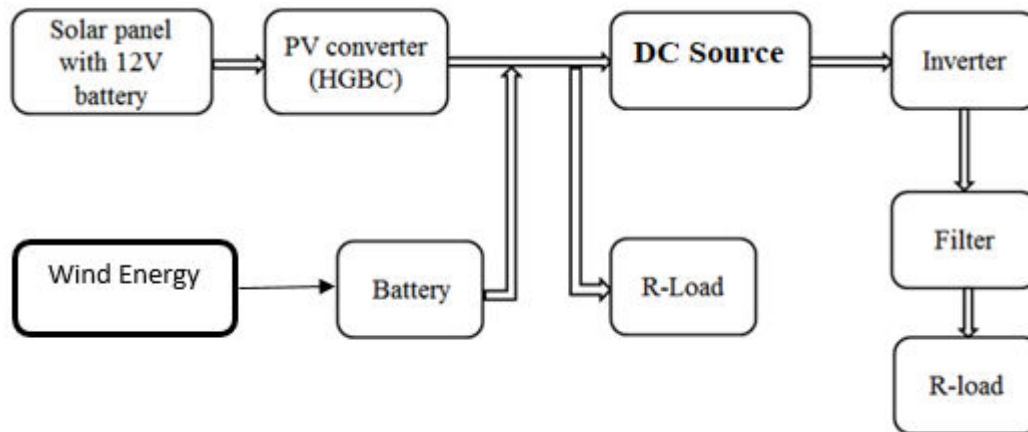


Fig.2: Block diagram of solar-wind energy battery storage system

A. Proposed System Technique

The PV array is integrated through a DC-DC boost converter and controlled using a maximum power point tracking (MPPT) algorithm to obtain the maximum power under varying operating conditions. The battery energy storage system (BESS) is integrated to the diesel engine generator (DG) set for the coordinated load management and power flow within the system

- Wind turbine along with the synchronous generator is primarily done which is fed to a utility with the help of a dc/dc rectifier and boost model.
- Using this, a complete detailed model is presented which comprises of a wind turbine, PMSG, rectifier and 3- phase boost circuit involving MPPT.

The maximum power point tracking control scheme is developed using the boost converter circuit, by having a optimum duty ratio which is been provided using the several equations involved in achieving the power output by the duty ratio of the boost converter.

The proposed system employs PMSG and use converters on the generator side in order to control the generator speed which aims to achieve maximum power point tracking. Through dynamic modeling and simulation of WEGS for the maximum power control of wind turbine for wide wind speed ranges. The wind turbine concept given by the authors could help as aid to get an assessment to various control strategies, power quality and connection of the wind turbine for various types of grid and storage systems.

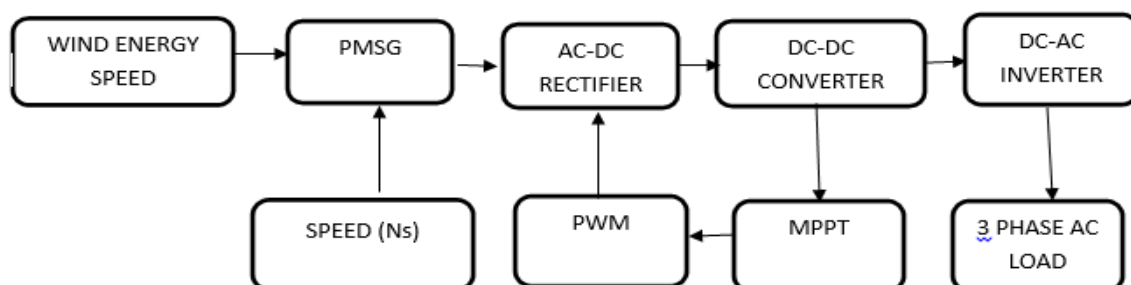


Fig.3: Block diagram of wind energy battery storage system

B. MODULES DESCRIPTION

1. Photovoltaic Array (PV Array)

Solar power Solar panels are the medium to convert solar energy into the electrical energy. Solar panels can convert the energy directly or heat the water with the induced energy. PV (Photo-voltaic) cells are made up from semiconductor structures as in the computer technologies. Sun rays are absorbed with this material and electrons are emitted from the atoms. This release activates a current. Photovoltaic is known as the process between radiation absorbed and the electricity induced. Solar power is converted into the electric power by a common principle called photo electric effect. The solar cell array or panel consists of an appropriate number of solar cell modules connected in series or parallel based on the required current and voltage.

2. Wind Power

The wind energy is a renewable source of energy. Wind turbines are used to convert the wind power into electric power. Electric generator inside the turbine converts the mechanical power into the electric power. Wind turbine systems are available ranging from 50W to 3-4 MW. The energy production by wind turbines depends on the wind velocity acting on the turbine. Wind power is able to feed both energy production and demand in the rural areas. It is used to run a windmill which in turn drives a wind generator or wind turbine to produce electricity.

3. Dc-Dc Converter

DC to DC converters are important in portable electronic devices such as cellular phones and laptop computers, which are supplied with power from batteries primarily. Such electronic devices often contain several sub-circuits, each with its own voltage level requirement different from that supplied by the battery or an external supply (sometimes higher or lower than the supply voltage). Additionally, the battery voltage declines as its stored energy is drained. Switched DC to DC converters offer a method to increase voltage from a partially lowered battery voltage thereby saving space instead of using multiple batteries to accomplish the same thing.

Most DC to DC converters also regulate the output voltage. Some exceptions include high-efficiency LED power sources, which are a kind of DC to DC converter that regulates the current through the LEDs, and simple charge pumps which double or triple the output voltage.

4. Inverter

Energy stored in the battery is drawn by electricals loads through the inverter, which converts DC power into AC power. The inverter has in-built protection for Short-Circuit, Reverse Polarity, Low Battery Voltage and Over Load. 5. Microcontroller The microcontroller compares the input of both Power system and gives the signal to the particular relay and charges the DC Battery. The DC voltage is converted into AC Supply by Inverter Circuit. The MOSFET (IRF 540) is connected to the Secondary of the centre tapped transformer. By triggering of MOSFET alternatively, the current flow in the Primary winding is also alternative in nature and we get the AC supply in the primary winding of the transformer.

5. Maximum Power Point Tracking (MPPT)

Maximum power point tracking (MPPT or sometimes just **PPT**) is a technique used commonly with wind turbines and photovoltaic (PV) solar systems to maximize power extraction under all conditions.

Although solar power is mainly covered, the principle applies generally to sources with variable power: for example, optical power transmission and thermophotovoltaics.

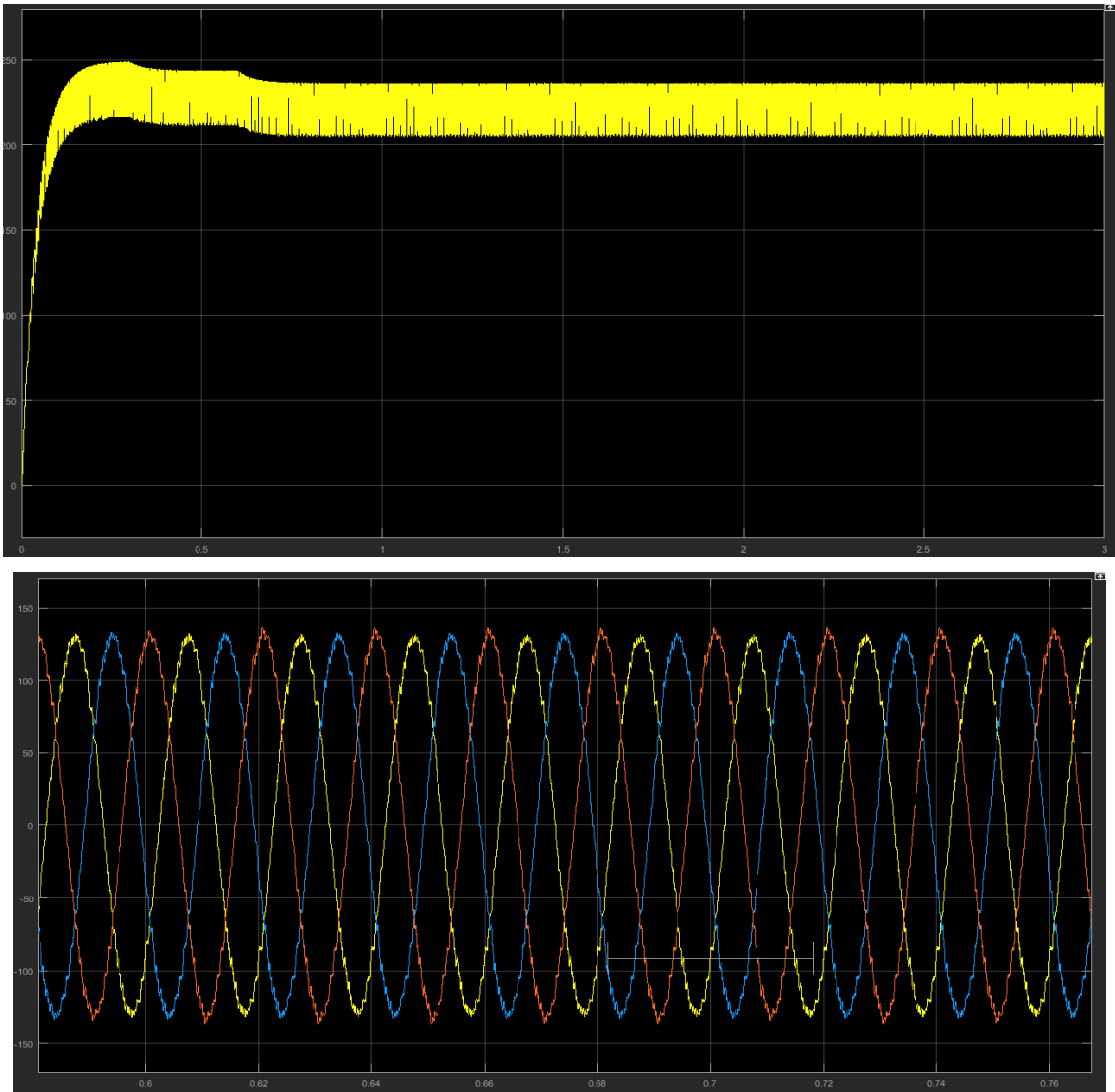
PV solar systems exist in many different configurations with regard to their relationship to inverter systems, external grids, battery banks, or other electrical loads.^[3] Regardless of the ultimate destination of the solar power, though, the central problem addressed by MPPT is that the efficiency of power transfer from the solar cell depends on both the amount of sunlight falling on the solar panels and the electrical characteristics of the load. As the amount of sunlight varies, the load characteristic that gives the highest power transfer efficiency changes, so that the efficiency of the system is optimized when the load characteristic changes to keep the power transfer at highest efficiency. This load characteristic is called the **maximum power point** and MPPT is the process of finding this point and keeping the load characteristic there.

Perturb and Observe Algorithm

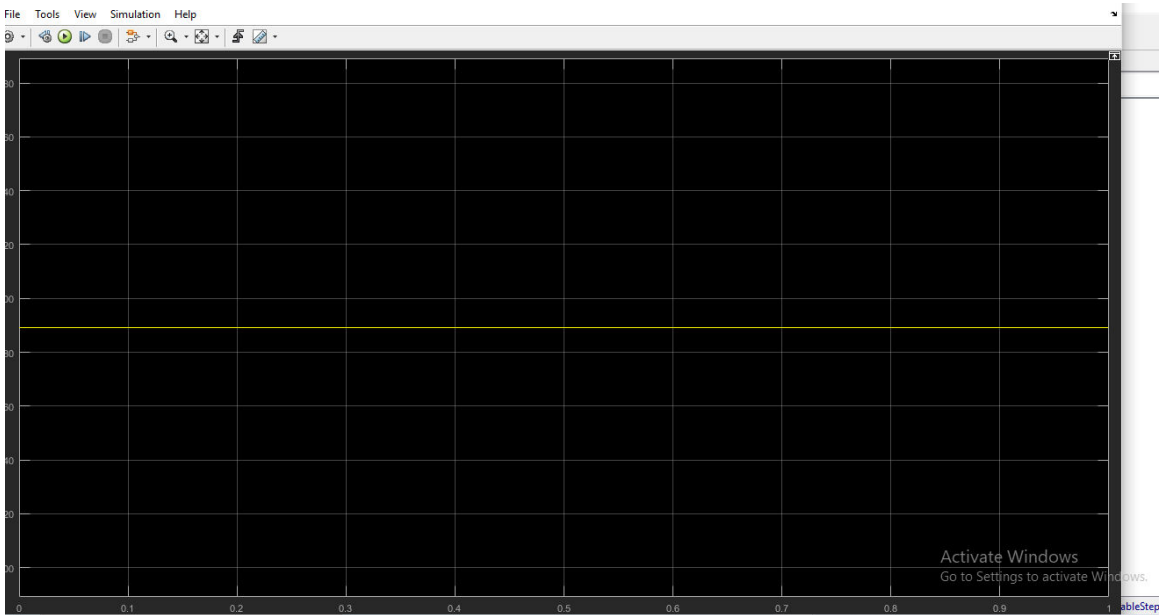
In this method the controller adjusts the voltage by a small amount from the array and measures power; if the power increases, further adjustments in that direction are tried until power no longer increases. This is called the perturb and observe method and is most common, although this method can result in oscillations of power output. It is referred to as a hill climbing method, because it depends on the rise of the curve of power against voltage below the maximum power point, and the fall above that point. Perturb and observe is the most

commonly used MPPT method due to its ease of implementation. Perturb and observe method may result in top-level efficiency, provided that a proper predictive and adaptive hill climbing strategy is adopted

Voltage Output Waveform



Solar Panel Output



Boost Converter Output



IV. CONCLUSION

In this work, we focused on the development of a energy generation of solar and wind energy

Hybrid systems and stored in battery.we proposed a control system designed via MPPT

algorithm to obtain the maximum power under varying operating conditions.the battery energy storage system(BESS) is integrated to the wind generator (DG) set for the coordinated load management and power flow within the system.the admittance based control algorithm is used for load balancing,harmonics elimination and reactive power compensation under three phase four-wire linear and nonlinear loads.simulation results demonstrated the effectiveness and applicability of the proposed approach.Future work will include the investigation of large time span behaviour of the hybrid wind-solar generation system taking into account information of future weather forecast,and investigation of the performance of the system under the condition that the future power demand is unknown.

ACKNOWLEDGE

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**INTERLINKING CONVERTER DESIGN AND ANALYSIS FOR RENEWABLE ENERGY
INTEGRATION INTO HYBRID GRIDS**

D. Keerthana, Dr. P. Balachenniah, S. Imran Basha, P. Naveen Kumar, P. Sarala

Electrical and Electronics Engineering, Annamacharya Institute of Technology and Sciences, Rajampet

ABSTRACT

Microgrids are an ideal paradigm for forming smart grids due to their small size and ability to 'island' when supplying the majority of their loads during times of need, which improves system reliability. Maintaining load-generation balance, on the other hand, is extremely difficult, given that micro grids are dominated by renewable-based DGs, which are characterised by their probabilistic nature and intermittent power. Although micro grids are now well-established and extensively studied, there is still some debate about whether they should be solely ac or solely dc, with the consensus favouring hybrid ac-dc micro grids.

This is an interconnected converter architecture that allows for the flexible integration of renewable energy into hybrid grids. The proposed converter has one AC port and two DC ports, allowing it to function as a DC-DC converter, a DC-AC inverter, or a DC-DC/AC multiport converter, offering a versatile solution for integrating multiple DC and AC sources. The results of the simulation validated the proposed concept by allowing for controllable power flow and flexible power conversion.

Index terms- Hybrid DC/AC grid, flexibility, reliability, leakage currents.

I. INTRODUCTION

Renewable energy is expected to play an important role in the future to meet rising energy demand, reduce carbon dioxide emissions, and address environmental concerns. This clean energy can be integrated at both the transmission and distribution levels. Wind energy is the primary driver of transmission, particularly in Europe. In Northern Europe, for example, many offshore wind farms are connected to the main transmission grid via AC or DC links. The power grid becomes more vulnerable and unstable as a result of their intermittent nature and the fact that these wind farms are connected to the grid via power electronics converters.

The interlinking conversion can be accomplished in two ways: by establishing a multistage conversion system with separate general DC-DC and DC-AC converters and by developing standalone multi-port configurations [3–9]. For example, split-source inverters were introduced [6],[7] to improve compactness, efficiency, flexible power flow, and voltage-boosting, while the leakage current issue was not taken into account. When applied to PV systems, this presents a difficult challenge. Transformer-less stand-alone converters [8],[9] can be used to reduce leakage currents, but they do not support bidirectional power flow. Furthermore, because a dual-buck inverter is used, large AC filter inductors are required, resulting in a relatively low power density, which contradicts the benefits of standalone hybrid converters.

The interlinking conversion architecture proposed in this paper is a promising candidate for RES integration into hybrid grids. It outperforms in terms of high reliability, ease of implementation, and flexibility of operation. The proposed architecture is realised by replacing the boost converter's power device with an active switch and a voltage source inverter (VSI). Furthermore, it employs a symmetrical impedance network, which improves system efficiency, leakage current suppression, and power density. A dedicated modulation scheme is demonstrated, which can improve power quality and flexibility [10] while maintaining efficiency.

II. Micro Grid Concept:

"The Micro grid structure assumes an aggregation of loads and micro sources operating as a single system providing both power and heat," according to the Consortium for Electric Reliability Technology Solution (CERTS). To ensure controlled operation as a single aggregated system, the majority of the micro sources must be power electronic in nature. This control flexibility enables the Micro grid to present itself to the bulk power system as a single controlled unit, to have plug-and-play simplicity for each micro source, and to meet the local needs of the customers. Among these requirements are increased local dependability and security. [White Paper on the Integration of Distributed Energy Resources by the Consortium for Electric Reliability Technology Solutions] The microgrid includes control for each power source as well as power flow management.

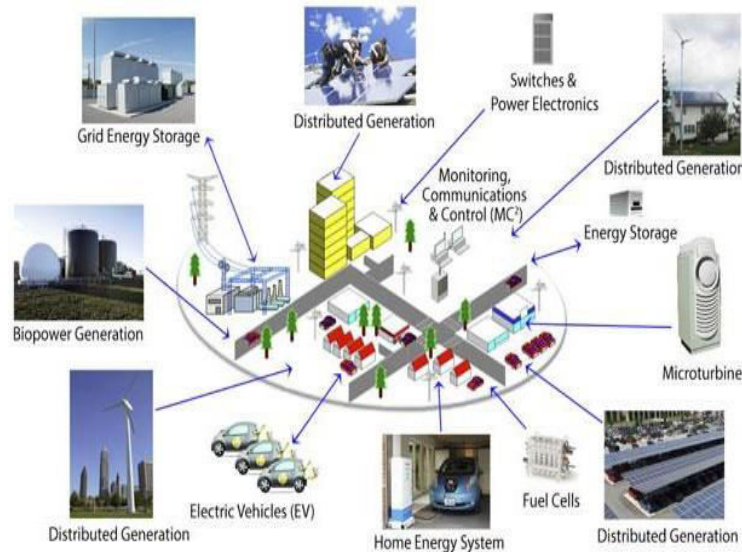


Fig.1: Micro Grid Structure

As illustrated in fig.1, a microgrid is made up of one or more power generators and multiple users in a small area. Connecting a different power source to the Micro grid provides energy independence for local power generation and customers. The microgrid can operate at either low or high voltage. Figure 2 depicts the hybrid system configuration. The various AC and DC sources and loads are connected to the appropriate AC and DC buses. Power inverters and transformers connect the AC and DC buses.

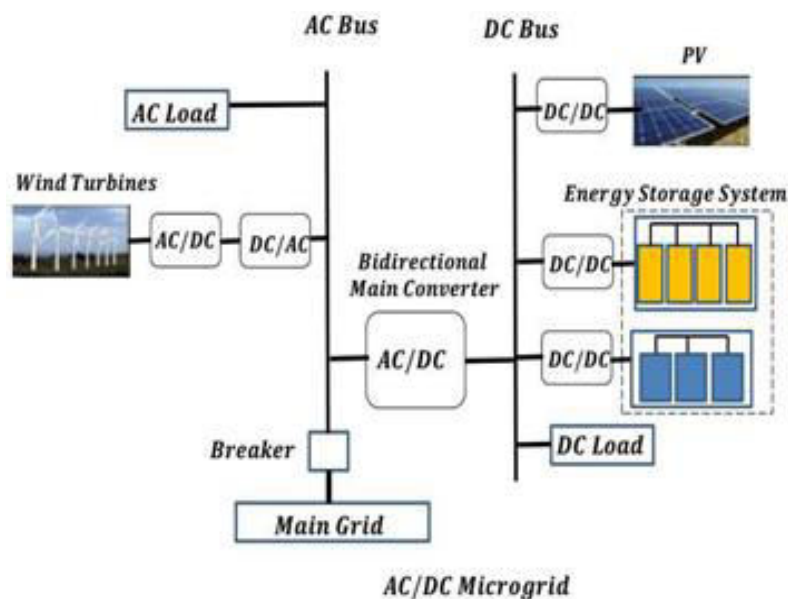


Fig.2: Hybrid Ac/Dc Micro Grid System.

III. PROPOSED INTERLINKING CONVERTER

A. General Concept

Figure 3 depicts the general concept of the proposed interlinking converter architecture for hybrid grids. As shown in Fig. 3, the converter has two DC ports and one AC port, with the low-voltage DC (DCL) side capable of connecting to PV panels, batteries, or other RESs, and the high-voltage DC (DCH) side capable of connecting to a DC grid or loads (also storages). Similarly, an AC load or an AC grid can be used on the AC side. Notably, for maximum flexibility, all power conversions in the proposed architecture should be bidirectional. The following factors should be considered in order to achieve this: 1) The boost converter's control switch is replaced by a VSI, and its common-mode voltage (CMV) is clamped to achieve the AC output; 2) An active switch, i.e., a synchronous rectifier switch, is used for bidirectional DC-DC conversion, and thus the hybrid converter can achieve boost or buck conversion between the DCL and the DCH sides; 3) A symmetrical impedance network (SIN) is placed at the DCL side, as illustrated in fig. 3, which is also essential to lower the leakage currents.

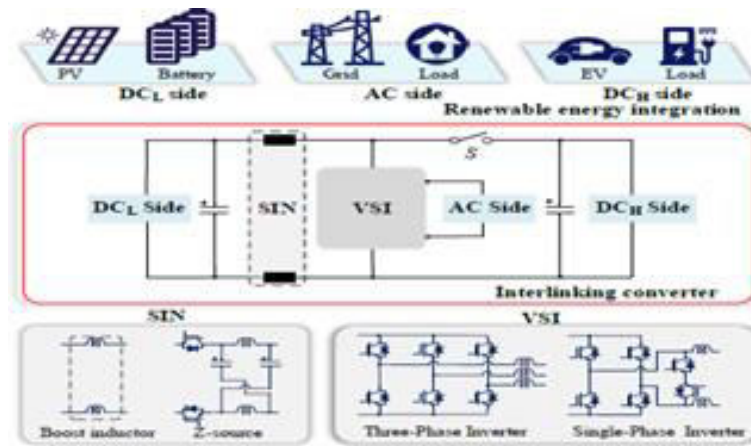


Figure3: General concept of the proposed interlinking converter architecture, where S represents an active switch that allows bidirectional power flow.

The symmetrically arranged impedance and the VSI will clamp the CMV to half of the DCL voltage in such an architecture. The proposed interlinking converter architecture with a single-phase inverter is illustrated in fig. 4 to demonstrate CMV clamping.

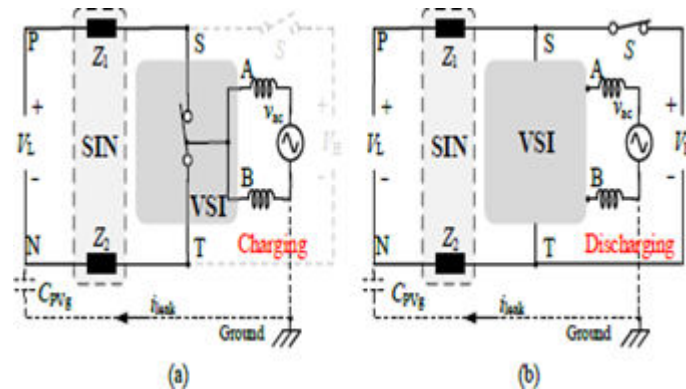


Figure 4 illustrates the operational states of the proposed interlinking converter architecture with a single-phase inverter: (a) charging state and (b) discharging state, where Z1 and Z2 are the equivalent impedances of the SIN ($Z_1 = Z_2$), P and N are the positive and negative terminals of the DCL side, S and T are the positive and negative input terminals of the VSI, A and B are the output terminals of the VSI, VL, VH, and VAC are the DCL, DCH, and AC voltages, CPVg and ileak are the PV parasitic capacitor and the leakage current.

As shown in fig. 4, the SIN has two modes, namely charging and discharging, which are defined as follows: (1) During the charging period, the VSI is in shoot through (ST) mode, with the active switch S turned off, as shown in Fig. 4. (a). As a result, the terminal voltages are $V_{AN} = V_{BN} = V_L/2$ and the CMV V_{cm} is calculated as

$$V_{cm} = V_{AN} + V_{BN} / 2 = V_L / 2 \quad (1)$$

As shown in Fig. 4(b), the SIN is discharging, the VSI is in DC-AC conversion mode, and S is turned on. Because the CMV has already been clamped by the adopted VSI, the proposed converter's resultant CMV can be obtained as

$$V_{cm} = V_{AT} + V_{BT} / 2 = V_H / 2 \quad (2)$$

Equations show that the proposed interlinking conversion architecture can maintain a constant CMV due to the use of the SIN and the VSI with its CMV clamped. As a result, the proposed interlinking converter is appropriate for PV applications. It should be noted that leakage current suppression can only be accomplished on the DCL side. Depending on the application, additional isolation equipment on the DCH side may be considered (e.g., in a DC grid).

A. Operational Flexibility

The use of a synchronous rectifier switch, as shown in fig. 3, allows for bidirectional power flow between the DC ports. Furthermore, the VSI can inject reactive power using a dedicated modulation method with a power factor adjustment range of $[-1, 1]$. Overall, the proposed hybrid converter has a high level of flexibility and

controllability for integrating RES into hybrid grids. The possible operation modes, as shown in fig. 5, reflect the flexibility: power feed-in mode (Mode I), power feedback mode (Mode II), and power factor mode (Mode III):

(1) In Mode I, the DCL side serves as a power source for the DCH, AC, or both sides. In this case, the converter performs boost DC-DC and DC-AC conversions from the DCL to the DCH and AC sides, respectively. Furthermore, in this mode, power can be fed into the AC/DCH side from both the DCL and the DCH/AC sides.

(2) There are three operation cases in Mode II. To begin, power is fed back from the AC side to the DCL and DCH sides (i.e., the two DC ports are loads), where the converter operates in active rectification for the DCH side and buck DC-DC conversion for the DCL side from the AC side. Second, in the power feed-back mode, only the DCL side is acting as a load (e.g., charging batteries). That is, both the DCH and AC sides supply power. Third, the DCL and AC sides are both acting as loads, with the DCH side performing the buck DC-DC and DC-AC conversions, respectively.

In Mode III, regardless of the power flow modes between the DCL and DCH sides, the power factor at the AC side should be flexible controlled to enable grid-connected applications. When the modulation method for the DC-AC conversion has reactive power injection capability, as shown in Fig. 5, the proposed converter architecture can achieve this.

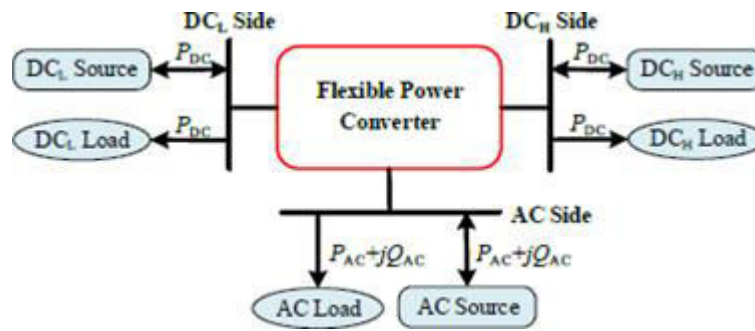


Figure5: The proposed interlinking conversion architecture's possible operation modes where PAC and QAC represent the corresponding active & reactive power at the ACport.

When used in a hybrid AC/DC grid (the AC and DCH ports are connected to grids), the overall system operation can be greatly improved. For example, when the AC grid requires assistance (for example, to address frequency stability), the active power from the input DCL side can be regulated, while the DCH grid can also assist by feeding power to the AC port. Similarly, if the DC side experiences instability during faults (e.g., voltage issues), the AC grid can be operated in the rectification mode to assist the DC grid in withstanding the fault. Overall, the proposed power conversion architecture has the potential to be a flexible and promising solution for integrating RESs into hybrid AC/DC grids.

B. Modulating Strategy:

In Fig. 6, a modulating technique for interlinking converters is demonstrated using a highly efficient and reliable inverter concept (HERIC) inverter as the VSI and a symmetrical inductor network as the SIN.

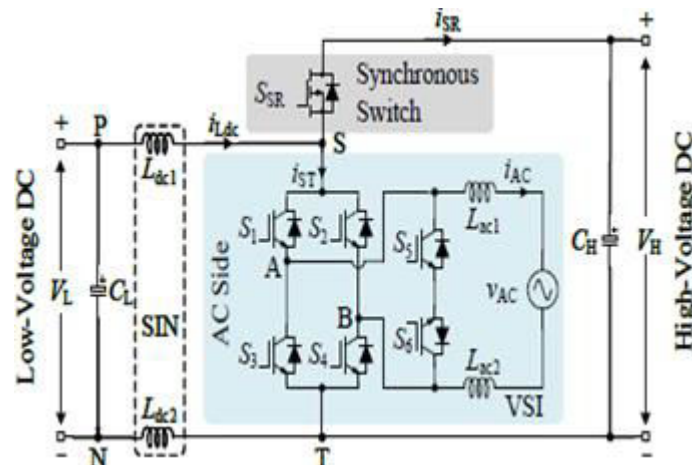


Fig.6: Structure of proposed interlinking conversion architecture using a symmetrical boost inductor network and a HERIC, where SSR is the synchronous rectifier switch, the boost inductors are Ldc1, Ldc2, (i.e., Ldc1 = Ldc2), CL and CH are the DC capacitors, idc, iST, and iSR are the DC inductor currents, the VSI input current,

and the synchronous rectifier switch current, i_{AC} is the current of the L-type filter (i.e., including L_{ac1} and L_{ac2} , $L_{ac1} = L_{ac2}$), and its positive direction is from the VSI to the AC grid.

IV. Simulation Results:

Case1:

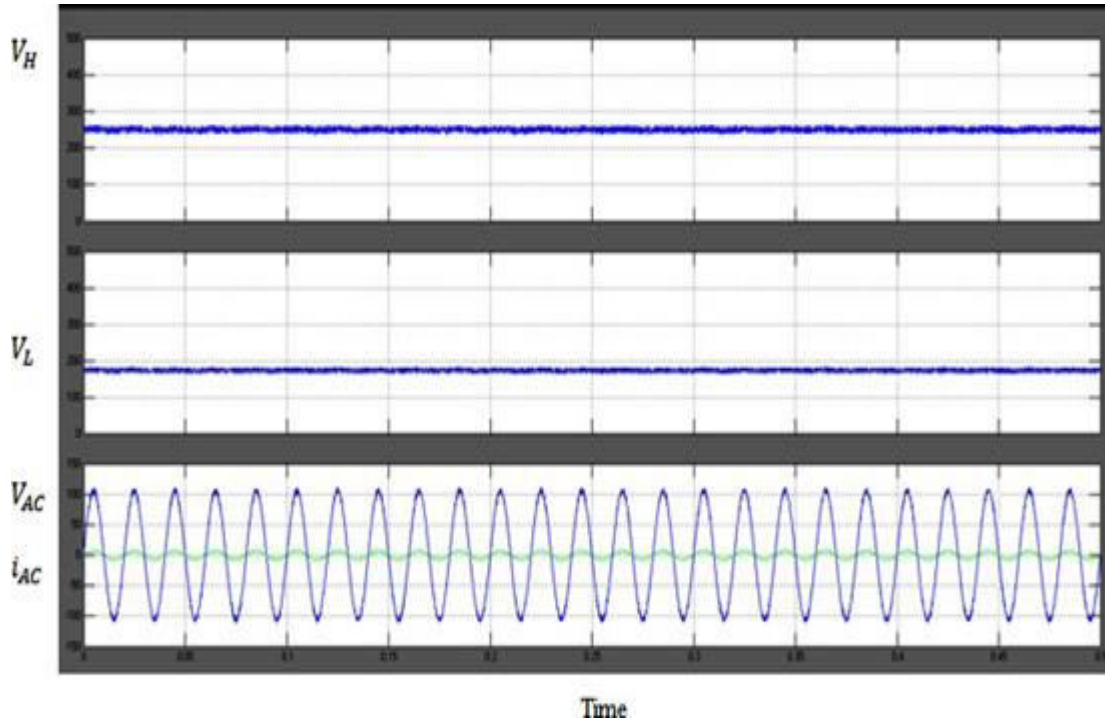


Fig.7: Performance of the proposed interlinking converter with an HERIC as the VSI operating in Mode I.

Figure 7 depicts the performance of the proposed converter in Mode I, where the DCL side supplies power to the DCH side and the AC output. The proposed architecture, as shown in fig. 7, can provide both AC and DC outputs at the same time. To address this, power decoupling strategies for conventional VSIs can be used.

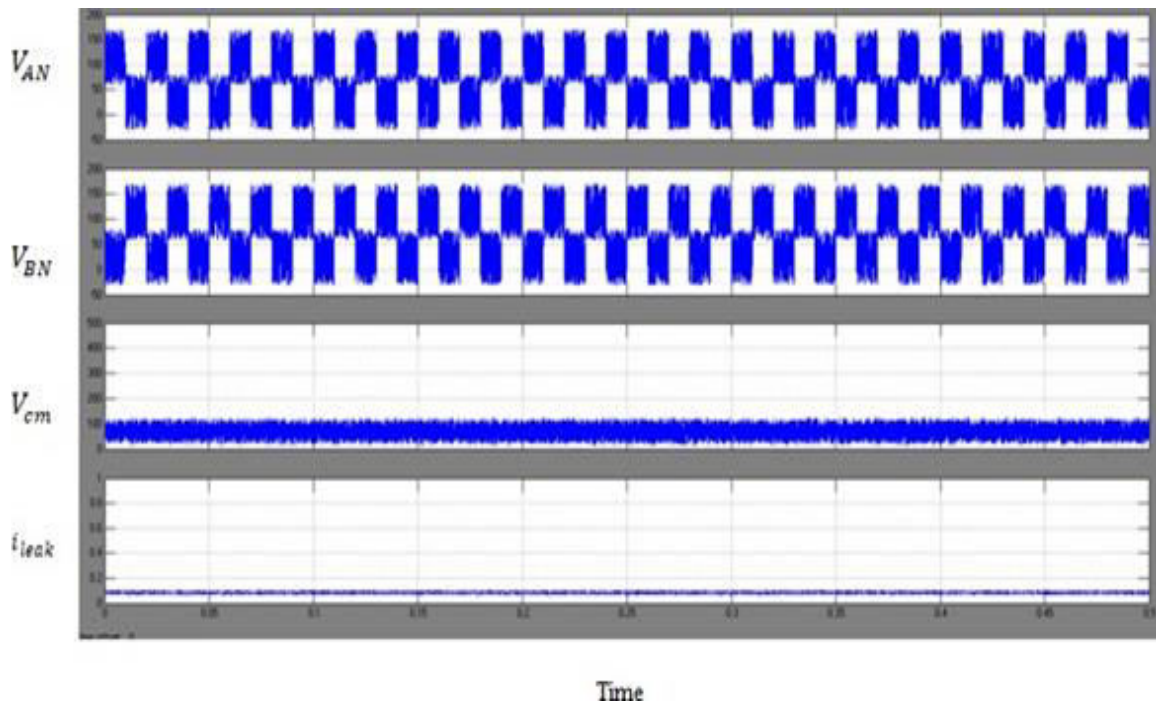


Fig.8: Performance of the proposed converter, where V_{AN} and V_{BN} are the voltage of the terminals A and B to N, respectively, and V_{CM} and i_{leak} are the CMV and the leakage current.

The CMV and leakage currents of the proposed converter for PV applications are shown in Fig. 8. The leakage current i_{leak} is below the limit, as shown in fig. 8. Furthermore, the inverter voltages V_{AN} and V_{BN} in fig. 8

show that the modulation method used can achieve the same performance as the HERIC with unipolar PWM. As a result, the proposed converter can maintain low leakage currents while also providing high power quality.

Case- 2:

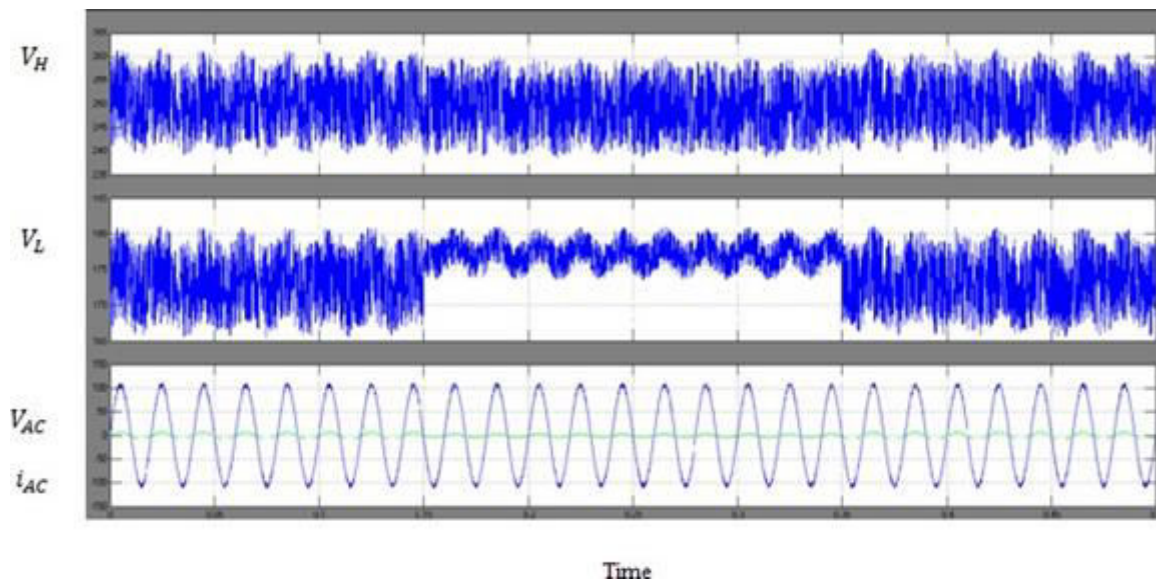


Fig.9. Performance of the proposed interlinking converter under load step changes at the AC side in ModelI.

Furthermore, the converter's dynamic performance in Mode I has been tested with an AC load change. The experimental results show that the proposed converter can operate reliably in the face of dynamic load changes. More importantly, because the DC-DC and DC-AC conversions are controlled separately, load changes have no effect on current quality.

Case- 3:

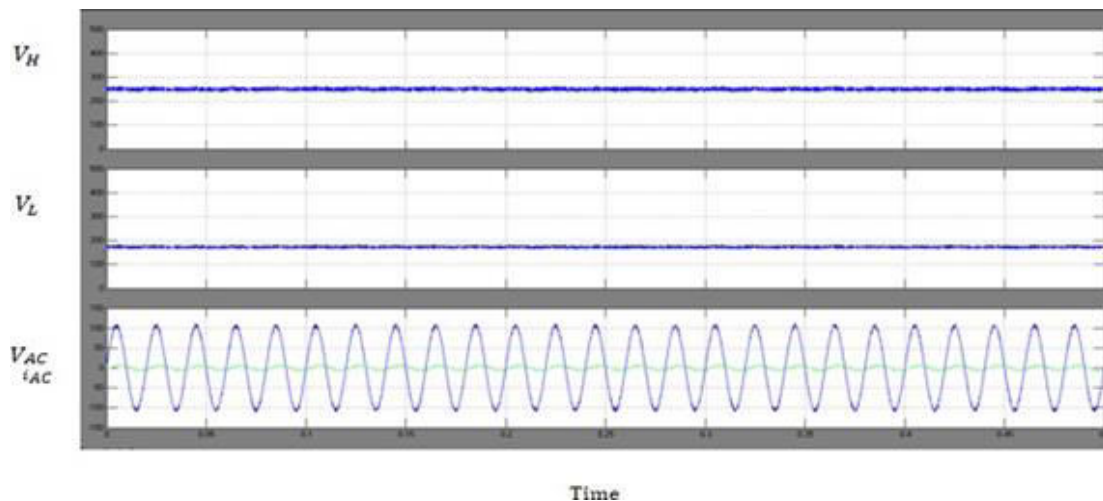


Fig.10 Performance of the proposed interlinking converter in Mode III, where i_{AC} lags behind V_{AC} .

To validate the proposed converter's performance further, simulation tests in Mode III are performed, and the results are shown in fig. 10, where the DC-AC conversion operates with a non-unity power factor. Observations in Fig. 10 show that the proposed converter can provide flexible reactive power injection, which may benefit the overall system operation (e.g., to provide grid support).

CONCLUSION

An interlinking conversion architecture was proposed in this paper as a promising solution for integrating various energy sources into hybrid grids. The proposed architecture is realised by replacing the boost converter's power devices with a VSI and an active switch. Low leakage currents, good power quality, high efficiency, and flexible power flow control are all possible with the proposed interlinking conversion architecture. The proposed architecture's performance has been validated using MATLAB/SIMULINK simulation results. The flexible power conversion architecture could be a promising interlinking stage as the demand for hybrid energy systems grows.

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LAPAROSCOPIC APPENDECTOMY VERSUS OPEN APPENDECTOMY IN BAQUBA TEACHING HOSPITAL

Nabil Isam Naiem, M.B.Ch, B - F.I.C.M.S and Asmaa Yaseen Jasim

¹C.A.B.S – F.I.C.B.S General surgery specialist Shahid Ahmed ismail – Shorsh teaching Hospital
Mohammed Mohammad Habash

²Assistant professor in general surgery

³Head of Department of surgery Diyala University, College of Medicine

ABSTRACT

Background: Appendectomy is the most common surgical procedure performed in emergency surgery. Because of lack of consensus about the most appropriate technique, appendectomy is still being performed by both open (OA) and laparoscopic (LA) methods. In this retrospective analysis, we aimed to compare the laparoscopic approach and the conventional technique in the treatment of acute appendicitis.

Material and Method: We collected data of 40 appendectomies done in Baquba teaching hospital between September 2020 and May 2021. These comprised 20 patients who underwent conventional appendectomy and 20 patients treated laparoscopically. The two groups were compared for operative time, length of hospital stay, postoperative complication .

Results: We found Laparoscopic appendectomy was associated with a shorter hospital stay (1.4 ± 0.6 day in LA and 2.7 ± 2.5 days in OA. Operative time was significantly shorter in the Laparoscopic group (30 ± 3.2 in LA and 35 ± 5.2 min in OA). Total number of complications was less in the LA group with a significantly lower incidence of wound infection (00.00% vs 15 %, $P=1.00$).

Conclusion: The laparoscopic approach is a safe and efficient operative procedure in appendectomy and it provides clinically beneficial advantages over open method (including shorter hospital stay , earlier return to work, lower rate of wound infection)

Keywords: Open appendectomy, Laparoscopic appendectomy, Appendicitis.

INTRODUCTION**Anatomy**

The vermiform appendix is a blind muscular tube with mucosal, submucosal, muscular and serosal layers. Morphologically, it is the undeveloped distal end of the large caecum found in many lower animals. In approximately one- quarter of cases, rotation of the appendix does not occur, resulting in a pelvic, subcaecal or paracaecal position. Especially in childhood, the mesoappendix is so transparent that the contained blood vessels. In many adults, it becomes laden with fat, which obscures these vessels. The appendicular artery, a branch of the lower division of the ileocolic artery, passes behind the terminal ileum to enter the mesoappendix a short distance from the base of the appendix. It then comes to lie in the free border of the mesoappendix. An accessory appendicular artery may be present but, in most people, the appendicular artery is an 'end-artery', thrombosis of which results in necrosis of the appendix (synonym: gangrenous appendicitis). Four, six or more lymphatic channels traverse the mesoappendix to empty into the ileocaecal lymph nodes⁽¹⁾.

Microscopically

The appendix varies considerably in length and circumference. The average length is between 7.5 and 10 cm. The lumen is irregular, being encroached upon by multiple longitudinal folds of mucous membrane lined by columnar cell intestinal mucosa of colonic type⁽¹⁾.

Acute appendicitis is the most common intra-abdominal condition requiring emergency surgery.

Appendicitis

Appendicitis is the inflammation of the vermiform appendix. It typically presents acutely, within 24 hours of onset, but can also present as a more chronic condition. Classically, appendicitis presents with initial generalized or periumbilical abdominal pain that later localizes to the right lower quadrant. This activity reviews the presentation, evaluation, and treatment of appendicitis and stresses the role of the interprofessional team in evaluating and treating patients with this condition.

Symptoms of appendicitis⁽¹⁾

- Peri-umbilical colic

■ Pain shifts to the right iliac fossa

■ Anorexia

■ Nausea

Clinical signs in appendicitis

■ Pyrexia

■ Localised tenderness in the right iliac fossa ■ Muscle guarding

■ Rebound tenderness

Signs to elicit in appendicitis⁽¹⁾

■ Pointing sign

■ Rovsing's sign

■ Psoas sign

■ Obturator sign

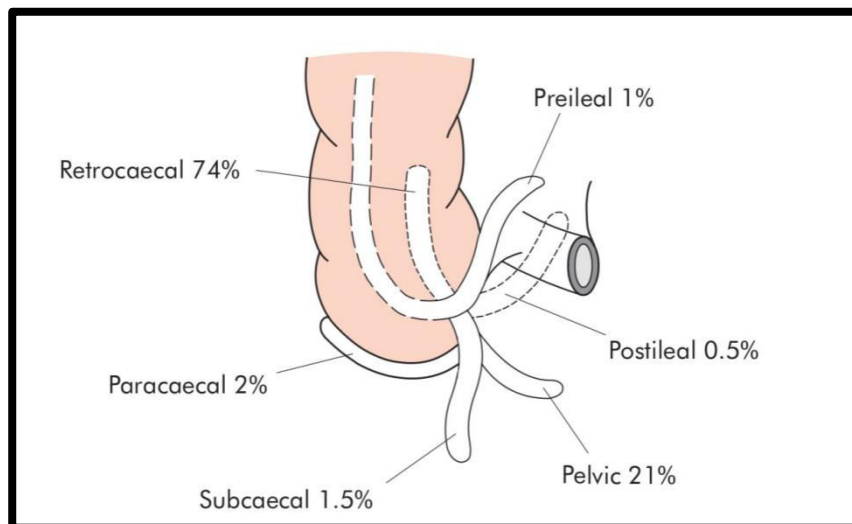


Figure (1): The various positions of the appendix (after Sir C. Wakeley, London, formerly PRCS).

Open appendectomy has been a safe and effective operation for acute appendicitis for more than a century. According to the literature, approximately 7% of the population develop appendicitis in their life time, with peak incidence between the ages of 10 and 30 years, thus making appendectomy the most frequently performed abdominal operation⁽²⁾. Recently, several authors proposed that the new technique of laparoscopic appendectomy should be the preferred treatment for acute appendicitis. However, unlike laparoscopic cholecystectomy, laparoscopic appendectomy (LA) has not yet gained popularity⁽³⁾. Laparoscopic cholecystectomy is now considered a standard method of performing cholecystectomy and has mostly replaced the old method throughout the world, while appendectomy has yet to achieve such popularity³. Since its introduction by McBurney in 1884, appendectomy has been a treatment of choice for acute appendicitis⁽⁴⁾. For more than a century, open appendectomy remained the gold standard of treatment of acute appendicitis and for interval appendectomy. In 1981, Semm, a German gynecologist performed the first laparoscopic appendectomy⁽⁵⁻⁶⁾.

Open appendectomy (OA) is standardized among surgeons and, unlike cholecystectomy, OA is typically completed using a small right lower quadrant incision and postoperative recovery is usually uneventful⁽⁸⁻⁷⁾. It is the second most common general surgical procedure performed after laparoscopic cholecystectomy, and the most common intra-abdominal surgical emergency, with a lifetime risk of 6%. The overall mortality of OA is around 0.3%; and morbidity, about 11%.⁴ The introduction of laparoscopic appendectomy (LA) was therefore greeted with initial reluctance, skepticism, or outright rejection by many surgeons⁽⁹⁻¹⁰⁾. Surgeons were discouraged by the disadvantages of the laparoscopic approach, including longer duration of operation, increased cost to the patient, and reports of complications⁽¹¹⁾. Nearly 3 decades later, large series of randomized controlled trials have shown significant evidence in favor of LA in many centers across the world. Despite published studies showing several advantages, the validity of this procedure in developing countries has not

been confirmed⁽¹²⁾. Hence the present study was planned to compare the clinical outcomes between laparoscopic and open appendectomy.

There are studies showing that laparoscopic appendectomy does not offer any advantages^(13, 14). With improved visualization of the entire abdomen, laparoscopic appendectomy improves the diagnostic accuracy and can identify the definitive pathology causing lower abdominal pain in young females than the open approach. It was concluded that laparoscopy reduces unnecessary appendectomies and improves diagnosis in fertile women.

Many advantages of Laparoscopic surgery have been documented over to open appendectomy.

It requires small incisions and its gives good visualization, it also gives better access to reach the organs in abdomen, as well as fast recovery in the postoperative period. Even Meta- analyses of randomized, controlled trials proved that this approach in better as compared to open appendectomy. It also showed that the incidence of intra-abdominal abscess is thrice more in LA than OA⁽¹⁵⁾.

The incidence of intra-abdominal abscess is found to be more common especially in complicated cases of appendicitis⁽¹⁶⁾. Hence laparoscopic appendectomy is considered a suitable surgical technique for uncomplicated appendicitis. As mentioned above, it has several advantages. But it has certain and some disadvantages also. Hence it is the choice of surgeons to decide whether to go for laparoscopic appendectomy or open appendectomy⁽¹⁷⁾.

Use of Laparoscopic appendectomy technique in cases of complicated appendicitis remains doubtful⁽¹⁸⁾. Considering pros and cons discussed above, laparoscopic appendectomy is suggested as the method of choice for surgical treatment for acute appendicitis⁽¹⁹⁾. Considering these issues, we have undertaken to study the efficacy of laparoscopic appendectomy its advantages, disadvantages and reasons for conversion of laparoscopic to open appendectomy.

Patients and Methods

We conducted retrospective review study of patients with appendectomy in Baquba teaching hospital between September 2020 and May 2021. Pregnant women and patients with severe medical disease (hemodynamic instability, chronic medical or psychiatric illness, cirrhosis, coagulation disorders) requiring intensive care were excluded. The decision about the type of the operation was made according to the preference and experience of the surgical team on duty. We analyzed 40 patient that met the inclusion criteria and their clinical data .. The patients were divided into two groups: open appendectomy (OA) group 20 patients and laparoscopic appendectomy (LA) group 20 patients. The collected clinical data included demographic data, comorbidities, initial laboratory findings, operation time, intraoperative findings , time to soft diet, postoperative hospital stay, amount of analgesics and postoperative complications. The diagnosis was made clinically with history (right iliac fossa or periumbilical pain, nausea/vomiting), physical examination (tenderness or guarding in right iliac fossa). In patients where a clinical diagnosis could not be established, imaging studies such as abdominal ultrasound or CT were performed. Both groups of patients were given a prophylactic dose of third-generation cephalosporin and metronidazole at induction of the general anesthesia as part of the protocol. OA was performed through standard McBurney incision. After the incision, peritoneum was accessed and opened to deliver the appendix, which was removed in the classical appendectomy. A standard 3-port technique was used for laparoscopic group. Pneumoperitoneum was produced by a continuous pressure of 12–14 mmHg of carbon dioxide via a Verres canula, positioned in supraumbilical site. The patient was placed in a Trendelenburg position, with a slight rotation to the left. The abdominal cavity was inspected in order to exclude other intrabdominal or pelvic pathology. After the mesoappendix was divided with bipolar harmonic, the base of the appendix was secured with two legating loops, followed by dissection distal to the second loop. Then, the distal appendicular stump was closed to avoid the risk of enteric or purulent spillage. The specimen was placed in an endobag and was retrieved through a 10-mm supraumbilical port. All specimens were sent for histopathology. The patients were not given oral feed until they were fully recovered from anesthesia and had their bowel sounds returned when clear fluids were started. Soft diet was introduced when the patients tolerated the liquid diet and had passed flatus. Patients were discharged once they were able to take regular diet, afebrile, and had good pain control. The operative time (minutes) for both the procedures was counted from the skin incision to the last skin stitch applied. The length of hospital stay was determined as the number of nights spent at the hospital postoperatively. Wound infection was defined as redness or purulent or seropurulent discharge from the incision site. Seroma was defined as localized swelling without redness with ooze of clear fluid. Paralytic ileus was defined as failure of bowel sounds to return within 12 h postoperatively. Waiver of informed consent from patients was approved because of the observational nature of the study .

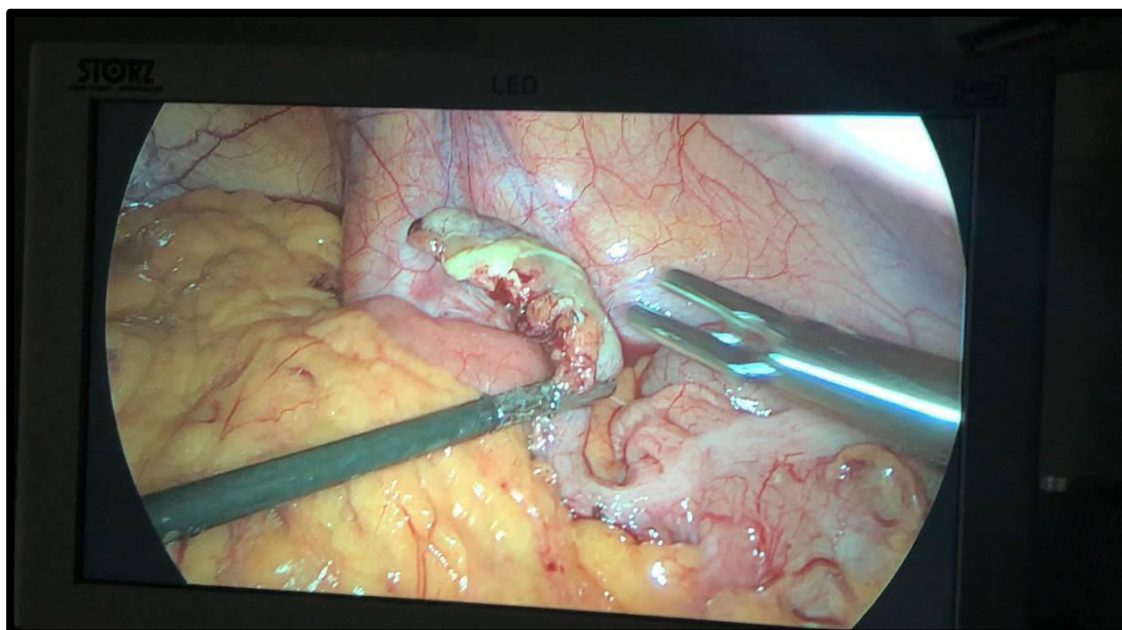


Figure (2): Laparoscopic appendectomy

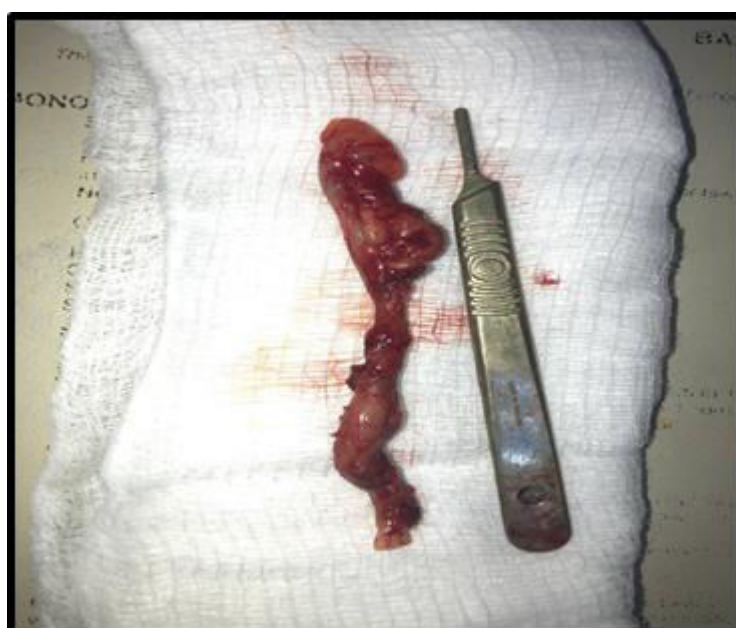
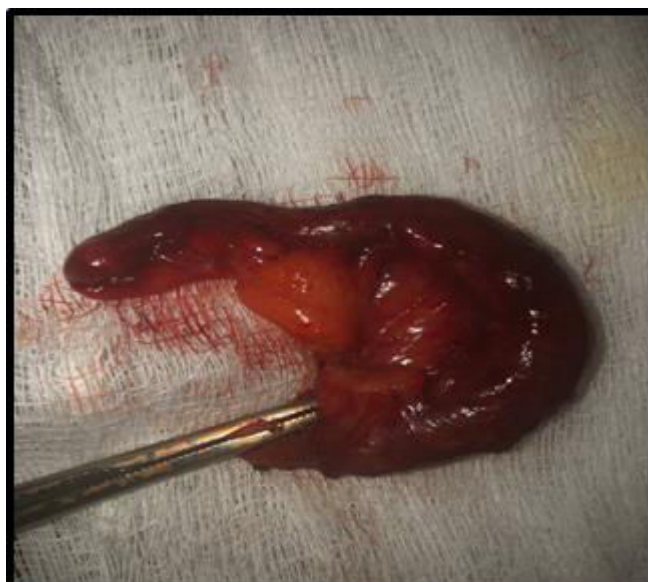


Figure (3): Inflamed appendix during laparoscopic appendectomy

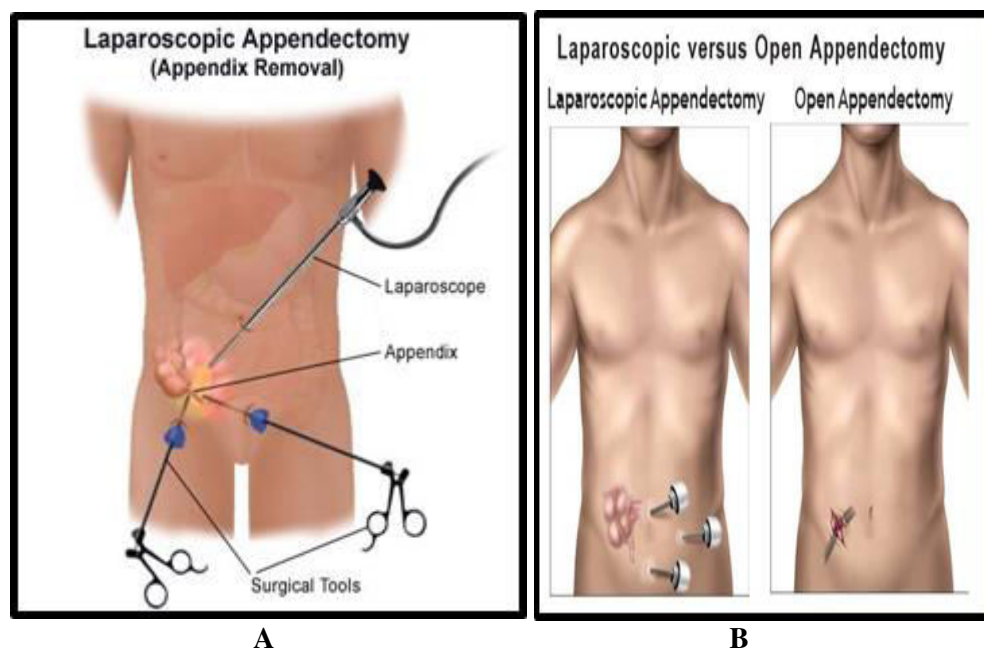


Figure (4): A. Laparoscopic appendectomy, B. Laparoscopic versus open appendectomy

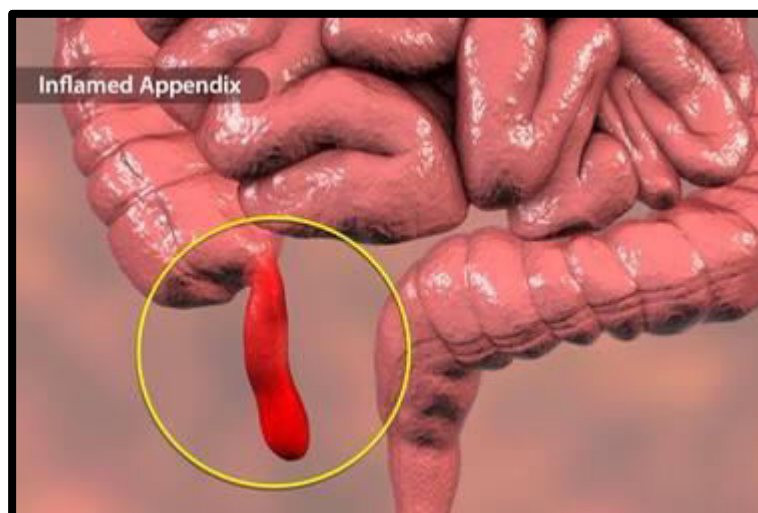


Figure (5): Inflamed appendix

STATISTICAL ANALYSIS

Data of current study were analyzed by using Chi-square (X²) test to compared between percentages. Numeric data were described by (Mean $\pm$ SD). T test used to compare between two numeric variables. A level of significance of $\alpha=0.05$ was applied to test. (Excel 2013) programs used to analyze current data.

RESULTS

Out of 40 patients with acute appendicitis, 20 patients underwent open appendectomy and 20 patients underwent laparoscopic appendectomy. Demographic and preoperative clinical data between OA group and LA group are showed in Table 1. There were no significant differences with respect to age and associated comorbidities. On the contrary, the difference in gender at presentation was statistically significant. Out of the total 20 open procedures, 13 (65%) males and 7 (35%) females. In the laparoscopic group, 20 procedures, 9 (45%) males and 11 (55%) females. operative and postoperative complication showed in table 2. In our study, the mean $\pm$ standard deviation (SD) operative time of 30 ± 3.2 min for the LA group was shorter than the mean operative time of 35 ± 5.2 min for open appendectomy ($p=0.049^*$).

Hospital stay was significantly shorter in the laparoscopic group with a mean $\pm$ SD of 1.4 ± 0.6 days compared with 2.7 ± 2.5 of the open appendectomy group ($P = 0.019^*$).

A highly significant difference existed between the 2 groups in time taken to return to routine daily activities, which was less in the laparoscopic group with a mean 11.5 ± 3.1 days compared with mean 16.1 ± 3.3 days in the open appendectomy group (Table 2).

We observed a greater overall incidence of complications in open surgery than in laparoscopic surgery. the Wound infection was reported by only 03(15.00%) individuals from open appendectomy group .

Table 1: Demographic and preoperative clinical data

	laparoscopic appendectomy n=20	Open appendectomy n=20	P value
Gender			
Male	9(45)	13(65)	0.394
Female	11(55)	7(35)	0.346
Mean age	27.75±14.24	29.66±15.13	0.761

Table 2: Operative and postoperative complication clinical data

	Laparoscopic appendectomy	Open Appendectomy	P value
Operative time (min)	30±3.2	35±5.2	0.049*
Hospital stay(day)	1.4±0.6	2.7±2.5	0.019*
Postoperative complication Wound infection	0(0.0)	3(15)	1.00
Return to normal activity(day)	11.5±3.1	16.1±3.3	0.053

DISCUSSION

Acute appendicitis is the most common intra-abdominal condition requiring emergency surgery ⁽⁵⁾ . The possibility of appendicitis must be considered in any patient presenting with an acute abdomen, and a certain preoperative diagnosis is still a challenge ^(20,21) .

Muhammad et al. conducted a similar study and reported that the mean age in the laparoscopic appendectomy group was 32 ± 14 years; the mean age of patients in the open appendectomy group was 34 ± 13 years ⁽²²⁾. These results are quite close to the mean ages in our study. This similarity in age is because appendicitis is more common in the younger age group, as shown by Thomas et al. ⁽²³⁾. According to Drinkovic et al., appendicitis was most common in the 11 to 20 year age group, but the increasing incidence in older patients may be due to increased life expectancies ^(24,25).

The significantly shorter mean operating time for laparoscopic as compared to open appendectomy noted in our study differs from Muhammad et al.'s findings, who reported the mean operating time as 75 ± 23 minutes for a laparoscopic appendectomy and 64 ± 15 minutes for an open appendectomy ⁽²²⁾. While in our study operative time as 30±3.2 minutes for a laparoscopic appendectomy and 35±5.2 minutes for an open appendectomy. Another study conducted by Lin et al. showed that laparoscopic appendectomy took a longer time to complete (96.1 ± 43.1 minutes) than open appendectomy (67.8 ± 32.2 minutes) ⁽²⁶⁾. These results were in contradiction to ours. However, our findings of shorter mean operating times via the laparoscopic approach align with studies by Tiwari et al., who found a mean operating time for laparoscopic appendectomy were 47.8 ± 14.5 minutes and 49.10 ± 12.5 for open appendectomy ⁽²⁷⁾. The variation reported in the literature in mean operating times may be due to variations in skill levels and experience with laparoscopic techniques in different centers.

Comparison of mean hospital stay in both groups in our setup showed an insignificant difference between the laparoscopic appendectomy group (1.4 ± 0.6 days) and the open appendectomy group (2.7 ± 2.5 days). Result of our study align with study done by, Muhammad et al. reported the mean length of hospitalization for the laparoscopic appendectomy group was 5.3 ± 2.1 days while open appendectomy group had a mean length of hospitalization of 7.2 ± 3.2 days ⁽²²⁾. In our study postoperative wound infection similar Muhammad et al., who reported that the rate of infections in the laparoscopic appendectomy group was 8.3% while that in the open appendectomy group was 24.4% ⁽²²⁾. Lin et al. also showed that the rate of infections was significantly lower in laparoscopic appendectomy (15.2%) than in open appendectomy (30.7%) ⁽²⁶⁾. This may be attributed to the fact that laparoscopic appendectomy requires less manipulation of the gut by the surgeon's hands and instruments as compared to open appendectomy. Furthermore, the gut does not come into contact with the incision in the layers of the anterior abdominal wall during laparoscopic appendectomy as the appendix is explored in situ.

Result of return to normal activity in our study similar to study done by Antonio et al. who reported 11.5 ± 3.1 days in laparoscopic appendectomy and 16.1 ± 3.3 ⁽²⁸⁾.

CONCLUSIONS

Our results showed the advantages of laparoscopic superior better than open appendectomy including shorter hospital stay, earlier return to work and lower rate of wound infection.

RECOMMENDATIONS

We recommend use Laparoscopic surgery for acute appendicitis because give a better results and less complications.

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NON-ALIGNMENT AND CONTEMPORARY WORLD ORDER

Athokpam Marconi Singh

Research Scholar, Junior Research Fellow Department of Political Science Manipur University, Canchipur-795003

ABSTRACT

The policy of non-alignment represents a political doctrine of detachment from the military blocs during the Cold War. The non-aligned movement emerged as a purely collective protest movement of the newly liberated countries in Asia and Africa against the polarised politics of the bi-polar world. It is a product of global politics that appeared after World War II. It expanded its scope in the sixties and gained phenomenal success as the moderating influence in the world during the seventies. The perspective of non-alignment has undergone significant change after the collapse of the Soviet Union. The contemporary world order brought a plethora of problems to the non-aligned movement. Though the non-alignment has lost its earlier enthusiasm as during the Cold War, some of the issues focused on by the non-aligned movement are still alive. It has achieved tremendous strides since its inception in international politics. The non-aligned countries need a new strong commitment to create the movement as a real-world force by facing pronounced challenges of the growing opposition.

Keywords: Cold War, Disarmament, Global Politics, Non-alignment, Sovereignty.

INTRODUCTION

The birth of the crystallisation of the bi-polar world saw the rise of non-alignment as a diplomatic operation of the newly liberated countries of Asia and Africa. After World War II, the Cold War emerged between the United States and USSR. The United States tried to expand democracy, but the USSR aimed to spread communism. These two nations, with their allies, were fighting over the political ideology. This is known as bipolar world political order. The international political situation had a negative impact on the newly emerging nations of the world. The two Super Powers targeted them to spread their influence. These newly emerging countries wanted to avoid entangling themselves in the power blocs led by the United States and USSR during the Cold War. They designed a policy of staying away from the military alliances to take the role of the mediator to prevent war and maintain world peace. This policy is known as non-alignment. The core of the non-alignment is to stay away from military blocs, preserve the independence of a nation and its national interest and freedom to choose its own path in internal and external policies. The genesis of non-alignment lies in the anticolonial and solidarity movements of the Afro-Asian countries. The first demo of this solidarity was noticed at the First Asian Relations Conference, 1947, held in New Delhi. At this Conference, Jawaharlal Nehru, the architect of non-alignment, proposed the countries of Asia to stand on their own feet and bound to have their politics in world affairs. He wanted them to be no longer used as pawns by others. The Bandung Conference, 1955 marked the beginning of the non-aligned movement. The objectives and tasks of the non-aligned movement were first formulated at the Belgrade Conference in 1961. Chronologically, India was the first nation which adopts the non-alignment. The nation led the Afro-Asian countries in shaping the essence of non-alignment. During the last sixty years, the non-aligned movement has raised its voice against disarmament, imperialism, neo-colonialism, racial discrimination and economic exploitation to maintain world peace. Today, the non-alignment has earned criticisms from many quarters. The problems of the world are becoming more and more complicated, which demands the non-aligned movement to deal with the changing international environment.

OBJECTIVE OF THE STUDY

The non-alignment has been one of the significant areas of study in international relations. The present study analysed whether the policy of non-alignment is relevant or not in the newly emerging world order. It highlighted the major principles of the non-alignment and the criterion that need to be fulfilled for its membership. It suggested valid reasons and measures for the revitalisation of non-alignment.

Meaning of Non-Alignment

Non-alignment refers to the policy adopted by the newly emerging nations to remain aloof from the military alliances of the United States and USSR during the Cold War. George Schwarzenberger defined non-alignment as a policy of keeping out of alliances. Jawaharlal Nehru said, "Broadly, non-alignment means not tying yourself off with military blocs of nations or with a nation. It means trying to view things, as far as possible, not from the military point of view, though that has to come in sometimes, but independently, and trying to maintain friendly relations with all countries." Non-alignment has two aspects. In its positive aspect, non-

alignment implies perseverance of freedom by a country to adopt concerning global politics. The negative aspect implies opposition to the formation of military blocs. The concept of non-alignment is indifferent to neutrality. A neutral policy is passive, but non-alignment is active. Non-alignment has nothing to do with neutralism or isolationism but is an expression to judge the issues independently. It rejected the hegemony of Super Powers. It opposed the military alliances that divides the world. It encouraged friendly relationships among nations and peaceful settlement of conflicts. It advocated sovereign equality of all nations. It favoured comprehensive nuclear disarmament. It aimed to extend support for the United Nations to establish universalism and multilateralism. It is not a static but dynamic policy. It incorporated a broader connotation than it exactly appears on the surface.

Criterion of Non-Alignment

The preparatory meeting of the Conference of Uncommitted Countries was held in Cairo from 5th to 12th June, 1961. It formulated the following criterion that needs to be fulfilled by the countries who want to adopt the non-alignment.

1. A country should follow an independent policy of non-alignment or should be showing a trend in favour of such a policy.
2. It should consistently have supported movements for national independence.
3. It should not be a member of multilateral military alliances concluded in the context of Great Power conflicts.
4. If it has conceded military bases, these concessions should not have been made in the context of Great Power conflicts.
5. If it is a member of a bilateral or regional defence arrangement, this should not be in the context of Great Power conflicts.

Principles of Non-Alignment:

Every policy has definite principles. The major principles of the policy of non-alignment are discussed below:

- (a) **Anti-Imperialism and Anti-Racialism:** The non-alignment considered anti-imperialism as the chief principle. The non-aligned countries aimed to erase imperialism from the world so there would be no curtailed human rights and victims of imperial domination. They also opposed racial discrimination and urged for universal brotherhood and equality.
- (b) **Preservation of Sovereignty:** After coming out from the bondage of colonialism, the erstwhile colonies aimed to preserve their hard-won independence and sovereignty. They realised that they had lost their independence and had less significance in world affairs during their existence under colonialism. They wanted to be free from power blocs to pursue an independent foreign policy due to their political, economic, and military weakness.
- (c) **Nuclear Disarmament:** Non-alignment opposed the nuclear arms race. It aimed to bring the relaxation of international conflicts and tension due to armament. It stood for nuclear disarmament for peaceful resolution of the problems.
- (d) **Maintenance of World Peace:** The non-alignment rejected war which brings nothing but the destruction of the entire humanity. The non-aligned countries felt that military alliances and armament eventually resulted in war. They believed that the policy of non-alignment is best designed to avoid war and maintain world peace.
- (e) **Support to the United Nations:** The non-alignment aimed to ensure that the United Nations work successfully to deal with all the global issues. The non-aligned countries wanted to use the United Nations as the most appropriate global platform for taking part in international politics. Their decisions can exercise a significant influence on the General Assembly.
- (f) **Economic Development and Equitable International Economic Order:** The non-aligned countries were poor and underdeveloped. They focused on developing their economy to recover the exploitation of economic resources by the colonial rulers. They wanted to improve the living standard of their people and develop their nations at a fast rate. After the end of the Cold War, they felt a wide gap between developed and developing countries in terms of economy. The gap is becoming wider due to the monopolised of economic resources by the developed countries. In other words, the prevailing economic order is found to be in favour of the developed countries. They wanted to establish an equitable international economic order.

Is Non-Alignment Relevant in the Contemporary World Order?

It is often asked what is the relevance of non-alignment in today's world affairs. It is generally believed that non-alignment emerged as a particular reaction to the Cold War era, and its relevance should have become redundant with the end of the Cold War. Many scholars have shared bitter criticisms against non-alignment. James Burton stated, "there has been no full treatment of the concept, no analysis and precise description, no exposition through which others might estimate the significance and prospects of policies of non-alignment." Critics argued that the definition of non-alignment is confused with many terms, including neutralism. Some proponents of non-alignment are even not very clear about its exact meaning. The founder nations of the non-alignment have failed to analyse its concept for popular understanding. The Western Scholars admitted non-alignment as nothing but a policy to fulfil the selfish interest of non-aligned countries. The non-aligned countries were blamed for abusing their position and taking sides. Many non-aligned countries have close ties with the Super Powers. Nuclear disarmament has not so far seen success. Apart from the Super Powers, the developing countries speed up the process of nuclear armament. The world is full of fear of the ultimate destruction created by nuclear weapons. The non-aligned countries have failed to stop the spiralling arms race to save humankind from nuclear threats and future catastrophes. Decolonisation has become almost complete since most of the colonies gained their independence. The gap between the economies of the rich and developing countries is still widening. It is also claimed that the United Nations is under the control of the veto powers, and the non-aligned countries cannot use the United Nations as a global platform despite their numerical strength. The enthusiasm of the non-aligned movement during the Cold War has been lost in the contemporary era.

Though the non-aligned movement has been confronted with myriad critical challenges, the study of the events and policies of the past and present revealed that the non-aligned countries never adopted an aggressive approach towards any nation or power blocs. Their approach is directed towards a positive goal where all the nations would be living together in peace and have an equal opportunity to enhance their well-being. During the Cold War, numerous crises took place in which the non-alignment movement validated its utility. The Suez Canal Crisis and the Congo War can be illustrated as examples. The issues raised by the non-aligned countries are still alive. Nuclear disarmament, preservation of sovereignty, world peace, racism and equitable international economic order remained major global issues that need to be discussed at major forums of the international community. The agony of the world brought by the nuclear threats proved that the disarmament of non-alignment remains valid. The ideology of coexistence formulated by the non-alignment is gaining more prominence. The pressure to establish the New International Economic Order was built by the non-aligned countries. The policy of racial discrimination is widely prevalent, and the non-aligned countries moved in the direction of universal brotherhood and racial equality. As long as these issues exist in a unipolar world, the relevance of non-alignment would remain undisturbed. Emmanuel Togbiyele said, "In finding solutions to the grave problems of peace and war, non-aligned nations have an immense power for good- the power of the weak." The non-aligned movement has grown its members over the year, showing the relevance of the policy in no small measure. The non-aligned countries may not be able to pose a significant challenge to the veto powers of the United Nations, but the voice of their overwhelming majority in the General Assembly can represent a world public opinion. The role of a balancer played by the non-aligned countries ignoring power struggles represented a new role in global politics. The non-aligned movement has not lost its relevance, but it needs to be strengthened as earlier to prove that it offers the only alternative to challenge power politics in the contemporary world.

Revitalisation of Non-Alignment

The policy of non-alignment has undergone significant changes due to the radical change in international affairs. But it has strong positive sides despite glaring imperfections. The world is still full of conflicts among nations, and the Super Powers and advanced countries have always tried to interfere and dominate the developing countries. It has miles to go to create an ideal peaceful order of the non-aligned movement. There is a need to revitalise the non-alignment and its movement in today's world. Mere resolutions, discussions and debates would not be meaningful to revitalising its earlier spirit. In *New Horizons of Non-Alignment*, B.K. Kaul recommended many measures to make non-alignment a more effective force for peace and progress. Firstly, the non-aligned countries should adopt only peaceful means to solve their mutual disputes. They should not have any direct or indirect ties with the military alliances of the Super Powers. Secondly, they should treat aggression against any non-aligned countries as aggression against all and promise to extend every possible support to defeat the aggressor. They should attempt to bring about actual disarmament, which remains the most significant dream to be realised. Fourthly, they should reduce their dependence on advanced countries to fight against their exploitative practices. They should focus on mutually beneficial economic, cultural and trade relations with them. Though many politically and socially varied countries adopted the policy of non-alignment,

there is a similar approach among them in terms of preserving sovereignty, peace and developmental needs. They should have to retain such an approach without any influence from the Super Powers. They should endeavour to develop a collective political will to work towards the goal of non-alignment.

CONCLUSION:

The policy of non-alignment emerged in a divided world during the Cold War. It has travelled a long journey. The conflicts and tensions between the nations and the ever-increasing acceleration of the arms race provided a severe threat to world peace. The changing international environment has brought a complex system for the non-alignment to pursue their objectives. The question about the relevance of non-alignment is highly relevant. Though it arose as a reaction to the Cold War, it does not mean that the end of the Cold War makes it redundant. The non-alignment has achieved tremendous strides since its inception in international politics. The revival of earlier vigour of non-aligned movement is indispensable in bringing stability to the majority of the world's nations. It must not stop struggling against military blocs and alliances, nuclear threats, intervention in sovereignty, antagonistic policy and economic deterioration. The non-aligned countries need to adhere to the principles of the movement and construct a collective bargaining platform. They should rejuvenate the same sense of sagacity and commitment as shown during the height of the Cold War to create the movement as a real-world force by facing the pronounced challenges of the growing opposition. No Super Power can flout the world opinion if the non-aligned countries strongly challenge the legitimacy of the nuclear weapons. Though the very basis of the policy of non-alignment has lost its vigour, it will remain the driving force for a future of peace, dignity, development and progress for all in the present epoch and beyond.

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OVERALL VIEW ON DIETARY PROTEIN SUPPLEMENTS- REVIEW

Sandhya R¹ and Dr. Ghadevaru Sarathchandra²¹Department of Food processing Engineering, SRM Institute of Science and Technology, Kattankulathur
Professor and Head²Pharmacovigilance Laboratory for Animal Feed and Food Safety, Tamil Nadu Veterinary and Animal sciences
University, Chennai**ABSTRACT**

This review tries to synthesise available research and reach a consensus on the benefits and drawbacks of protein supplementation. Large section of the general population and adults typically utilise Protein supplements for meal replacement, weight loss, and health advantages, to increase their muscular growth and strength because protein supplements are rich in vitamins, minerals and have water-soluble milk protein. Any addition to an adult's regular diet to attain a specific nutritional goal is referred to as a supplement. Protein powders (soybeans, peas, rice, potatoes, or hemp) are powdered sources of protein obtained from plants, eggs, or milk (casein or whey protein). In recent years, protein supplementation has become increasingly popular among gym-goers and the general population. It is recommended that the required protein intake be obtained through natural food sources, with protein supplementation being used only if adequate protein is not available in the regular diet.

Keywords: Protein supplements, Dietary, Mass gain.

1. INTRODUCTION

Protein is an essential component of a balanced diet. Proteins are made up of amino acids, which are chemical 'building blocks. Amino acids help our bodies build and repair muscles and bones, as well as produce molecules and substances. They have the potential to be employed as a source of energy. Proteins are large biomolecules and macromolecules made up of a series of lengthy amino acid chains. Protein is a macronutrient required for proper growth. It is most commonly found in creature items, however it can likewise be seen as in nuts and vegetables. Protein can be found in an assortment of food sources, and it's basic to devour sufficient protein in your eating regimen consistently. Protein is a supplement that your body expects to develop, fix, and capacity successfully.

Dietary restrictions such as the amount and type of protein consumed, as well as non-protein energy sources, are thought to affect protein digestion. As a result of constant attention, protein digestion improves. Taking care of results in a net protein gain, which offsets protein losses during the post-absorption interval. Proteolysis inhibition, protein combination stimulation, or net protein gain could come from planned modifications in these two factors that result in a faster rate of protein amalgamation than proteolysis. Postprandial protein digestion is controlled by dietary parameters such as protein quantity, absorbability, and AA profile. Additionally, the rate of protein absorption appears to be an independent regulatory variable of postprandial protein gain, according to mounting evidence. The improved responsiveness of protein amalgamation to taking care of through an expanded removal of AA to muscle was attributed to the superior adequacy of the beat design. For different populaces, the pertinence of slow or quick protein relies upon changes of protein digestion that must be forestalled or amended. Applications in a variety of pathophysiological disorders are only hypothetical and need to be researched further. ^[18]

Changes in urinary calcium discharge in the two gatherings didn't vary altogether throughout the span of the review. When elderly people with severe hip fractures were supplemented with 20g/d protein for a long time, over the course of a year, they experienced less bone misfortune in the contralateral hip than controls. Protein has been shown to cause calciuria in response to its corrosive delivery load on numerous occasions. Although baseline estimates for the things were not available for this investigation, clinical features, food profiles, calcium discharge, and bone mineral thickness were all areas where the two groups agreed well, indicating that the other measures were likely to be agreed upon as well. ^[17]

2. NUTRITIONAL VALUE

The number of necessary amino acids found in a protein determines its nutritional value. Essential amino acids can be found in varying levels in different diets.

- Animal products (chicken, beef, or fish, as well as dairy products) are complete proteins because they include all of the essential amino acids. All of the required amino acids are found in soy products, quinoa, and the seed of an amaranth leafy green (which is eaten in Asia and the Mediterranean).

- Plant proteins are frequently incomplete proteins because they lack at least one necessary amino acid.

In terms of performance, there is no scientific agreement on the benefits of protein supplementation. Several research have looked into the proposed pathways that are linked to the intended performance effects of protein supplementation.^[1]

3. Protein Supplements

Protein supplement attractiveness is fueled by claims of enhanced muscle mass, fat loss, higher performance, and improved recovery signs. Protein consumption during and around a training session appears to be regulated by total daily protein intake as well as the existence or absence of an energy deficit in terms of recovery and performance. While the findings support the impact of post-exercise protein consumption on fat free mass (FFM), Those who consume enough daily calories and a minimum of 1.6 g/kg of protein per day may not show any additional benefit from immediate post-training protein consumption on muscle strength.^[2]

Continuous eating alters protein metabolism. Net protein accretion occurs as a result of feeding, which compensates for protein losses after absorption. Protease inhibitors, protein synthesis stimulators, or Net protein gain could come from any coordinated changes in these two factors that result in a rate of protein synthesis larger than the rate of proteolysis. Furthermore, there is mounting evidence that the pace at which proteins are digested is an independent regulatory element of postprandial protein accumulation. The pulse pattern's higher effectiveness was connected to improved protein synthesis response to feeding via increased AA disposal to muscle. The importance of slow or fast protein in different populations is determined by changes in protein metabolism that must be avoided or corrected.^[3]

4. Types of Protein Supplements

Protein powder is a well known healthful supplements that is accessible in numerous assortments. The food and medication organization doesn't control dietary supplements, for example, protein powders as stringently as drugs.

- Whey and casein protein
- Plant protein

Whey protein is a fast-digesting protein that the body can absorb quickly. This implies it's a good protein source for a snack before or after a workout. Because casein takes longer to digest, it may be beneficial to consume it before fasting or sleeping.

Plant protein, for example, hemp protein and pea protein are possibilities for veggie lovers, individuals with lactose bigotry and those whose bodies don't process milk protein well.

5. Dietary Protein Supplements

Protein supplements are protein and nourishment sources, as well as food items, that body builders and competitors use to assist them with meeting their every day protein prerequisites. Protein powders, protein bars, weight gainers, and feast substitutions are generally instances of protein supplements. Protein supplements are ordinarily enhanced with nutrients and minerals and give more than 20 to 30 grams of protein for each serving. Protein supplements are accessible in a wide scope of flavors, including natural product enhanced protein powders, treat and cream-seasoned weight gainers, and peanut butter-seasoned protein bars.

6. Recommendations of Protein Intake for Healthy Adults

Protein need increments alongside expanding power and length of execution. Prior proposals zeroed in additional on all out-protein consumption during the day, though ideal planning of protein admission is presently likewise featured.^[10] Protein should be remembered for dinners when the true presentation is made, as well as during the day (every 3-5 hours) to maintain a sufficient stockpile of essential amino acids. In spite of the fact that proposals on protein admission are given independently for perseverance and strength competitors, more significant is to adjust the admission as indicated by the requirements of various preparation periods. Another major challenge is eating enough energy to guarantee that amino acids are used rather than oxidised for protein synthesis.^[11] It is critical to evaluate how dietary protein and fat intake control may have a greater impact on body weight and body synthesis in competitors than carbohydrates, although this impact can vary depending on hereditary variations.^[12]

If the eating regimen of sportspeople needs protein, a few consequences for organ frameworks might happen. Satisfactory protein admission should uphold bone digestion and body protein upkeep, for instance, and these viewpoints contribute to excellent athletic performance and injury avoidance. In extreme situations, a lack of protein may also produce feminine problems in female competitors. The lack of explicit equipment and

biomarkers for assessing competitors' nutritional condition has resulted in a scarcity of data on the rate of protein deficiency in athletes. There is just restricted data accessible concerning the conceivable unfriendly impacts of long-haul protein supplement usage; this features the requirement for better guideline and direction for protein supplement accessibility and measurement, individually, particularly for explicit gamble populaces, like individuals in danger of kidney disappointment. Besides, liver and bone digestion might be abundantly tested due to unnecessary protein admission, and future exploration is expected to permit clear science-based suggestions for explicit populace gatherings.^[13]

7. Benefits of Protein Supplements

One of the building blocks of bone, muscle, and skin is protein. It is required by the body for the production of hormones, enzymes, and other compounds. The following are some of the potential health benefits of protein powders:

- Weight management
- Muscle growth
- Added nutrition

Amino acids are not stored in the same way as unsaturated fats or carbohydrates are. This implies that we need to guarantee that day by day admission of amino acids expected for protein amalgamation and other explicit metabolic capacities are satisfactory. The amounts of amino acids in the blood are rather stable. As a result, muscular protein breakdown increases when dietary protein absorption is poor. Individually, in the event of extreme dietary admission, proteins are catabolized and utilized for energy.^[14]

The mammalian objective of rapamycin (mTOR) pathway has been shown to invigorate muscle protein blend in a portion subordinate approach using whey protein, which has the highest BCAA concentration of all regular protein sources. Portion reliance has been displayed to level at around 2 g of leucine very still, however to increment up to 3.5 g leucine when ingested post-work out. Expansions in plasma leucine and all out BCAA fixations have been related with further developed perseverance execution and chest area power.^[15]

One more chance to upgrade MPS and post-practice recuperation is protein organization before rest. Ingestion of 30-40 g casein subsequent to evening exercise has been displayed to invigorate net muscle protein growth over the course of the evening and further develop entire body protein balance. In spite of the fact that, MPS is generally dynamic during the initial not many hours post-work out, muscle seems, by all accounts, to be sharpened to protein taking care of for somewhere around 24 h after work out.^[16]

The nature of dietary protein is likewise significant. Competitors ought to consume protein with a high organic worth to acquire sufficient measures of EAA. When compared to plant proteins, which are often deficient in at least one EAA, animal and particularly dairy-based proteins have the highest EAA content and the greatest anabolic benefit. MPS is best energised by quickly digested proteins that include enough leucine (700-3000 mg).^[10]

8. Risk of Protein Supplements

When utilizing a protein powder, there are a number of hazards to consider. We have no idea what the long-term ramifications will be. "There is a scarcity of data on the potential negative effects of high protein supplement use," McManus writes. It's probable that it'll make you feel nauseous. "People with dairy allergies or problems digesting lactose [milk sugar] may have gastrointestinal distress if they consume a milk-based protein powder," McManus says.

It could contain a significant amount of added sugars and calories. Some protein powders have a little quantity of added sugar, while others have a large amount. Protein powders can turn a glass of milk into a drink with almost 1,200 calories. Risks include weight gain and an unhealthily high blood sugar level. The American Heart Association recommends that women limit their sugar intake to 24 grammes per day and men limit their sugar intake to 36 grammes per day.

9. Adulteration on Protein Supplements

Milk, milk products, wines, coffee, chocolate, and a variety of other foods have all been misrepresented.^[9] Whey from milk is a by-product of the cheese-making process that was formerly thought to be a waste product and an environmental pollutant with no commercial use.^[4] Whey makes up roughly 85–90% of the volume of milk used in cheese making, and it maintains around 55% of the milk's nutrients.^[5] It has a lot of potential in the sports nutrition market as a functional ingredient because it's high in important amino acids, especially those with branched side chains.^[6] Product authentication, which verifies that a specific food matches its label

description, has gained in popularity as the public's awareness of food quality and safety has increased. As a result, in the modern food sector, continual quality monitoring is an unavoidable demand.^[7] Whey protein concentrate (WPC) is a protein-based nutritional supplement used by athletes and sportsmen who claim to have increased performance and a higher yield in protein anabolism.^[8]

10. Approval and Acceptance

Research has shown that numerous dietary enhancements sold in significant corporate store, regular food shops, and respectable web-based outlets don't contain or contain fixings that are not recorded in the lab. If they want to sell or advertise some dietary supplements, even those that help in muscle development, manufacturers do not have to get approval from the Food and Drug Administration. It needs to go through the drug approval process if the company wants to market a muscle growth drug, either as a prescription product or for over-the-counter sales. Otherwise, if only a nutritional supplement is to be marketed by the manufacturer, it would only ensure that the food it offers is safe for human use. In India, the No bodybuilding supplements have been approved by the FDA. Protein supplements must be imported from foreign countries and consumed with certain restrictions and safeguards. FDA has given Good Manufacturing Practices (GMPs) for dietary enhancements, a bunch of necessities and assumptions by which dietary supplements should be made, ready, and put away to guarantee quality. Makers are relied upon to ensure the character, virtue, strength, and piece of their dietary enhancements. "There are a few non-profit organisations that offer "seals of approval" that can be shown on specific dietary supplement products. These show that the item has finished the association's quality assessments for things like intensity and impurities. These "seals of approval" don't imply that the item is protected or viable; They certify that the item was manufactured properly, that it contains the contents listed on the label, and that it is free of dangerous contaminants." When it comes to product safety and labelling, the FDA defers to producers. As a result, there's no way of knowing if a protein powder contains the elements that the manufacturer claims it does.

11. CONCLUSION

Over time, total daily calorie and protein consumption have the most important nutritional roles in enabling exercise adaptations. When these considerations are considered, however, peri-exercise protein consumption appears to have a potential benefit in terms of improving physical performance and recovery. Established researchers typically support moderate protein intake, while some analysts have noted that the momentum suggestions may be missing for competitors, the elderly, or because of weight-control and weight-loss programmes that track calories. With regards to protein and amino corrosive enhancements, these different parts present in these items might actuate antagonistic impacts during long haul utilization, Sportspeople, as well as their manner of life, may be more vulnerable than competitors. We propose that as opposed to adding protein and amino corrosive enhancements to high-protein counts calories, protein ought to be ideally gotten from entire food sources, like fish, eggs, dairy items, vegetables, and cereals, alongside strands and other food parts supporting the prosperity of both the host and their stomach microbiota. This should be included in the healthy programmes of competitors, athletes, and more stationary populations. Moreover, the showcasing and publicizing of high-protein and amino corrosive items ought to be pain stakingly arranged and coordinated by protein needs.

The current proposals supply a satisfactory measure of protein for a great many people, no matter what their movement level, yet in explicit cases there may be a requirement for higher protein admission. Notwithstanding, for some individuals, a protein admission higher than the current proposals won't give any extra advantage, and for some's purposes, it could adversely affect wellbeing. This study was conducted in order to synthesise available research and reach an agreement on the benefits and drawbacks of protein supplementation.

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PARENTAL INVOLVEMENT IN CHILDREN'S PRIMARY EDUCATION

Percy Touthang and Dr. Keisham Shitaljit Singh¹Research Scholar and ²Associate Professor, Department of Education Manipur University Canchipur-795003, Manipur, India**ABSTRACT**

Parents are the first and foremost essential teachers, influencers, nurturers, and guides. Parental involvement is considered a critical factor in the child's overall development. It is an essential strategy for the advancement of the quality of education. The ultimate objective is to expand the social and cognitive capacities of children. The present study aims to determine parental participation based on three dimensions: School Involvement, Home Involvement, and Involvement through PTA. The study was conducted on 30 parents based on Stratified Sampling selected from the Saikul sub-division of Kangpokpi District, Manipur, India. The researcher used the Parent Involvement Scale developed by Dr. Rita Chopra and Dr. Surabala Sahoo as an instrument to collect data. The data were analyzed by the Percentage Method. The study's findings revealed that there is an average level of parental involvement among the parents of Saikul Sub-division of Kangpokpi District, Manipur.

Keywords: Home Involvement, Parent, Parental Involvement, Academic Achievement, Primary Education, Children

INTRODUCTION

All great people were children once, and all children will be great men one day. Children are the precious human resources that must be trained, nurtured, and well educated because they are the nation's wealth. Education is necessary for every individual if he or she is to lead a life successfully. It enables a man to find solutions to his life problems easily. It makes individuals fit for their environment- both natural and socio-cultural- by developing their abilities. Education is essential for society to develop. If there are more educated people in society, the more civilized and well-disciplined the society will be. Mainly, the family is responsible for socializing children to make them productive members of society. Parents play the most crucial role in the overall development of the child. It is the proper guidance of the parents that makes the child a successful, valuable, and refined person.

A child's behavior during the early years can be molded and shaped in the desired form. If we provide negative impressions, they will be difficult to remove in their later life. Moreover, if the child is rear in an open, affectionate, and accessible environment with care and attention, the latest developments of the child will be healthy. Home- a center of love and affection is the best place and the first school for children. Education starts at birth, and the proper nurse is the mother. Mothers are the ideal teachers, and informal education at home is most effective and natural. The more the parents engage themselves in imparting education to their children, the more they will excel in their academic careers and become productive and responsible members of society. It has been assumed that the academic achievements of students do not only depend on the schools and the teachers; instead, the extent of parental involvement has a vital role. Learning begins at home through interaction with one's family. A child's learning is enhanced when schools encourage parents to stimulate their children's intellectual development. The home environment has a substantial impact on what children and youth learn, not only in school but outside of school as well. This environment is more powerful than the parents' income and education in influencing what children learn during their early years of life. Children spend most of their time from infancy throughout their childhood under the influence of their parents. Parents are the ideal teachers, and informal education at home is most effective and natural. Therefore, ultimately, parents are their first and foremost essential teachers, influencers, nurturers, and guides. The more the parents are involved in imparting education to their children, the more they will excel in their academic careers and become responsible members of society. So, Parental Involvement is an essential factor in the rearing and upbringing of the child. Studies have shown that parental involvement and academic achievement have positively correlated. Offering support to children helps them to create an everyday routine of learning.

Review Of Related Studies

Henderson and Berla (1994) reported in "A New Generation of Evidence: The Family is Critical to Student Achievement" that when parents are involved in their children's education at home, they do better in school and set higher academic goals. They conducted a meta-analytic synthesis of 66 studies, reviews, and books. They found that high levels of parental involvement are linked with higher student achievement, better attendance, higher rates of completing homework, desirable student attitudes and behavior, higher graduation rates, and more excellent enrolment rates in post-Secondary education. The authors opined that the most accurate

predictor of student achievement in school is not the parental income but the extent to which the family can support their children's learning: parents as teachers, supporters, advocates, and decision-makers. The findings suggest that parents who take a vital role in their children's education enhance their learning process.

Catsambis (2001), in her study "Expanding Knowledge of Parental Involvement in Children's Secondary Education": Connections with High School Seniors' Academic Success, explored the impact of parental involvement on the success of high school seniors. She found that parental involvement during the senior year does impact students' success but not as much as it did in earlier years. She also found that educational expectations and parental encouragement were the most effective parental involvement in affecting academic success.

Pati and Acharya (2005) in their study "Out of School Learning and its Impact on the Achievement of the Pupils" analyzed that the pupils who learn from parents or guardians after the normal school instruction had done much better achievement in the exam than those learned in group coaching or tuition and learned by them.

Sreekanth (2010) conducted a study on "Parents involvement in the education of their Children": Indicators of level of involvement. In this study, 35 parents from grades(classes) VI to X were invited for a one-to-one interview with the author. The responses to several questions indicate that there was a wide variation among parents regarding how they perceive the education of their children. While most of the interviewees were committed to bare acts such as attending a parent-teacher meeting, supporting children with homework, being proactive with the teachers for the welfare of the children, etc., there were few positive responses from parents of a higher level of involvement.

Milad Khajehpour (2011) conducted a study on "The role of parental involvement effect in children's academic performance." The study uses multiple measures to examine parental involvement. It discusses various areas such as volunteering, home involvement, and attending parent classes. The population of the investigation consisted of three regions of Tehran and Iran. A sample of 200 boy students was drawn through a randomized process from 10 schools by multistage cluster sampling. Parents were asked about how they are involved in their children's academic performance. The study found that parental involvement and academic achievement have a positive and significant correlation. It also shows that children's academic performance in families with high parental involvement is better than children with low parental involvement. The authors conclude that when teachers and educational administrators are strongly committed to drawing parents into their children's education, the academic product for children can be very positive. Parental involvement shows to be an essential variable in children's education. The author hoped that the study results would give parents and educators a better understanding of how parental involvement affects children's performance.

Prajapati Ashok N (2014) conducted a study on "The Effect of Parental Education area in Parental Involvement on Children's Study Habits, Academic Anxiety and Academic Achievement." The study attempts to find out the significant role of the degree of parental involvement on study habits, academic anxiety, and academic achievement of their children. The sample consists of 640 parents and 640 children studying secondary or higher secondary school. The sample was selected randomly from various Central and North Gujarat locations from both the sexes and ages ranging from 35 to 50 and 13 to 17 years for parents and their children, respectively. The study found that the difference between children with less and more involved parents in study habits is significant. Children of more involved parents have better study habits than less involved parents. The difference between children of less and more involved parents on academic anxiety is non-significant. The children of more involved parents have slightly higher levels of academic anxiety than the children of less involved parents. The difference between children of less and more involved parents in academic achievement is significant. The children of more involved parents have slightly higher levels of academic achievement than that of less involved parents.

Dalal Rekha (2019) conducted a study on "Self-Regulated Learning and Academic Achievement of Senior Secondary School Students concerning Parental Involvement, Achievement Motivation, and Goal Orientation." The study to find the relationship between parental involvement and self-regulated learning, parental involvement, and academic achievement of senior secondary school students. It also studies the difference between self-regulated learning of senior secondary school students having high and low parental involvement. It further looked at the difference between the academic achievement of senior secondary school students having high and low parental involvement. The investigator used a descriptive survey method for the study. The sample for the study comprises 400 students of the 11th class selected randomly from 10 senior secondary schools in Rohtak and Faridabad districts. The study's main findings include a positive and significant relationship between self-regulated learning and parental involvement, achievement, and parental involvement.

A significant difference was found in the academic achievement of senior secondary school students having high and low parental involvement. Thus, the higher parental involvement, the higher the self-regulated learning and better academic achievement will be.

Saleem T and Zaffar F (2022) conducted a study on "Multiple Facets of Parental Involvement and the Homework Performance of Primary Level Students." The study examines the multiple facets of parental involvement among the parents of primary-level students. The study also compares the effect of various aspects of parental involvement on the homework performance of primary-level students. The investigator uses a Cross-sectional survey design to investigate the influence of three facets of parental involvement on the homework performance of grade 4 and 5 level students from 10 primary level schools of Hattian Bala city. Convenient sampling was used to select the ten schools. A sample of 120 students and 20 teachers each from 5 governmental and five private schools were selected for the study. Parental involvement was determined in three areas, i.e., administrative, emotional, and cognitive. The study shows that parents' emotional involvement in their children's homework activity does not always significantly progress as in the given case. Still, in general, it has a positive impact on children. The result of the study provides strong evidence of parental improvement in homework assistance. Monitoring of homework by parents, reading out lessons to children and helping to solve complex questions have a tremendous impact on the homework performance of their children, as reported by teachers. The study confirms the significance of improving parents' homework activities, especially regarding cognitive and administrative involvement facets. The authors further suggested a few recommendations to enhance parental involvement, such as fixing specific times and providing a specific place for their children during homework activities to get better administrative control over the activities.

OBJECTIVES OF THE STUDY

1. To find the level of parental involvement in their children's school education.
2. To analyze the level of parental involvement regarding home involvement in their children's education.
3. To determine the level of parental involvement in the Parent-Teacher Association.
4. To study the level of parental involvement among the parents of the Saikul sub-division of Kangpokpi District, Manipur.

HYPOTHESES OF THE STUDY

1. There exists a low level of parental involvement in their children's school education.
2. There exists a low parental involvement regarding home involvement in their children's education.
3. There exists a low parental involvement in the Parent-Teacher Association.
5. There exists a low parental involvement among the parents of the Saikul sub-division of Kangpokpi District, Manipur.

SIGNIFICANCE OF THE STUDY

Parents' active involvement in their children's learning improves student achievement, less absenteeism, and boosts parents' confidence in their children's education. Students with involved parents or guardians have good grades, better social skills, and improved behavior. Besides bearing the financial expenses of educating children, parental involvement in their children's academic activities may save personal and public spending and contribute to improving the quality of education and academic achievement of children at the individual and national levels. A child's most important cognitive development takes place during their preschool years. By taking an active part in the early child's learning education process, parents help can ensure that their child has all the needed support they need to develop to their full potential. Parent involvement helps extend teaching outside school, creates an experience for children, and helps children perform better when in school. Parental involvement has always been an essential component of every teacher-student-school academic endeavor. Parents are considered one of the stakeholders of the school community and play tremendous roles in the child's educational and environmental transformation. Thus, parents' intensity or extent of participation in their child's education and school have to be realized more often. The present study is on the involvement of parents in their children's education, which will provide the analysis of the present parental involvement in the Saikul sub-division of Kangpokpi District. The present study is significant because it intends to cite the status of parental involvement in primary education in the Saikul sub-division, which any of the researchers has not explored till today. This study can add support to the knowledge base of research on parental involvement in their children's education. The study reveals the barriers to parental involvement in children's primary education. It suggests measures to enhance parent participation. The information taken from this study will give better insight to

parents, educators, and students. If parents are aware that their involvement in their children's education affects the child's learning, they will be more interested in taking part. The impression given to the child during their childhood stays till their adult life. Childhood is the foundation stage that needs proper guidance, care, and affection. So, the role of parents is vital in shaping a child's life academically and beyond school life. The findings of this study may also be helpful to educational institutions. The results could be used to develop school programs associated with parental involvement in school activities, decisions, and home work. Therefore, the present study is considered quite significant in learning. Thus, this program will help bridge the gap between home and school while improving students' academic achievement. It will also be helpful in the existing knowledge of the sociology of education.

METHODOLOGY OF THE STUDY

The Normative Survey Method has been used for the collection of data.

i. Population

For the study, the population consists of all the parents of the Saikul sub-division of Kangpokpi District whose children are studying primary education.

ii. Sample

For the study, the researchers took a sample of 30 parents based on stratified random sampling technique.

Tools Used

The Parent Involvement Scale developed by Dr. Rita Chopra and Dr. Surabala Sahoo was adopted for the collection of data. The scale consists of 34 items and is divided into three dimensions, namely School Involvement (10 items), Home Involvement (24 items), and Involvement through PTA (10 items).

Statistical Techniques Used

For the analysis and interpretation of the collected data, the researchers used the Percentage method.

Data Analysis and Interpretation

Table no.: 1 Data showing the responses of 30 Parents

PARENT	QUALIFICATION	School Involvement	Home Involvement	Parent-Teacher Association	Parental Involvement
1.	X	28	29	12	69
2.	Illiterate	21	22	17	60
3.	XII	28	38	28	94
4.	B.A.	30	39	28	97
5.	XII	26	29	22	77
6.	B.A.	24	33	18	75
7.	X	28	25	22	75
8.	VIII	28	30	26	84
9.	Illiterate	25	24	10	59
10.	X	30	22	20	72
11.	XII	30	39	23	92
12.	Illiterate	23	25	15	63
13.	X	30	41	21	92
14.	Illiterate	22	37	19	78
15.	Illiterate	30	29	16	75
16.	Illiterate	30	36	24	90
17.	X	30	41	29	100
18.	Illiterate	24	28	24	76
19.	Illiterate	26	25	18	69
20.	Illiterate	28	39	21	88
21.	Illiterate	27	37	16	80
22.	B.A.	30	42	30	102
23.	M.A.	30	41	30	101
24.	BA	27	30	18	75
25.	Illiterate	28	35	16	79
26.	Illiterate	30	34	23	87

27.	Illiterate	24	36	21	81
28.	Illiterate	25	27	16	68
29.	XII	27	30	23	80
30.	7	27	31	21	79

Interpretation: The above table No.1 shows the responses to the level of parental involvement of the parents of the Saikul sub-division of Kangpokpi District in three dimensions: school involvement, home involvement, and Parent-Teacher Association.

Table No.: 2 Indicating the level of parental involvement regarding School Involvement

Sl. No	Level of Parental Involvement	No. of Parents	Percentage
1.	High (25 & above)	24	80%
2.	Average (16-24)	6	20%
3.	Low (15 & below)	0	Nil

Interpretation: From table No.2, it can be observed that 80% of the parents have a high level of parental involvement, 20% of the parents have an average level of parental involvement, and 0% of the parents have a low level of parental involvement. Thus, it can be interpreted that most parents have a high level of parental involvement regarding School Involvement. Therefore, the given Alternate Hypothesis is rejected.

Table No.: 3 Indicating the level of parental involvement regarding Home Involvement

Sl. No	Level of Parental Involvement	No. of Parents	Percentage
1.	High (35 & above)	13	43.33%
2.	Average (23-34)	15	50%
3.	Low (15 & below)	2	6.67%

Interpretation: From table No.3, it can be observed that 43% of the parents have a high level of parental involvement, 50% of the parents have an average level of parental involvement, and 6% of the parents have a low level of parental involvement. Thus, it can be interpreted that most of the parents have an average level of parental involvement regarding Home Involvement. Therefore, the given Alternate Hypothesis is rejected.

Table No.: 4 Indicating the level of parental involvement regarding PTA Involvement

Sl. No	Level of Parental Involvement	No. of Parents	Percentage
1.	High (26 & above)	12	40%
2.	Average (15-25)	18	60%
3.	Low (14 & below)	0	Nil

Interpretation: From the given table No.4, it can be observed that 40% of the parents have a high level of parental involvement, 60% of the parents have an average level of parental involvement, and 0% of the parents have a low level of parental involvement. Thus, it can be interpreted that most of the parents have an average level of parental involvement in the Parent-Teacher Association. Therefore, the given Alternate Hypothesis is rejected.

Table No.: 5 Indicating the level of parental involvement

Sl. No	Level of Parental Involvement	No. of Parents	Percentage
1.	High (81 & above)	12	40%
2.	Average (49-80)	18	60%
3.	Low (48 & below)	0	Nil

Interpretation: From the given table No.5, it can be observed that 40% of the parents have a high level of parental involvement, 60% of the parents have an average level of parental involvement, and 0% of the parents have a low level of parental involvement. Thus, it can be interpreted that most parents have an average level of parental involvement. Therefore, the given Alternate Hypothesis is rejected.

MAIN FINDINGS

1. The study reveals a high level of parental involvement among the Saikul Sub-division of Kangpokpi District parents regarding School Involvement.
2. The study reveals an average level of parental involvement among the Saikul Sub-division of Kangpokpi District parents regarding Home Involvement.

3. The study reveals an average level of parental involvement among the Saikul Sub-division of Kangpokpi District parents regarding Parent-Teacher Association.
4. The study reveals an average level of parental involvement among the parents of the Saikul Sub-division of Kangpokpi District.

CONCLUSION

Parental involvement is never-ending and is neither limited to a particular aspect. From the study, it was found that there is average parent involvement. So, parents should be encouraged to participate in their children's education by connecting with the child, monitoring and advocating the child's life. Engaging the parents in their child's schoolwork activities, home assignments, and co-operating in their co-curricular activities will improve the child to a great extent. Parents must set goals with children and foster achievement of those goals, accessing and using children's academic scores to ensure they are on track, developing a relationship with children's teachers, and often keeping in touch with them. When parents are keen on their children's education at school and home, they perform better in academic and non-academic life. They tend to possess desirable attitudes, behavior, and habits, have higher rates of completing their home assignments, better attendance, improved achievement, less absenteeism, and become highly motivated. Parental participation and support provide children to broaden their knowledge and learn better leaving fewer doubts. Therefore, Parents are the prime teacher of the child and have a significant influence on the child's school life and beyond.

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PHYTOCHEMICALS IN TRADITIONAL HERBS ROLE IN THE PREVENTION AND TREATMENT OF CANCER- AN OVERVIEW

Birundadevi

Professor, Department of Maruthuvam, Sri Sairam Siddha Medical College. West Tambaram, Chennai – 44, Tamilnadu

ABSTRACT

Siddha system of medicine, which has been prevalent in the ancient Tamilnadu, is probably the foremost of all other medical systems in the world. The uniqueness of siddha system is by its continuous service to the mankind for also in maintaining its physical, mental and moral health. Cancer is a disease that affects the human race worldwide. Incidence of Malignancy is found to be increasing in the developed world and is one of the major threats to human health. Cancer is the second cause for the mortality of human being in developed countries. The need for having new technologies and treatments to diagnose and treat cancer is becoming more important challenge. The current treatments for cancer include radiation, chemotherapy and surgery. All these treatments are accompanied with side effects in and cause psychological impact on patients. Hence, the treatments that have lesser side effects form the recent research. Cancer is known as 'Puttru' in Siddha system of Medicine. Many herbs that have been used for cancer in traditional system of medicine is constructed on the siddha philosophy of three humours and also having phytochemicals to treat and prevent cancer. They are often assumed to be safe and efficacious. Cancer chemoprevention with natural phytochemical compounds is an emerging strategy to prevent, impede, delay, or cure cancer. This review summarizes the latest research in cancer chemo prevention and treating using bioactive components from natural herbs. Relevant molecular mechanisms involved in the pharmacological effects of these phytochemicals are discussed in this paper.

Keywords: Cancer, chemoprevention, phytochemicals, siddha system, traditional herbs.

INTRODUCTION

Cancer is a disease that affects the human race worldwide. Incidence of Malignancy is found to be increasing in the developed world and is one of the major threats to human health. Cancer is the second cause for the mortality of human being in developed countries. The need for having new technologies and treatments to diagnose and treat cancer is becoming more important challenge. The current treatments for cancer include radiation, chemotherapy and surgery

Cancer is known as 'Puttru' in Siddha system of Medicine. Many herbs that have been used for cancer in traditional system of medicine is constructed on the siddha philosophy of three humours and also having phytochemicals to treat and prevent cancer. Carcinogenesis is a multi-step process which could be prevented by phytochemicals. Phytochemicals from dietary plants and other plant sources such as herbs are becoming increasingly important sources of anticancer drugs or compounds for cancer chemoprevention or adjuvant chemotherapy. Phytochemicals can prevent cancer initiation, promotion, and progression by exerting anti-inflammatory and anti-oxidative stress effects which are mediated by integrated Nrf2, NF- κ B, and AP-1 signaling pathways(1). There are excellent sources of bioactive compounds exerting their health beneficial effects. Certain bioactive components from the plants have been confirmed for their anti-cancer activities. There is an estimate that approximately 50-60% of cancer patients in the United States utilize agents derived from different parts of plants or nutrients (complementary and alternative medicine), exclusively or concomitantly with traditional therapeutic regimen such as chemotherapy and/or radiation therapy [2]. These include curcumin from turmeric, genistein from soybean, tea polyphenols from green tea, isothiocyanates from cruciferous vegetables, diallyl sulfide from garlic, lycopene from tomato, and gingerol from gingers, just to name a few. Various review articles summarized natural phytochemicals and their anti-cancer effects. In recent years, some of these reviews touched the general overview for the bioactive aspect for phytochemical compounds [3-12], or specific compounds such as Vitamin E from plant oil [13-15], boron-rich natural compound [16], hydroxytyrosol from virgin olive oil [17] or EGCG from green tea polyphenols [18], while the others are more specific for certain cancers, e.g., colorectal cancer [19,20], breast cancer [14, 21], head and neck cancer [22], pancreatic cancer [23], prostate cancer [24], or protein targets and pathway mechanisms, such as Nrf2 [25], COX-2 [26], PLK1 [27], angiogenesis [28]. In this review, we will provide a comprehensive summary for the current status of the research and challenges in this area [29].

2. Phytochemicals Used as Cancer Chemopreventive and Treatment Agents

Curcumin from Turmeric

Curcumin (diferuloylmethane) is the major components of popular Indian spice turmeric, *Curcuma longa* L., a member of the ginger family. Its anti-cancer effects have been studied for colon cancer, breast cancer [30], lung metastases, and brain tumor [31].

Curcumin's anticancer effect is attributed to its ability to induce apoptosis in cancer cells without cytotoxic effects on healthy cells, which is very attractive to cancer research scientists. Curcumin interferes with NF- κ B [32], which connects with inflammatory diseases including cancer [33]. Curcumin was able to dissociate raptor from mTOR, inhibit mTOR complex I and might represent a new class of mTOR inhibitor [34]. Ravindran *et al* suggested that curcumin modulates growth of tumor cells through regulation of multiple cell signaling pathways including cell proliferation pathway (cyclin D1, c-myc), cell survival pathway (Bcl-2, Bcl-x, cFLIP, XIAP, c-IAP1), caspase activation pathway (caspase-8, 3, 9), tumor suppressor pathway (p53, p21), death receptor pathway (DR4, DR5), mitochondrial pathways, and protein kinase pathway (JNK, Akt, and AMPK) [35]. Curcumin inhibits p65 and cell invasion by downregulation of COX-2 and MMP-2 expression [36]; by suppression of gene expression of EGFR and modulation of Akt/mTOR signaling, and inhibition of cell growth [37, 38]. It has also been reported that curcumin suppresses p38 mitogen-activated protein kinase (MAPK) activation, reduces IL-1 beta and matrix metalloproteinase-3, and enhances IL-10 in the mucosa of children and adults with inflammatory bowel disease [39]. Epstein and co-workers had a thorough review on *in vitro*, animal and clinical studies [40]. In that review, curcumin is cited as non-toxic to human subjects at a high oral dose of up to 12 g/day, and it has anti-inflammatory, antioxidant and anti-cancer properties, however, under some circumstances, its effects can be contradictory as the first clinical trial failed to show benefit, which may be due to an unexpected lack of cognitive decline in placebo group [40].

Crocetin from Saffron

Saffron is a spice from the flower of the Saffron crocus and a food colorant present in the dry stigmas of the plant *Crocus sativus* L. [2]. In a recent review article, saffron is listed as a potential agent for a novel anti-cancer drug against hepatocellular carcinoma [2, 41, 42].

Saffron and its ethanolic extracts are also reported for the studies on human lung cancer [43, 44], pancreatic cancer cell line [45], skin carcinoma [46], colorectal cancer cells [47], and breast cancer [48]. Its applications and mechanism of actions are reviewed by Bathaie and Mousavi [49], and more recently, by Gutheil and Reed [2]. Yet, it has been concluded that the exact mechanism of action is still not clear. In general, crocetin affects the growth of cancer cells by inhibiting nucleic acid synthesis, enhancing anti-oxidative system, inducing apoptosis and hindering growth factor signaling pathways [2]. Nam's study has shown that crocetin is effective for the inhibition of LPS-induced nitric oxide release, for the reduction of the produced TNF- α , IL-1 β , and intracellular reactive oxygen species, for the activation of NF- κ B, and blockage of the effect of LPS on hippocampal cell death [50]. Although some studies beyond those mentioned above are successfully conducted, more thorough understanding of the mechanism on crocetin and its effects are needed.

Epigallocatechin Gallate from Green Tea

EGCG is the most abundant catechin compounds in green tea. Increasing evidences show that EGCG can be beneficial in treating brain [51], prostate [52], cervical [53], and bladder

[54] cancers. Yang *et al* reviewed tea and cancer prevention on molecular mechanisms, molecular targets and human relevance of tea constituents [55-57]. Among numerous mechanism studies, EGCG binds and inhibits the anti-apoptotic protein Bcl-xL [58], a protein involved in both cancer cell and normal cell survival [59]. EGCG suppressed AOM-induced colonic premalignant lesions in mice [60], interfered with EGFR signaling [61], and inhibited hepatocyte growth factor-induced cell proliferation in human colon cancer cells [62]. EGCG has shown inhibition of mitogen-activated protein kinases (MAPK), cyclin-dependent kinases, growth factor-related cell signaling, activation of activator protein 1 and NF- κ B, topoisomerase I and matrix metalloproteinases. In human, the pharmacological concentration are typically at least 10 μ mol/L [57].

In lab [1] studied EGCG induced stress signals in HT-29 human colon adenocarcinoma cells and found that EGCG inhibited HT-29 cell growth with an IC₅₀ of approximately 100 μ M, and the dose levels higher than that showed apparent nuclear condensation and fragmentation, and the study concluded that EGCG caused damage to mitochondria and JNK mediated EGCG-induced apoptotic cell death [63]. EGCG was also found to increase AP-1 luciferase activity dose-dependently up to 100 μ M [28], reduce LPS-induced I κ B alpha phosphorylation [29]. Additional study in group demonstrated that combining sulforaphane and EGCG exerted synergistic effects in HT-29 AP-1 human colon carcinoma cells [64]. To investigate possible Nrf2-mediation, EGCG were

orally dosed to C57BL/6J and C57BL/6J/Nrf2(−/−) mice. The liver and small intestine were analyzed using Affymetrix mouse genome 430 2.0 array. Gene expression showed that 671 Nrf2-dependent and 256 Nrf2-independent genes were regulated by EGCG in liver, and 228 Nrf2-dependent and 98 Nrf2-independent genes are regulated by EGCG in intestine. This study pointed out that the EGCG chemopreventive effects may be mediated by Nrf2, at least partially [65].

Genistein from Soybean

Genistein is an isoflavone originates from a number of plants such as lupine, fava beans, soybeans, kudzu, and psoralea, *Flemingiavestita*, and coffee. Functioning as antioxidant and anthelmintic, genistein has been found to have antiangiogenic effects (blocking formation of new blood vessels), and may block the uncontrolled cell growth associated with cancer, most likely by inhibiting the enzymes that regulate cell division and cell survival (growth factors). Genistein's activity was chiefly functioned as a tyrosine kinase inhibitor by inhibiting DNA topoisomerase II [66,67]. *In vitro* and *in vivo* studies show that genistein has been found to be useful in treating leukemia [68-71].

Estrogen receptors are over-expressed in around 70% of breast cancer cases (ER-positive). Binding of estrogen to the ER stimulates proliferation of mammary cells, with the resulting increase in cell division and DNA replication. Estrogen metabolism produces genotoxic waste, which may cause disruption of cell cycle, apoptosis, DNA repair, and forms tumor. Genistein can compete with 17 β -estradiol (estrogen) to bind to estrogen receptor and shows higher affinity towards estrogen receptor β than towards estrogen receptor α [72], where estrogen receptor functions as a DNA-binding transcription factor that regulates gene expression. Genistein was confirmed to increase the rate of growth of some estrogen receptor in breast cancer and the rate of proliferation of estrogen-dependent breast cancer when not co-treated with an estrogen antagonist [73,74]. In colon cancer, genistein is thought to contribute to reduced colonic inflammation in 2,4,6-trinitrobenzene sulfonic acid (TNBS)-induced colitis [75].

Gingerol from Gingers

Gingerol is the active component of fresh ginger with distinctive spiciness. Gingerol has been studied for its anticancerous effects for the tumors in colon [76], breast and ovarian [77,78], and pancreas [79]. A recent review by Oyagbemi et al summarized the mechanisms in the therapeutic effects of gingerol [80]. In short, gingerol has demonstrated antioxidant, anti-inflammation, and antitumor promoting properties, decreases iNOS and TNF- α expression via suppression of I κ B α phosphorylation and NF- κ B nuclear translocation [80]. Treating K562 cells and MOLT4 cells with gingerol, the ROS levels were significantly higher than control groups, inducing apoptosis of leukemia cells by mitochondrial pathway [81]. On human hepatocarcinoma cells, gingerol, along with 6-shogaol were found to exert anti-invasive activity against hepatoma cells through regulation of MMP-9 and TIMP-1, and 6-shogaol further regulated urokinase-type plasminogen activity [82]. Topical application of 6-shogaol, another active component from ginger is more effective than 6-gingerol and curcumin in inhibiting 12-O-tetradecanoylphorbol 13-acetate (TPA)-induced transcription of iNOS and COX-2 mRNA expression in mouse skin, which may justify further *in vitro* and *in vivo* studies [83].

Lycopene from Tomato

Lycopene is a bright red pigment and phytochemical from tomatoes, red carrots, watermelons, and red papayas. It demonstrates antioxidant activity and chemopreventive effects in many studies, especially for prostate cancer. Poorly soluble in water, lycopene has high solubility in organic solvents. Its anti-cancer property is attributed to activating cancer preventive enzymes such as phase II detoxification enzymes [84]. Lycopene was found to inhibit human cancer cell proliferation, and to suppress insulin-like growth factor-I-stimulated growth. This may open new avenues for lycopene study on the role of the prevention or treatment of endometrial cancer and other tumors [85]. Lycopene also possesses inhibitory effects on breast and endometrial cancer cells [86], prostate cancer cells [84], and colon cancer cells [87]. However, in a study conducted by Erdman and group using xenograft prostate tumors into rats, it was found that the tumors grew more slowly in those given whole dried tomato powder but not in those given lycopene, which may indicate that lycopene may be an important component in tomato but not the only component in tomato that actively suppressing the growth of the prostate cancer [88].

Sulforaphane from Cruciferous Vegetables

Sulforaphane is an organo sulfur compound obtained from cruciferous vegetables such as broccoli, Brussels sprouts and cabbages. The enzyme myrosinase in GI tract transforms glucoraphanin into sulforaphane upon damage to the plant such as from chewing. Broccoli sprouts and cauliflower sprouts are rich in glucoraphanin.

Sulforaphane has shown induction of phase II drug metabolism enzymes of xenobiotic transformation, such as quinone reductase and glutathione S-transferase, and enhances the transcription of tumor suppression proteins. Sulforaphane downregulated the Wnt/beta-catenin self-renewal pathway in breast cancer stem cells [89]; protected skin against UV radiation damage [90], and inhibited histone deacetylase (HDAC) activity [91]. In Apc(Min/+) mice, sulforaphane reduced the number of polyps by inhibiting Akt, ERK signaling, COX-2, and cyclin D1 protein expression [92] and also inhibited cancer cell growth by inducing apoptosis in SW620 cells [93]. In a recent study, sulforaphane induced cytotoxicity and lysosome- and mitochondria-dependent cell death in colon cancer cells with deleted p53. It also increased Bax in the presence of JNK-mediated Bcl-2 inhibition followed by mitochondrial release of cytochrome c and activation of apoptosis [94].

Triterpenoids From Wax-Like Coatings of Fruits and Medicinal Herbs

Triterpenoids are biosynthesized in plants by cyclization of squalene, a triterpene hydrocarbon and precursor of all steroids [95]. This group of phytochemicals are sub-classified into cucurbitanes, dammaranes, ergostanes, friedelanones, lanostanes, limonoids, lupanes, oleananes, tirucallanes, ursanes [14], and the list is still growing. The diversity and regulation of terpenoids are appreciated by Tholl review [96]. Various in vitro and in vivo studies have been conducted for chemoprevention and therapy of breast cancer [14], and pancreatic cancer [97] using triterpenoids. This group of phytochemicals exert their chemopreventive and anti-cancer activities via enhancing apoptosis, NO, stimulating DR4, DR5, caspase-3/7, caspase 8, Bax, JNK, MAPK, p38, decreasing phospho-STAT3, PARP cleavage, suppressing COX-2, IL-1 β , NF- κ B, IKK α/β , cyclin D1, cyclin A, cyclin B1, ER α protein and mRNA, HER2 phosphorylation, caveolin-1, Akt, JAK1, STAT 3, Bcl2, c-Jun, c-Fos, JNK, mTOR, blocking cell cycle at G1, G1-S, G2-M, etc [14].

Through these studies, triterpenoids have been shown to possess pleiotropic mode of effects for cancers in in vitro and in vivo models. More studies are needed to validate their promises in their chemopreventive and anti-cancer activities in clinical stage.

Vitamin E from Plant Oil

Vitamin E represents a family of compounds comprising both tocopherols and tocotrienols and is a fat-soluble antioxidant that exists in many foods including wheat germ oil, sunflower oil, and safflower oils. Alphatocopherol is the most bioactive form of vitamin E that stops the production of reactive oxygen species when fat undergoes oxidation. There are reports that both tocopherols and tocotrienols have anti-tumor effects due to their antioxidant properties, and tocotrienols show stronger bioactivity and both show antiproliferative, proapoptotic and COX-2 inhibiting effects in in vitro studies [98]. Review by Viola et al discussed the hypomethylated forms of tocotrienols in their high in vitro and in vivo metabolism and their potency in cytoprotection, cancer prevention and even chemotherapeutic effects [13]. Chen et al reported that vitamin E supplementation could evidently inhibit or reverse the cytotoxic effects of cigarette smoke extract in a dose- and time-dependent manner in mouse embryonic lung cells [99]. A recent review by Nesaretnam and Meganathan linked tocotrienols and their roles in inflammation and cancer, and in this review, mechanism of the cellular signaling pathways of NF- κ B, STAT3, and COX-2 were discussed [100]. In a meta-analysis and meta-regression study, although vitamin A, dietary vitamin E, and total vitamin E intake all reduced breast cancer risk significantly when data from all studies were pooled, the results became non-significant when data from cohort studies were pooled [101].

DISCUSSION

From the above review paper, we came to know that many natural dietary phytochemicals have been selected for epidemiological, preclinical, and early clinical studies for cancer prevention and treatment. These compounds typically involve multiple signaling transduction pathways. They themselves or their synthetic analogue have profoundly guided continuing research to bring them into practice. The following natural plants and agents are in the clinical trials for anti-carcinogenesis: ashwagandha, brassica, ginseng, tomato-soy juice, red and white wine, curcumin, genistein. [102].

Chemical structures of the phytochemicals are now well understood and some of the physical and chemical properties are not documented in literatures. Additional studies and drug developmental diligence are necessary to further characterize their physical and chemical properties. Medicinal scientists now use these phytochemicals as lead compounds to synthesize their analogues based on the ever-enriching structure-property relationships. For example, although curcumin has been shown to be an effective chemopreventive compound, its synthesis analogue, EF24 demonstrated ~ 10 fold greater potency over its natural form [103].

Bioavailability is another challenge needs to be overcome for many phytochemicals. Another example of curcumin is that it shows low bioavailability in earlier studies. To improve that, nanotechnology, liposomes,

micelles, various coating materials, and phospholipid complexes have been applied to increase its water solubility and to enhance its bioavailability.

CONCLUSION

Natural dietary phytochemicals have been widely used in *in vitro*, *in vivo*, and preclinical cancer prevention and treatment studies. Some of these clinical trials have shown various degrees of success. Through the extensive mechanistic studies, we have observed robust chemopreventive effects by some of the phytochemicals. From this review it can be concluded that phytochemicals, bioactive compounds derived from medicinal herbs can be used to treat and prevent cancer. Natural dietary phytochemicals have been and will continue to be a promising and active research area in the near future.

ABBREVIATIONS

ABCG2	ATP-binding cassette sub-family G mem
ALP	alkaline phosphatase
AMPK	AMP-activated protein kinase
AOM	azoxymethane
AP-1	activator protein 1
Apaf-1	apoptotic protease activating factor-1
Bcl-2	B-cell lymphoma 2
BCRP	breast cancer resistance protein
CD	Chromodomain
CDK4	Cyclin- dependent kinase 4
COX-2	Cyclo oxygenase-2
CYP	Cytochrome P450
DDR	DNA damage response
DHC	Dihydrochalcone
DISC	death inducing signaling complex
DIM	diindolylmethane
DR	death receptor
EGCG	epigallocatechin gallate
EGFR	epidermal growth factor receptor
ER	estrogen response
ERK	Extracellular signal regulated -kinase
HDAC	histone deacetylase
HER2	human epidermal growth factor receptor
HO-1	hemeoxygenase-1
IL-1β	interleukin-1beta
IL-6	interleukin-6
iNOS	inducible nitric oxide synthase
JNK	c-JunN-terminal kinases
LPO	lipid peroxidation
LPS	lipopolysaccharide
MAC	mitochondrialapoptosis-induced channel

MAPK	mitogen-activated protein kinase
MKK	mitogen-activated protein kinase kinase
MMP	matrix metalloproteinase
MNU	N-methyl nitrosourea
mTOR	mammalian target of rapamycin
NF-κB	Nuclear factor-kappa-B
Nrf2	nuclear factor-erythroid 2-related factor 2
PARP	poly(ADP-ribose) polymerase
PCa	prostate cancer
PI3K	phosphoinositide3-kinase
PKG	protein kinase G
PLK1	polo-like kinase 1
q-PCR	quantitative real time-polymerase chain reaction
ROS	reactive oxygen species
RT-PCR	reverse transcription polymerase chain reaction
SMAC	small mitochondrial-derived activator of caspases
SMRT	silencing mediator of retinoid and thyroid-hormone receptors
STAT	signal transducer and activator of transcription
TCF	T-cell factor
TIMP	tissue inhibitor of metalloproteinases
TNBS	2,4,6-trinitrobenzenesulfonic acid
TNF-α	tumor necrosis factor alpha
u-PA	urokinase-type plasminogen activator
UVB	ultraviolet B
VDR	vitamin D receptor
VEGF	vascular endothelial growth factor
XIAP	X-linked inhibitor of apoptosis protein

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PLACENTAL WEIGHT IN PREGNANCY WITH HIGH OR LOW HEMOGLOBIN CONCENTRATION

Enas Jaleel Alobaidy, Inaam Fasial Mohamed and Duaa Abid Ali (Graduated Student)

Department Obstetrics and Gynecology, Collage of Medicine, Diyala University

ABSTRACT*Objective: to assess the relationship of maternal hemoglobin concentration with placental weight.**Material & Method: from July 1st, 2018 to December 31, 2018 , placenta were obtained from (70) normal Pregnancy. We compared mean placental weight and placental to birth weight ratio Regarding to hemoglobin concentration of mother: < 9 g/dl, 9_13.5 g/dl or > 13.5 g/dl.**Results: In pregnancies with maternal hemoglobin concentrations <9 g/dl , mean placental weight was 689.8 (SD 53.2), followed by 591.9 (SD 103.0) for hemoglobin concentrations 9_13.5 g/dl and 556.9 (SD 65.3) for hemoglobin concentrations >13.5 g/dl (ANOVA, $p < 0.001$). mean placental to birthweight ratio was highest in pregnancies with maternal hemoglobin concentrations <9 g/dl (0.222 (SD 0.031)). We found no difference in mean placental to birthweight ratio for maternal hemoglobin concentrations 9_13.5 g/dl (0.185 (SD 0.035)) and >13.5 g/dl (0.188 (SD 0.043)). Adjustments for our study factors did not alter the estimates notably.**Conclusions: Placental weight decreased with increasing maternal hemoglobin concentrations. The high placental to birthweight ratio with low maternal hemoglobin concentrations suggests differences in placental growth relative to fetal growth across maternal hemoglobin concentrations.**Keywords: Anemia Birth weight Hemoglobin concentrations**Placental weight Pregnancy***INTRODUCTION**

Anemia during pregnancy is commonly health problem in developing countries and it is can be Preventable and simply treatable if noticed . Can be influenced by on some causes like Socioeconomic status, dietary habit, lifestyle, communicable and non_communicable diseases (1).

Anemia affects placenta and fetal outcome dreadfully. Placenta is a developing organ during Pregnancy for given that nutrition, oxygen supply for the fetus and to eliminate excretory Wastes and protective barrier. If the placenta has got affected due to anemia it adversely Affects for the growth of the fetus. Hence a good fetal outcome depends on mothers' health And her diet during antenatal period (2).

Anemia is a pathological disorder which leads to loss of placental weight and poor pregnancy Outcome. The world organization (who) reports appraised that 56 million live in developing Countries, where the most affected area is South Asia whereas of pregnant women are anemic in India. Anemia is 89% act as for 12-28% of fetal loss, 30% perinatal death and 7_10% of fetal death (3).

Severe anemia during pregnancy is a possibly hazardous hematological condition. It is linked With late abortions, prematurity, low birth weight and stillbirths(4). The totality of which is Increased perinatal loss. Rendering to a World Health Organization (who) report the worldwide Occurrence of anemia amongst pregnant women is 55.9%.

Anemia in pregnancy is observed more frequently in developing Countries. The prevalence of Anemia in South East Asia is around 56%. In India the incidence of anemia in pregnancy has been noted as 40-80% (5).

The proportion of maternal deaths due to anemia has been appraised in India about 16% (6). It Also increases the maternal, fetal mortality and morbidity significantly (7).

The prevalence of anemia between pregnant women and lactating mothers at Maharashtra State is 76% and 73% (8). The prevalence of anemia at Satara district was 45.3% (9)(10).

THE aim of our study to assess the association of placental weight and fetal outcome among Normal and anemic mothers admitted in Al_Batool hospital, Iraq. We enclosed the below two Purposes

-To assess and compare placental weight and fetal outcome among normal and anemic Delivered mothers.

-An association between placental weight and fetal outcome with selected demographic Variables in both groups.

Anemia in pregnancy is a global health problematic, and low maternal hemoglobin Concentrations have been associated with increased risk of giving birth to offspring with low Birth weight, prematurity, abortion and fetal death.

The capability of the fetus to grow and thrive in utero is supposed to be a role of the placenta. The placenta at term is , on average, 185 mm in diameter and mm in thickness , with an Average volume of 497 ml and a weight of 508 g.

It is a developing organ during pregnancy for provided that nutrition, oxygen supply for the Fetus and eliminate excretory wastes, and a protective barrier. If the placenta has got affected Due to anemia it unfavorably affects for the growth of the fetus. Hence a good fetal outcome depends on mothers' health and her diet during antenatal period.

Patient & Methods

This study were included singleton births of (75) pregnant lady, in Iraqi, Diayla, during July 1st , 2018 to December 31, 2018, aged 18_40 years old at Al_Batool teaching hospital.

Between;

Includes criteria:-

- 1) Subjects who had accurate question eye (date her cycle, or U/S repeat).
- 2) Gestational age (between 37_40)week.
- 3) Maternal age.

Questionnaire was designed to investigate maternal Parity (primipara or multipara), Maternal body mass index (BMI) was calculated as weight (kg)/height (m²) at admission to the delivery ward, and was categorized as <25, 25_30, >30 kg/m², Infant gender, Fetal distress, Delivery approaches (C.S or vaginal), Smoking or not.

Exclude Criteria

- 1) Maternal disease affecting placental weight as diabetes mellitus, hypertension disease, vascular disease, maternal anemia (hematocrit level less than 33%).
- 2) Multiple pregnancy & congenital anomalies.
- 3) Placenta Previa, abruption, accretion.

Our outcome measures were placental weight with membranes and umbilical cord after delivery.

Birth weight was based on routine weighing of newborn shortly after birth, by grams and Placenta to birth weight ratio was calculated as placental weight/birth weight.

Our outcome measures were placental weight and placental to birthweight ratio. The placentas were weighedwith membranesand umbilical cord attached within one hour after birth, accordingto Norwegian standards. Birthweight was based on routineweighing of the newborn shortly after birth. Weight was measuredin grams, and the placental to birthweight ratio was calculated asplacental weight/birthweight. Hence, a high placental to birthweight ratio indicates a high placental weight relative to birthweight.Maternal hemoglobin concentrations were measured in thefirst and in the second trimester according to Norwegian guidelines for antenatal care. Almost all women who give birth inNorway attend the public antenatal program, and results fromantenatal clinical examinations are routinely recorded instandardized antenatal patient journals. Maternal hemoglobinconcentrations during pregnancy were reported as <9 grams/deciliter (g/dl) (yes or no) or >13.5 g/dl (yes or no). Thus, womenwithout such values had hemoglobin concentrations at 9–13.5 g/dl

during pregnancy. We categorized maternal hemoglobin concentrations as: <9 g/dl, 9–13.5 g/dl or >13.5 g/dl.

Other study factors included in our data analyses were:

gestational age at birth, preeclampsia, parity, maternal age (years), diabetes, body mass index (BMI), smoking, offspring sex and year of birth. Gestational age at birth was based on term date estimated at routine fetal ultrasonographic examination in gestational weeks 17–19. Preeclampsia (yes/no) was defined as presence of blood pressure 140/90 mmHg in addition to proteinuria (protein dipstick 1+ or >0.3 g/24 h) after 20 weeks of gestation. Parity was coded: 0 or 1 previous deliveries. Maternal diabetes (yes/no) included diabetes type 1, diabetes type 2 and gestational diabetes. Maternal BMI was calculated as weight (kg)/height (m)² at admission to the delivery ward, and was categorized as <25, 25–29, 30–35, >35 kg/m² or missing. Occasional or daily smokers were defined as being smokers and smoking was categorized as yes, no or missing.

We calculated mean placental weight and placental to birthweight ratio for each category of maternal hemoglobin concentrations (<9 g/dl, 9–13.5 g/dl and >13.5 g/dl). Differences in means were tested by applying one-way ANOVA with Bonferroni correction. The associations of hemoglobin concentrations with

placental weight and placental to birthweight ratio were estimated as crude and adjusted unstandardized regression coefficients (B) with 95% confidence interval (CI) by applying linear regression analyses. Hemoglobin concentrations 9–13.5 g/dl were used as the reference group. The unstandardized regression coefficient (B) can be interpreted as the estimated change in placental weight (grams) by change in category of hemoglobin concentrations. Adjustments were made for the study factors presented above. We performed sensitivity analyses in subsamples of pregnancies without preeclampsia and pregnancies with term delivery (gestational

week 37). All statistical analyses were conducted by using the IBM SPSS

Statistics Version 22.0, (IBM Corp., Armonk, NY, USA)

Results:-

results

Table (1): Distributions of study factors according to hemoglobin concentrations.

Hemoglobin cons	<9 11 (16%)		9-13.5 51 (73%)		>13.5 8 (11%)		P value
placental weight (Mean and SD)	664.36	98.28	595.45	100.75	556.88	65.34	0.04*
Birth weight (Mean and SD)	3572.73	739.04	3270.59	619.45	3112.50	752.97	0.26
Ratio	0.19	0.04	0.19	0.04	0.19	0.04	0.91
GA	38.45	1.63	38.08	1.70	37.88	1.13	0.71
Age	25.55	4.27	26.31	6.13	25.50	4.90	0.87
parity							
primary N and %	3	27.30%	13	25.50%	4	50.00%	0.35
multi N and %	8	72.70%	38	74.50%	4	50.00%	
Delivery							
C.S N and %	8	72.70%	43	84.30%	7	87.50%	0.61
Vaginal N and %	3	27.30%	8	15.70%	1	12.50%	
Gender							
male N and %	5	45.50%	32	62.70%	3	37.50%	0.28
female N and %	6	54.50%	19	37.30%	5	62.50%	
Stress							
positive N and %	4	36.40%	11	21.60%	1	12.50%	0.43
negative N and %	7	63.60%	40	78.40%	7	87.50%	
Smoking							
positive N and %	0	0.00%	0	0.00%	1	12.50%	0.02*
negative N and %	11	100.00%	51	100.00%	7	87.50%	
BMI							
<25 N and %	5	45.50%	9	17.60%	1	12.50%	
25 N and %	5	45.50%	38	74.50%	7	87.50%	
>25 N and %	1	9.10%	4	7.80%	0	0.00%	0.22

- 1- Among the 70 pregnancies, 16% the women had hemoglobin concentration <9 g/dl, 73% had hemoglobin concentration 9_13.5 g/dl, and 11% of the women had hemoglobin concentration >13.5 g/dl, Mean placental weight was highest in pregnancies with maternal hemoglobin concentrations <9 g/dl compared to pregnancies with hemoglobin concentrations 9_13.5 g/dl and >13.5 g/dl, in pregnancies with hemoglobin concentrations <9 g/dl, mean placental weight was 664.36 g (SD 98.28), followed by 595.45 g (SD 100.5) for hemoglobin concentrations 9_13.5 g/dl, and 556.88 g (SD 65.34).
- 2- There's no significant differences in the mean birthweight and in the mean placental to birth weight ratio between pregnancies with hemoglobin concentrations <9 g/dl, 9_13.5 g/dl and 13.5 g/dl regarding to statistic analyses.

- 3- There's no significant differences in the mean maternal age and mean gestational age between pregnancies with hemoglobin concentrations <9 g/dl, 9_13.5 g/dl and 13.5 g/dl regarding to statistic analyses.
- 4- There's no significant differences in parity, maternal BMI, delivery approaches, fetal gender and fetal distress between pregnancies with hemoglobin concentrations <9 g/dl, 9_13.5 g/dl and 13.5 g/dl regarding to statistic analyses.

Table (2): Estimated differences in placental weight according to hemoglobin concentrations among 70 pregnancy

HGB	N (%)	Mean (SD)	Differences in placental weight					
			Crude B	95% CI	Adjusted B ^a	95% CI	Adjusted B ^b	95% CI
<9	11 (16%)	664.36 (98.28)	3.15*	1.26-5.22	4.23*	2.24-5.32	4.76*	3.51-5.89
9-13.5	51 (73%)	595.45 (100.75)	0		0		0	
>13.5	8 (11%)	556.88 (65.34)	-2.76*	-1.99 to -3.32	-2.12*	-1.65 to -2.88	-1.99*	-1.23 to -2.34

Differences in grams are presented as unstandardized B-coefficients estimated by linear regression analyses. Abbreviations: CI, confidence interval; SD, standard deviation. * p<0.01. All p-values are two-sided.

^a Adjustments made for GA.

^b Adjustments made for GA., parity, Delivery, Maternal age, Gender, Stress, Smoking and BMI.

The number of pregnancies were (11cases) had hemoglobin concentrations <9 g/dl, (51 case) had hemoglobin concentrations 9_13.5 g/dl and (8 cases) had hemoglobin concentrations >13.5 g/dl.

Mean placental weight was 664.36 (98.28) in pregnancies with hemoglobin concentrations <9 g/dl, 595.45 (100.75) in pregnancies with hemoglobin concentrations 9_13.5 g/dl and 556.9(SD 65.34) in pregnancies with hemoglobin concentrations >13.5 g/dl.

The mean differences in placental weight :-

Crude B was (3.15) highest in pregnancies with hemoglobin concentrations <9 g/dl, while in pregnancies with hemoglobin concentrations 9_13.5 g/dl was Zero and was (-2.76) lowest in pregnancies with hemoglobin concentrations >13.5 g/dl .

Adjusted B a was (4.23) highest in pregnancies with hemoglobin concentrations <9 g/dl, while in pregnancies with hemoglobin concentrations 9_13.5 g/dl was Zero and was (-2.12) lowest in pregnancies with hemoglobin concentrations >13.5 g/dl .

Adjusted B b (4.76) highest in pregnancies with hemoglobin concentrations <9 g/dl, while in pregnancies with hemoglobin concentrations 9_13.5 g/dl was Zero and was (-1.99) lowest in pregnancies with hemoglobin concentrations >13.5 g/dl .

Table (3): Estimated differences in ratio according to hemoglobin concentrations among 70 pregnancy

HGB	N (%)	Mean (SD)	Ratio					
			Crude B	95% CI	Adjusted B ^a	95% CI	Adjusted B ^b	95% CI
<9	11 (16%)	0.19 (0.04)	0.002*	0.0001-0.005	0.0015*	0.0011-0.0019	0.0012*	0.0009-0.0019
9-13.5	51 (73%)	0.19 (0.04)	0		0		0	
>13.5	8 (11%)	0.19 (0.04)	0.001*	0.0002-0.003	0.0009*	0.0002-0.0015	0.0007*	0.0002-0.0013

Differences in grams are presented as unstandardized B-coefficients estimated by linear regression analyses. Abbreviations: CI, confidence interval; SD, standard deviation. * p<0.01. All p-values are two-sided.

^a Adjustments made for GA.

^b Adjustments made for GA., parity, Delivery, Gender, Maternal age , Stress, Smoking and BMI.

Mean placental to birthweight ratio was 0.19 (0.04) in pregnancies with hemoglobin concentrations <9 g/dl, 0.19 (0.04) in pregnancies with hemoglobin concentrations 9_13.5 g/dl and 0.19 (0.04) in pregnancies with hemoglobin concentrations >13.5 g/dl.

The mean differences in placental to birthweight ratio:-

Crude B was (0.002) highest in pregnancies with hemoglobin concentrations <9 g/dl, while in pregnancies with hemoglobin concentrations 9_13.5 g/dl was Zero and was (0.001) lowest in pregnancies with hemoglobin concentrations >13.5 g/dl .

Adjusted B a was (0.0015) highest in pregnancies with hemoglobin concentrations <9 g/dl, while in pregnancies with hemoglobin concentrations 9_13.5 g/dl was Zero and was (0.0009) lowest in pregnancies with hemoglobin concentrations >13.5 g/dl .

Adjusted B b (0.0012) highest in pregnancies with hemoglobin concentrations <9 g/dl, while in pregnancies with hemoglobin concentrations 9_13.5 g/dl was Zero and was (0.0007) lowest in pregnancies with hemoglobin concentrations >13.5 g/dl .

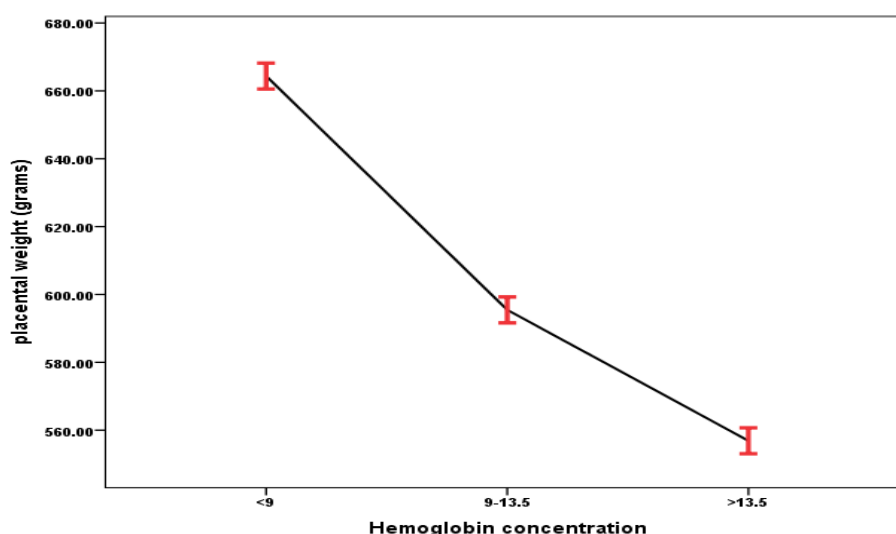


Fig (1): Crude differences in placental weight (g) according to hemoglobin concentrations.

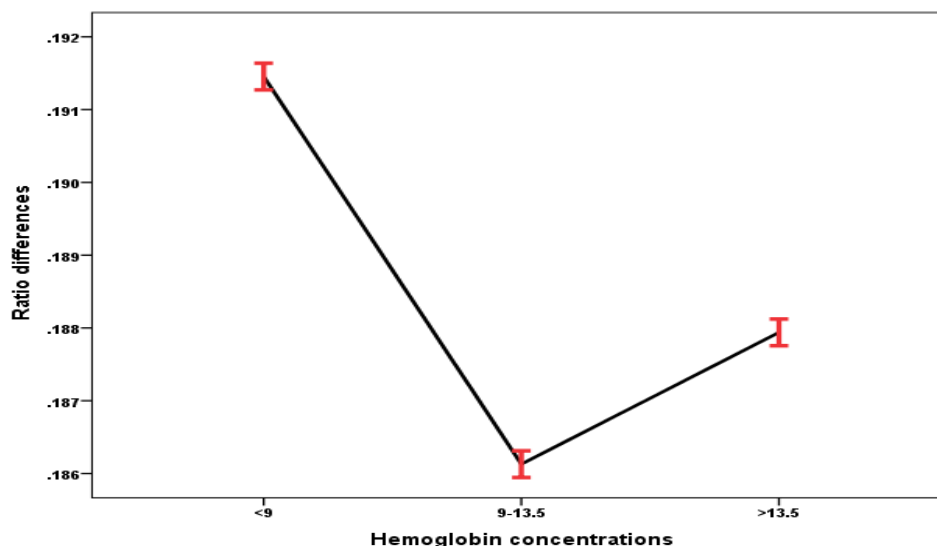


Fig (2): Placental to birth weight Ratio differences according to hemoglobin concentrations.

DISCUSSION

In our study of 75 pregnancies, placental weight was highest in pregnancies with low maternal hemoglobin concentrations and decreased with increasing hemoglobin concentrations. Placental weight relative to birthweight was higher in pregnancies with low maternal hemoglobin concentrations as compared to pregnancies with normal or high hemoglobin concentrations. This finding suggests differences in placental growth relative to fetal growth across maternal hemoglobin concentrated.

Placental weight and birthweight were measured by standardized procedures shortly after delivery.

Previous studies on the associations of low maternal hemoglobin concentrations with placental weight and placental to birth-weight ratio have shown conflicting results. Two large studies reported low hemoglobin concentrations to be associated high placental weight [6,7]. Other study, including low hemoglobin concentrations have been associated with high placental to birthweight ratio [7,14,18,19], but no association with placental to birthweight ratio have also been reported [15,20].

Few studies have included information about low and high hemoglobin concentrations within the same study sample [12–15], and most of these studies were performed over two decades ago with relatively small study samples. Similarly to our findings, these studies suggest lower placental weight in pregnancies with high hemoglobin concentrations compared to pregnancies with low hemoglobin concentrations [12,14,15]. Only one study found that placental to birthweight ratio decreased significantly by increasing hemoglobin concentrations [14].

We found high placental weight but low birthweight in pregnancies with low hemoglobin concentrations. Thus, in these pregnancies the placental to birthweight ratio was high. If the growths of the placenta and fetus were proportional across maternal hemoglobin concentrations, one would expect similar placental to birthweight ratio in pregnancies with low, normal and high hemoglobin concentrations. Placental growth was relatively more pronounced than fetal growth at low maternal hemoglobin concentrations. Low hemoglobin concentrations may result in decreased oxygenation of tissue. In pregnancy, low hemoglobin concentrations may therefore increase the risk of uteroplacental hypoxia. Hypoxia could cause sub-optimal fetal growth [21]. In the placenta, however, it is possible that biological compensatory mechanisms exist to enhance fetal oxygen supply. Increased angiogenesis is a known response to hypoxia [22], and increased vascularization of the placenta has been reported in pregnancies with low hemoglobin concentrations [23]. It is conceivable that development of new vessels in the placenta, as a response to hypoxia, can explain the placental enlargement in pregnancies with low hemoglobin concentrations. Placental enlargement has also been reported in pregnant women who live on high altitudes and thereby have decreased availability of oxygen [24]. An alternative explanation for the higher placental weight in pregnancies with low hemoglobin concentrations is that only pregnancies with optimal potential for placental growth are successful. It is possible that women with low hemoglobin concentrations have higher risk of miscarriage, and that in pregnancies with low hemoglobin concentrations and large placentas are overrepresented at birth as a result of positive selection.

As opposed to low hemoglobin concentrations, we found that high hemoglobin concentrations were associated with low placental weight and low birthweight. Thus, placental and fetal growths were proportional at high maternal hemoglobin concentrations. High hemoglobin concentrations may cause hyperviscosity of the blood, vascular occlusion and capillary congestion. Therefore, high hemoglobin concentrations may result in reduced availability of oxygen in the intervillous space and thereby suboptimal placental and fetal growth [25]. In addition, it cannot be ruled out that high hemoglobin concentrations impair early placental development and thereby placental growth later in pregnancy.

In this study of 75 pregnancies, in Iraqi, Diayla, placental weight decreased with increasing maternal hemoglobin concentrations. Placental to birthweight ratio was highest in pregnancies with low hemoglobin concentrations. This finding suggests differences in placental growth relative to fetal growth across maternal hemoglobin concentrations.

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PREGNANCY AND AUTOIMMUNE DISEASES

¹Salar Ayad Fakhri and ²Khulood M. Alsaraf¹Pharmacology and Toxicology Lecturer at Al-Esraa University College²Assistant professor Hed College of Pharmacy Al-Esraa University College**ABSTRACT**

Background: -Normally the function of immune system in our body is to recognize foreign elements and to destroy these before they could harm us either by humoral immune response (specific antibody formation) or cell mediated immune response by activation and clonal expansion of T cells. Sometimes the immune system makes a mistake and starts attacking the body's own tissues or organs. This is called autoimmunity.

Objective: - The objective of this study was to describe and identify the autoimmune disease and their effect on pregnant patients to understand the mechanisms of work and suggest a process for treating them.

Materials and methods: - At least, there were 80 types of autoimmune diseases, for the current study; the most important types had been included, and these are: - systemic autoimmune disease (rheumatoid arthritis, Grave's disease, type 1 diabetes, Crohn's disease, multiple sclerosis, lupus, scleroderma, systemic lupus erythematosus, antiphospholipid syndrome, polymyositis, dermatomyositis, and vasculitis). The pathological effect on pregnant patients had been considered for all the above-mentioned diseases. A protocol for the management of SADs during pregnancy had been described in this study via the following steps: - preconception counselling, disease assessment, and disease management).

Results: - Live vaccines should be avoided for at least the first 6 months of life in children with in utero exposure to biologics. The long-term effects of this exposure remain unknown. In clinical practice, the goal is to continue the least possible number of medications during pregnancy. Thus, the current practice is to allow RA patients to conceive on these medications and to discontinue them when pregnancy is confirmed. If a pregnant patient has a severe flare of arthritis, restarting the anti-TNF therapy should be considered after a careful risk/benefit assessment.

Pregnancy data for non-anti-TNF biologics are insufficient, and their use during pregnancy cannot be recommended.

Conclusions: - Managing a pregnancy in patients with SADs still represents a challenge. The overlapping features of physiologic and pathological changes and selected autoantibodies, and the use of potentially teratogenic medications, can complicate the management of patients with SADs during pregnancy.

A planned pregnancy in a patient with disease remission or low disease activity control before conception has a better chance of success. Preconception counselling, expert monitoring by a multidisciplinary team with experience in the field, and neonatal intensive care units remain the best ways to manage these high-risk pregnancies and obtain favourable maternal and neonatal outcomes.

Keywords: - Autoimmune disease, pregnancy, Management of systemic autoimmune disease.

1. INTRODUCTION

Normally the function of immune system in our body is to recognize foreign elements and to destroy these before they could harm us either by humoral immune response (specific antibody formation) or cell mediated immune response by activation and clonal expansion of T cells . Thus the immune system defends the body against infections and certain other diseases by identifying, attacking, and destroying germs and other foreign substances. Sometimes the immune system makes a mistake and starts attacking the body's own tissues or organs. This is called autoimmunity. There are many autoimmune diseases one example being type 1 diabetes in which the Islets cells (produce Insulin) in the pancreas are destroyed by the immune system .

An autoimmune disease (AID) is characterised by immune response to antigen , caused by self-reactivity of different effectors mechanisms of the immune system, namely antibodies and T cells. Its occurrence may be associated with genetic and/or environmental predisposition. There is an activation of the adaptive immune response with tissue damage and inflammation in the absence of any infection, expo- sure to toxins or tumour growth . Although, individually, each AID affects a small number of individuals, as a whole, it is estimated that its prevalence is between 7.6 and 9.4% . All AIDs, to some extent, have implications for fertility and obstetrics. In the general population, about 80% of miscarriages occur in the first 12 weeks of pregnancy and the risk of miscarriage in those under the age of 35 is about 10% while it is about 45% in those over the age of 40 .

Pregnancy and disease outcomes during and after pregnancy of SAD patients have improved significantly in the past decades, as the result of a better understanding of the diseases and the creation of multidisciplinary teams—including rheumatologists, high-risk obstetricians, and neonatologists—experienced in autoimmune diseases. However, the overlapping features of physiology and pathological changes during pregnancy, selected autoantibodies (eg, antiphospholipid [aPL] and antiRo/La antibodies), and the teratogenicity of commonly used immunosuppressive agents can complicate the management of patients with SADs during pregnancy.

The Aim of Study

To describe & identify the autoimmune disease which is a condition in which the immune system mistakenly attacks the body. The immune system normally guards against germs like bacteria and viruses. When it senses these foreign invaders, it sends out an army of fighter cells to attack them also how this disease effect on pregnancy to understand the mechanisms of work then treating it.

Hormone-Controlled T cell Responses Influence the Progression of Autoimmune Diseases

The immunology of pregnancy underlies the role of CD4+ T cell cytokine profile. Indeed, the mother must maintain tolerance of the fetal semi-allograft while not suppressing her own immune system and exposing herself and the fetus to infection. Non-specific factors, including probably not only hormonal changes but also trophoblast key immunomodulatory molecules (e.g. HLA-G51) favoring a switch to a predominantly Th2-type cytokine profile, may play some part in the maintenance of transient tolerance to paternal antigens in pregnancy.

1.1 Autoimmunity Diseases

Autoimmune disorders are a broad spectrum of disease that can affect any part of the body. More than 80 have been identified, a considerable number with similar symptoms. Inflammation is the classic sign of autoimmunity although how this impacts on an individual is determined by which part of the body is affected. Autoimmune disorders can be placed into two general types: those that are localised to specific organs or tissues (such as thyroiditis) or those that are systemic and damage many organs or tissues (such as systemic lupus erythematosus).

An autoimmune disease is a case of mistaken identity; it is an abnormal condition in which the body reacts against constituents of its own tissues. The result may be simple hypersensitivity reaction and or autoimmune disease when the body begins attacking its own healthy tissues. We can say it is a case of mistaken identity resulting in failure of the immune system to differentiate between self and non self. About 5 % to 7 % of adults suffer from autoimmune diseases and two thirds of these are females. Somehow left handed people are more prone the reason for this is not known.

1.2 Autoimmune Disease States

1.2.1 Systemic Autoimmune Diseases

These diseases are associated with auto antibodies to antigens which are not tissue specific. One example can be polymyositis, here the tissue involved are muscles, however the auto antibodies are found against the auto antigens which are often ubiquitous “t-RNA synthetases”. Another example is rheumatoid arthritis (RA). There is symmetric poly arthritis with muscle wasting and may be associated with myositis, and vasculitis, etc. The specific marker (auto antibody) found in blood in these patients is Rheumatoid Factor (RF) which is usually IgM. RF is an antibody against Fc fragment of immunoglobulins. Other systemic autoimmune diseases are polyarteritis nodosa, systemic lupus erythematosus and Sjogren’s syndrome as shown in the figure 1.

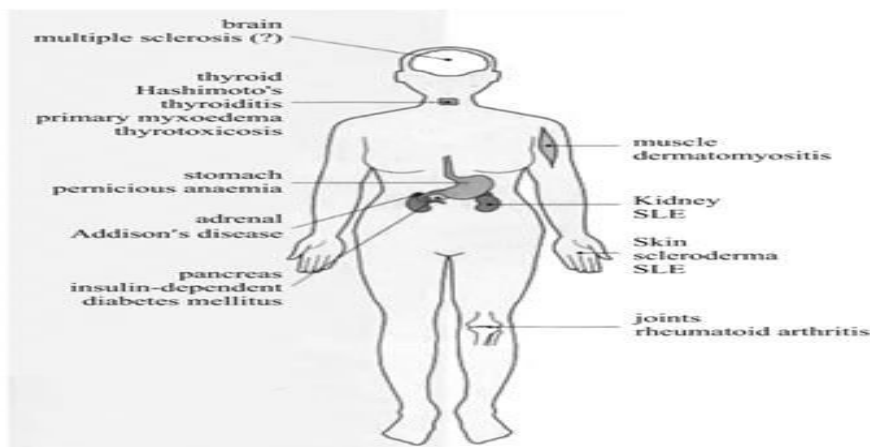


Fig 1: Polyarteritis nodosa, systemic lupus erythematosus and Sjogren’s syndrome.

1.2.2 Organ Specific or Localized Autoimmune Diseases

As the name indicates in these cases the autoimmunity involves a particular organ. One best studied organ is thyroid and examples are Hashimoto's disease which affects thyroid gland causing lymphadenoid goitre and the other is Graves disease causing thyrotoxicosis. Anti thyroglobulin antibodies are produced in both these cases and these can be shown in sera of the patients by various tests. However, the pathology in the two is different and so are the resulting symptoms. In Hashimoto's goitre there is hypothyroidism and in Graves disease there is hyperthyroidism. Another example is Addison's disease in which the adrenal glands are affected. There is lymphocytic infiltration of the adrenal glands and production of antibodies directed against zona glomerulosa. Other diseases include autoimmune disease of eyes, brain, skin and many others.

1.3 Examples of Localised Autoimmune Diseases with Pregnancy

1.3.1 Rheumatoid arthritis – a chronic condition that causes painful stiffness and swelling in the joints. Rheumatoid arthritis is a result of the immune system attacking tissues in the joint lining, eventually leading to damage of the joint itself. Rheumatoid arthritis can also effect inflammation around other organs, such as the heart and lungs. It differs from osteoarthritis, which is generally caused by mechanical stresses on the joint. Of this damage the adrenal gland does not produce enough steroid hormones (primary adrenal insufficiency), resulting in symptoms which include fatigue, muscle weakness, and a loss of appetite. This can be fatal if not recognised and treated, but treatment is relatively simple.

1.3.2 Rheumatoid Arthritis in Pregnancy

The course of rheumatoid arthritis (RA) often changes during pregnancy. Among patients with at least moderate disease activity in the first trimester, at least 48% had a moderate response during pregnancy, whereas patients with low disease activity in the first trimester reported that their disease activity remained stable during pregnancy. Thirty-nine percent of patients had at least 1 moderate flare postpartum.

Approximately 50% of pregnant women with RA have low disease activity, and 20% to 40% achieve remission by the third trimester; however, nearly 20% will have worse or moderate-to-high disease activity during pregnancy that may require further therapeutic intervention. Postpartum flares of RA may also occur, with studies reporting rates ranging from 39% to 90%. One study reported that disease activity decreased during pregnancy but increased after delivery. The investigators monitored a group of patients with RA for disease activity before conception; at each trimester of pregnancy, if possible; and at 6, 12, and 26 weeks postpartum.

1.3.3 Grave's disease – Grave's disease is one of the most common causes of hyperthyroidism affecting the thyroid. It results from the production of antibodies that mimic Thyroid Stimulating Hormone (TSH), which produces a false signal causing the thyroid gland to produce excessive thyroid hormone. Symptoms including insomnia, tremor, and hyperactivity.

Grave's Disease in Pregnancy

Graves disease is the most common cause of hyperthyroidism during pregnancy. Having too much thyroid hormone speeds up the way the body uses energy and controls growth.

A healthy thyroid gland works normally in pregnancy. Fewer than 1 in 100 women has an overactive thyroid in pregnancy. Graves disease is a problem with the body's immune system. Researchers believe it's caused by an antibody that triggers the thyroid gland to make too much hormones (34). Graves' hyperthyroidism affects 0.2% of pregnant women. Establishing the correct diagnosis and effectively managing Graves' hyperthyroidism in pregnancy remains a challenge for physicians.

.A Women with twin pregnancies, another frequent cause of GTT, have higher levels of human chorionic gonadotropin (hCG) for a more prolonged period of time and consequently may be more symptomatic. As pregnancy progresses, changes in the immunologic response lead to improvement in symptoms. Postpartum, a rebound of the immune system can lead to exacerbation of GH.

1.3.4 Type 1 diabetes – diabetes mellitus type 1 is a consequence of the autoimmune destruction of cells in the pancreas which produce insulin. Insulin is essential to control blood sugar levels and if left uncontrolled the disease can lead to serious complications, such as damage to the nerves, heart disease, and problems with the retina. Without adequate treatment type 1 diabetes would be fatal.

Type 1 Diabetes in Pregnancy

Diabetes complicates up to 10% of all 0.2% to 0.5% are patients with type 1 diabetes mellitus (T1DM). Pregnancies affected by T1DM are at increased risk for preterm delivery, preeclampsia, macrosomia, shoulder dystocia, intrauterine fetal demise, fetal growth restriction, cardiac and renal malformations, in addition to rare neural conditions such as sacral agenesis. Intensive glycemic control and preconception planning have been

shown to decrease the rate of fetal demise and malformations seen in pregnancies complicated by T1DM. Recent advances in insulin formulations and delivery methods have increased the number of options available to the obstetric team. Insulin regimens should be tailored to each individual patient to maximize compliance and ensure proper glycemic control. Intensive preconception counseling with frequent follow-up visits emphasizing tight glucose control is recommended for adequate management .

1.3.5 Crohn's disease – a type of inflammatory bowel disease (IBD), Crohn's is a result of chronic inflammation of the lining of the gastrointestinal tract that can cause diarrhoea, abdominal pain, and fatigue .

Crohn's Disease in Pregnancy

Crohn's disease can affect any age group, but the onset is most common during reproductive age . Crohn's disease is one of the most frequent medical disorders associated with pregnancy. Both gastroenterologists and obstetricians should be ready to offer proper counseling to women affected by CD that are pursuing a pregnancy or are already pregnant. Advances in inflammatory bowel disease therapies and treatment strategies have made pregnancy following a diagnosis of Crohn's disease a viable and safe option for more women with the disease. In this review we discuss the evidence-based management of Crohn's disease during pregnancy .

1.4 Autoimmune Diseases and Pregnancy

Most AIDs occur frequently in women and should they appear at childbearing age, they pose a potential risk for almost all aspects of reproduction, from fertility to pregnancy itself . In the past, it was suggested that women with certain AIDs [particularly systemic lupus erythematosus (SLE)/antiphospholipid syndrome (APS)] should avoid pregnancy. Currently, due to available treatments and specialised care for pregnant women with AID, the prognosis for both mother and child has improved significantly . However, these pregnancies are always high risk, often associated with foetal loss in the first trimester, preeclampsia/eclampsia, intrauterine growth restriction, premature rupture of membranes, placental insufficiency, pre-term birth, caesarean delivery and low birth weight The overall principle, common to all AIDs, is planning the pregnancy for the remission phase of the disease, in addition to all the care necessary for a successful pregnancy .

1.4.1 Examples of Systemic Autoimmune Diseases with Pregnancy

1.4.1.1 Multiple sclerosis – a chronic condition that can cause significant disability, multiple sclerosis is a disease in which the electrically insulating layers of the nerves are destroyed, thus affecting signalling between the brain and other parts of the body .

Multiple Sclerosis with Pregnancy

Fortunately, pregnancy does not appear to speed up the course or worsen the effects of MS. However, if patient have unrecognized MS may be more likely to start having symptoms during pregnancy. Some studies have found that MS symptoms decrease in pregnancy and increase after delivery. The disabling effects of the disease may make it physically hard to carry a pregnancy. Muscle weakness and coordination problems may increase the likelihood for falls. Fatigue may worsen. Wheelchair dependence may increase the risk for urinary tract infections. There is no evidence that MS causes infertility. Studies have shown that pregnancy, delivery, and rate of birth defects are not significantly different in women with MS compared with those without MS.

1.4.1.2 Lupus – systemic lupus erythematosus is a complex condition affecting many parts of the body, including the skin, joints, heart, lungs and nervous system. It occurs as a result of a widespread systemic autoimmune reaction and results in symptoms including fatigue, joint pain, and rashes .

Lupus with Pregnancy

Pregnancy and lupus. Women with lupus can safely get pregnant and most will have normal pregnancies and healthy babies. However, all women with lupus who get pregnant are considered to have a "high risk pregnancy." This means that problems during pregnancy may be more likely for women with lupus .

1.4.1.3 Scleroderma – in scleroderma the immune system attacks the connective tissue under the skin, resulting in a thickening of these tissues. In more severe forms it can affect blood circulation and internal organs .

Scleroderma with Pregnancy

Pregnancy in systemic sclerosis may be uneventful, with both good maternal and fetal outcomes. Because scleroderma is a multisystem disease and complications do occur, however, careful antenatal evaluations, discussion of potential problems, and participation in a high-risk obstetric monitoring program is very important to optimize the best outcome. Because women with diffuse scleroderma are at greater risk for developing serious cardiopulmonary and renal problems early in the disease, they should be encouraged to delay pregnancy

until the disease stabilizes. All patients who become pregnant during this high-risk time should be monitored extremely carefully .

1.4.1.4 Systemic AIDs

A) Systemic Lupus Erythematosus

SLE is a complex AID with varied clinical manifestations and developments. It is characterised by the presence of antinuclear autoantibodies (ANA), anti-DNA, anti-RNA, anti-Ro/SSA and anti-La/SSB autoantibodies (among others), immune complex deposition and damages to target organs, especially kidneys, skin and joints. It is associated with a significant mortality rate . Immunological mechanisms involved include defects in the removal of immune complexes, apoptosis and antigen presentation. The treatment may be topical (sunscreen and corticosteroids) or systemic, with anti-inflammatory drugs (non-steroidal anti-inflammatory drugs, salicylates) or immunosuppressors (hydroxychloroquine, methotrexate, corticosteroids, cyclophosphamide, mycophenolate mofetil, azathioprine, biological therapy) .

Systemic Lupus Erythematosus with Pregnancy

Systemic lupus erythematosus (SLE) is one of the most common autoimmune disorders that affect women during their childbearing years. SLE increases the risk of spontaneous abortion, intrauterine fetal death, preeclampsia, intrauterine growth retardation, and preterm birth. The presence of SSA and SSB antibodies can lead to fetal heart block and neonatal lupus. In general, pregnancy does not cause flares of SLE. Flares that do develop often occur during the first or second trimester or during the first few months after delivery. Complications due to flare of the lupus activity during pregnancy can cause increased morbidity and mortality, especially with renal disease .

B) Antiphospholipid Syndrome

APS is defined by the presence of at least one clinical manifestation (venous/arterial thrombosis or obstetric complications) and antiphospholipid antibodies (aAP). aAPs are part of a set of antibodies that recognise negatively charged plasma proteins and include anti-cardiolipin, anti- β_2 glycoprotein and lupus anticoagulant antibodies, among others . It also causes skin and cardiac valves lesions and changes in neurological, renal and haematological functions . This syndrome can be primary or occur in association with other systemic diseases, especially SLE . Many individuals are aAP positive without presenting any symptoms and may develop this syndrome. The prevention of the morbidity associated with APS requires an assessment of the risk of thrombosis and the evaluation of the benefits of antithrombotic therapy, which must be performed individually, taking into account the immunological profile and background .

Antiphospholipid Syndrome with Pregnancy

Women with the clinical features of APS should be tested for 3 antiphospholipid antibodies that have proven association with the diagnosis of APS: lupus anticoagulant (LAC), anticardiolipin (aCL) antibody, and anti-beta-2glycoprotein I antibody. (See Pathophysiology, Etiology, and Workup.)

These antibodies predispose to clotting in vivo, predominantly by interfering with the antithrombotic role of PLs. The antiphospholipid (aPL) autoantibodies bind moieties on negatively charged PLs or moieties formed by the interaction of negatively charged PLs with other lipids, PLs, or proteins.

C) Polymyositis (PM)/Dermatomyositis (DM)

Polymyositis with/without dermatomyositis is an inflammatory myopathy which begins by symmetrically affecting the proximal muscles, is characterised by an increase in the levels of muscle enzymes (creatine kinase/aldolase), electrophysiological changes and characteristic histological findings. These myopathies may involve the muscles that control breathing and swallowing, the heart (pericarditis, cardiomyopathy and heart failure) or the lungs (complications arising from aspiration, interstitial lung disease and pulmonary hypertension). DM also includes skin changes. While PM is mediated by T cells (CD8+), DM is a vascular disorder, mediated by autoantibodies. The first-line treatment of PM/DM is corticosteroid therapy, and it may call for the administration of other immunosuppressive drugs (azathioprine or methotrexate), to which DM responds better .

Polymyositis (PM)/Dermatomyositis (DM) with Pregnancy

PM/DM is idiopathic inflammatory myopathy characterized by proximal muscle weakness, muscle inflammation and autoimmune abnormalities. Though with a female predominance, PM/DM affects women more often after their childbearing age, with an incidence peak at 40–65 years and proportion of PM/DM onset from age 25 to 34 years estimated to be 4–11%. This accounts for the small sample size of the few relevant studies. Conclusive interpretations are difficult, given the complex relationship between the two entities.

D) Vasculitis

Vasculitis, an immune-mediated disease, is potentially fatal, especially when it affects medium or large calibre vessels. On the one hand, it can cause aneurysms, ruptures and haemorrhages and on the other, it may lead to luminal stenosis with obstruction, tissue ischemia or infarction. There are three major categories of systemic vasculitis: large-, medium- and small-vessel vasculitis. Its accurate diagnosis is difficult and requires clinical, pathological and laboratory data, crucial for an appropriate diagnosis and therapy.

Behcet's disease (BD) is a multisystem vasculitis, characterised by orogenital ulcers, uveitis and skin lesions. It may also affect the gastrointestinal tract, joints, the central nervous system or the cardiovascular system. Venous or arterial thrombosis may occur due to endothelial dysfunction and hypercoagulability. Its diagnosis is primarily clinical, although a positive Pathergy test is a classic indicator of the disease. Its treatment differs and may be topical (corticosteroids) or systemic (corticosteroids, anti-TNF- α).

Vasculitis with Pregnancy

Vasculitis has an adverse effect on pregnancy outcome. Pregnancy outcome is generally poor where vasculitis is uncontrolled at the time of conception. The only effective therapeutic agents for vasculitis known to be relatively safe in pregnancy are azathioprine and corticosteroids.

1.5 Pregnancy-Related Pathologic Changes

Some pregnancy-related complications are more common in patients with SADs compared with the general population. Complications health professionals always should include in pregnancy-related discussions are:

- Preeclampsia (PEC): Blood pressure higher than 140/90 mm Hg after 20 weeks of gestation on at least 2 occasions and proteinuria more than 300 mg/d
- HELLP (hemolysis, elevated liver enzymes, and low platelet count) syndrome
- Eclampsia: Seizures occurring in the setting of a PEC
- Preembryonic loss: Loss between conception through week 4 of gestation
- Embryonic loss: Loss between weeks 5 through 9
- Fetal loss: Loss between week 10 of gestation through delivery
- Intrauterine growth restriction (IUGR): Ultrasound-assessed fetal abdominal circumference < 5th percentile
- Preterm delivery: Delivery before week 37

1.6 Management of Sads During Pregnancy**Preconception Counseling**

Preconception counseling to assess risks, strict follow-up during pregnancy to recognize complications early, and an experienced neonatal unit to assist newborns are essential for successful pregnancies in patients with SADs. Physicians should tell their patients about how pregnancy can affect their disease and how the disease could influence the gestational outcome. Patients should be reassured that a successful pregnancy is generally achieved, if conception occurs in a stable disease remission state and if teratogenic medications are managed properly. Patients must be informed about medications that must be withdrawn before conception—those that can be maintained, and those that could be added in the event of disease flare. The main message to patients should be to plan the pregnancy according to their doctors' advice. A close collaboration between the physician who follows the autoimmune disease and the obstetrician who will follow the pregnancy should begin as soon as possible.

1.7 Disease Assessment

Initial disease evaluation should include an assessment of the disease activity and organ damage, a review of medications, a laboratory evaluation, and a discussion of specific risks. The suggested initial laboratory tests for lupus patients who are planning pregnancy or who are already pregnant include a complete blood count, urinalysis, creatinine clearance, 24-hour urine protein (or protein-to-creatinine ratio), lupus anticoagulant test, aCL IgG-IgM, α 2GPI IgG-IgM, anti-dsDNA, anti-Ro, and anti-La, C3, and C4. These recommendations could be followed with modifications for pregnant patients who have other SADs, eg, the assessment of baseline kidney function and aPL profiles. Further laboratory tests—depending on patient characteristics, the underlying SAD, and the laboratory profile—are recommended during each trimester or monthly, as needed.

1.8 Disease Management

Patients taking potentially teratogenic drugs should be removed from them or transitioned to safer ones. Conception should be delayed at least 3 months to monitor disease activity and adverse reactions.

In general, the treatment of a disease flare in pregnant patients with an SAD does not differ from the treatment of patients who are not pregnant. Corticosteroids are the first-line choice, with the dose adjusted according to severity. Depending on the disease as well as the disease activity in steroid-resistant cases, certain immunosuppressive medications, plasma exchange, and/or intravenous (IV) immunoglobulin (IVIG) can be started after a disease flare during pregnancy.

Fetal echocardiography, generally at weeks 16 through 33, should be performed for the evaluation of fetal heart rhythm, pericardial effusion, or myocarditis in mothers positive for anti-Ro and anti-La antibodies. Treatment of incomplete CHB is betamethasone or dexamethasone, which easily crosses the placenta. Rarely, plasmapheresis may be helpful. Complete CHB in a newborn usually requires a permanent pacemaker. Fetal outcomes in anti-Ro/SS-A antibody-positive patients are significantly improved with screening fetal echocardiographies. A neonatal electrocardiogram to identify clinically silent first-degree block should be performed on all infants born to mothers with anti-Ro/La antibodies. A recent study suggested that hydroxychloroquine (HCQ) may lower the risk of CHB in mothers positive for anti-Ro/La antibodies. IVIG and plasmapheresis both failed to prevent CHB based on small-scale studies.

Although controversial because of a limited number of well-designed controlled studies, the current standard of care for pregnant aPL-positive patients during pregnancy includes low-dose aspirin (LDA) and prophylactic-dose heparin for patients meeting the APS classification criteria based on a history of pregnancy morbidity only; LDA and therapeutic-dose heparin for patients meeting the APS classification criteria based on a thrombotic vascular event, regardless of pregnancy history; and no treatment or LDA for asymptomatic (ie, no history of vascular or pregnancy events) medium- to high-titer aPL-positive patients.

If patients fail the LDA and heparin combination, common next steps are increasing the heparin dose with antifactor Xa level monitoring with or without adding HCQ, corticosteroids, and/or IVIG, although a small placebo-controlled study showed no benefit. All patients with aPL require at least 8 to 12 weeks of anticoagulation postpartum (prophylactic-dose heparin) to prevent thrombotic events.

Some obstetricians frequently use LDA to prevent PEC in women identified as being at high risk, usually because of preexisting hypertension, renal insufficiency, or a history of previous PEC. However, a recent meta-analysis concluded that early administration of LDA reduces the risk of preterm, but not term, PEC and of severe, but not mild, PEC. In high-risk pregnancies, uterine artery Doppler is recommended around 20 weeks of gestation, and if abnormal, it should be repeated around the 24th week. Abnormal waveforms are good predictors of PEC, while normal results are related to good obstetric outcomes.

In patients with systemic sclerosis, careful monitoring of renal function and systemic arterial pressure is recommended during pregnancy. In general, angiotensin-converting enzyme inhibitors should be stopped because of the risk of fetal renal toxicity. However, they may be the only effective therapy for true scleroderma renal crisis—a life-threatening complication. A previous episode of renal crisis is not a strict contraindication for future pregnancy, but it is recommended that a woman should have good renal function and wait several years until her disease is stable before trying to conceive.

All pregnant patients should take folic acid during the first trimester to prevent fetal neural tube defects. Concomitant prophylactic calcium and vitamin D supplements should be prescribed to women who take corticosteroids and/or heparin, and/or are at high risk for osteoporosis.

CONCLUSION

An autoimmune disease is a condition arising from an abnormal immune response to a functioning body part. There are at least 80 types of autoimmune diseases. We concluded the most important of them. Nearly any body part can be involved. Common symptoms include low grade fever and feeling tired. Often symptoms come and go.

Live vaccines should be avoided for at least the first 6 months of life in children with in utero exposure to biologics. The long-term effects of this exposure remain unknown. In clinical practice, the goal is to continue the least possible number of medications during pregnancy. Thus, the current practice is to allow RA patients to conceive on these medications and to discontinue them when pregnancy is confirmed. If a pregnant patient has a severe flare of arthritis, restarting the anti-TNF therapy should be considered after a careful risk/benefit assessment.

Pregnancy data for non-anti-TNF biologics are insufficient, and their use during pregnancy cannot be recommended.

Managing a pregnancy in patients with SADs still represents a challenge. The overlapping features of physiologic and pathological changes and selected autoantibodies, and the use of potentially teratogenic medications, can complicate the management of patients with SADs during pregnancy.

A planned pregnancy in a patient with disease remission or low disease activity control before conception has a better chance of success. Preconception counselling, expert monitoring by a multidisciplinary team with experience in the field, and neonatal intensive care units remain the best ways to manage these high-risk pregnancies and obtain favorable maternal and neonatal outcomes.

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REACTIVE POWER COMPENSATION USING VEHICLE TO GRID ENABLED BIDIRECTIONAL OFF BOARD EV BATTERY CHARGER

Dr. B. Madhusudhana Reddy, K. Maheswari, V. Siva Sindhu, K. Santhosh Kumar Reddy and K. B. Siva Koteswar Reddy

Electrical and Electronics Engineering Annamacharya Institute of Technology and Sciences-Rajampet

ABSTRACT

The application of a grid-connected off-board Electric vehicle (EV) battery charger on reactive power compensation and simultaneous use as a battery charger (grid-to-vehicle (G2V) and power generator (vehicle-to-grid (V2G) is investigated in this study. A grid-facing front-end AC-DC cascaded H-bridge bidirectional converter regulates the power flow between the grid and the EV battery, while a back-end DC-DC bidirectional converter controls the power flow between the grid and the EV battery. As a safety measure, the charger setup provides galvanic isolation at the user end from the rest of the system. By managing EV current and battery current, the proposed control algorithm follows the active power command for G2V and V2G operation, as well as reactive power commands from the utility grid when requested. In addition, for system phase estimation and generated reference current synchronisation, an adaptive notch filter-based controller is developed. The phase locked loop (PLL) is removed from the controller architecture using the proposed control method. As a result, as steady-state and transient performance improves, the controller's computing complexity decreases. In addition, a 12.6 kVA off-board charger simulation model is created in the MATLAB/Simulink environment, and the suggested control algorithm's performance is evaluated during the EV charger's G2V, V2G, and reactive power compensation operations.

Keywords: Bidirectional EV charger, adaptive notch filter, grid to car, reactive power adjustment, vehicle to grid.

I. INTRODUCTION

Electric vehicles (EVs) have recently attracted a lot of attention in industrialised countries due to their lower gasoline consumption and greenhouse gas emissions [1]. The rapid installation of off-board fast-charging stations is one of the primary reasons driving EV penetration. The electronic circuitry of the off-board charger can be operated in either a unidirectional or bidirectional mode [2], [3]. The bidirectional operation refers to the transmission of active electricity in two directions: from the grid to the vehicle (G2V) and from the vehicle to the grid (V2G). Because of the stored energy in EV batteries, the V2G operation is exciting in the smart grid [3], [4]. Even if the stored energy in EV batteries has the potential to meet the grid's storage needs, EV battery degradation during V2G is a concern. Chargers, on the other hand, are used to provide power quality ancillary services such as a voltage regulator, reactive power compensation, and grid harmonic compensation. Battery life is preserved through adjustment and power factor correction without the use of EV batteries with grid [5]. Off-board chargers are preferable to on-board chargers for providing these supplementary services since they are more adaptable to power levels [6].

The energy source supplies the reactive current in a traditional power system. This results in additional reactance losses in the long transmission and distribution network, lowering system efficiency. The voltage quality of the system is lowered as the voltage drops at the line reactance. As a result, it is preferable to generate local reactive load demand. Furthermore, domestic loads such as compressors, refrigerators, washing machines, microwaves, and smart devices, among others, consume reactive power from the system for which consumers do not adequately compensate. A bidirectional EV charger, on the other hand, can supply reactive power locally without the use of additional VAR compensators. This paper focuses on the operation of an EV charger in grid service. As a result, off-board charging stations with grid ancillary services have become popular.

The suggested EV charger [7] is intended to compensate the grid for reactive electricity. The DC link voltage is adjusted by EV batteries, which affects its life, in order to ensure uninterruptible reactive power correction. Furthermore, it is subjected to more charging and discharging cycles, resulting in a shorter battery life. It is not stated if the charger can operate simultaneously in G2V and V2G with reactive power correction. The charger is also utilised to provide reactive power support to the grid in [8], [9]. Using EV batteries to control DC link voltage, on the other hand, affects the performance and life of the system. [10], [11] show how an EV charger may compensate for reactive power while still operating at G2V. The proposed charger control technique, on the other hand, manages the DC link using EV batteries, and V2G reactive power operation is not explored. [12] proposes a multipurpose EV battery charger with both reactive power compensation functions. Nonetheless, it does not investigate the charger's ability to operate in more than one operating mode at the same time. The

proposed charger control technique, on the other hand, manages the DC link using EV batteries, and V2G reactive power operation is not explored. [12] proposes a multipurpose EV battery charger with both reactive power compensation functions. Nonetheless, it does not investigate the charger's ability to operate in more than one operating mode at the same time.

An effective control method for a bidirectional off-board EV battery charger is presented in this study for providing reactive power adjustment when requested from the grid.

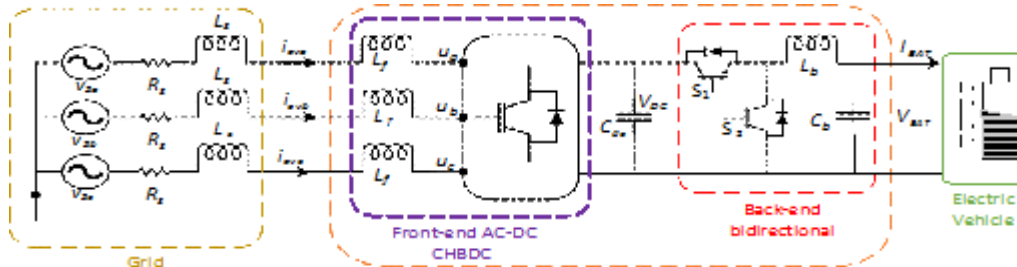


Fig.1: EV Charger Configuration

The proposed charger controller additionally allows for reactive power correction while the charger is operating in G2V or V2G mode. The reactive power compensation mode of the charger is referred to as the vehicle for grid (V4G) operating mode in this research. In addition, the suggested charger architecture provides galvanic isolation, making the EV charger extremely dependable in real-world applications. During charging, the EV charger controller ensures unity power factor (UPF). By removing the PLL from the controller, the proposed charger control method uses an adaptive notch filter (ANF) for grid synchronisation. As a result, the controller's dynamics have enhanced and its implementation complexity has decreased.

II. off-Board EV Battery Charger with Bidirectional Controls

Figure 1 shows the layout of the off-board EV battery charging model. The designed EV charger is being utilised to test the charger's reactive power adjustment capability as well as the charger's G2V or V2G operating modes. A single excited voltage source converter, the grid facing front-end AC-DC cascaded H-bridge bidirectional converter (CHBDC) is a single excited voltage source converter with grid facing front-end AC-DC cascaded H-bridge bidirectional converter (CHBDC). In Fig. 2, the grid facing converter's detailed circuit configuration is depicted. Three H-bridge modules per phase are used in the converter's current configuration. A single-phase toroidal core transformer is used to link each H-bridge output to the primary side. Three transformers' secondary windings are connected in series, resulting in a per phase output voltage that adds up the secondary voltage of each transformer. As shown in Fig. 2, each H-bridge contributes the same amount to each phase, i.e. 33.33 percent of the output phase voltage. Toroidal transformers are used as a high-frequency link in front-end converters, but their use at the output end improves performance over traditional transformer-based prototypes [13]. The converter may function with a single DC excitation voltage thanks to the toroidal core transformer. It also eliminates the need for voltage matching sensors, which were previously required to maintain equal power.

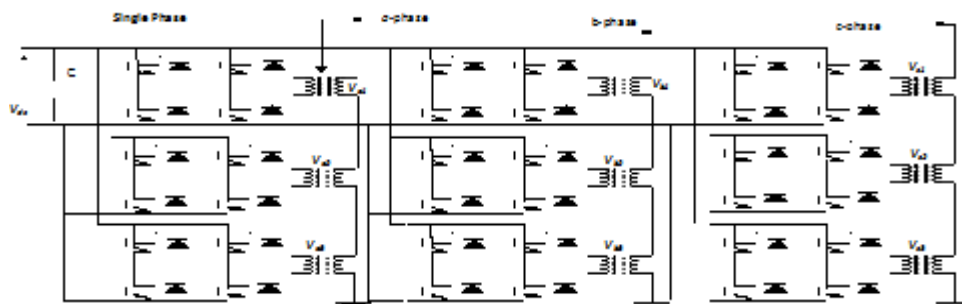


Fig.2: CHBDC Circuit Breaker

III. EV CHARGER'S CONTROL STRATEGY

The controller proposed in this work has two main goals: first, to charge the EV battery using active power from the grid (G2V), and second, to transfer active power back to the grid when asked (V2G). Second, when the utility grid operator requests it, it provides reactive electricity to the grid. Figure 3 illustrates the detail controller structure. To ensure synchronisation between the grid and the charger, the suggested control method employs ANF. [14] is the first to suggest the ANF for grid synchronisation. The ANF is functional regardless of system

disturbances, and it replaces the system controller's traditional PLL. The ANF's dynamic equations are as follows:

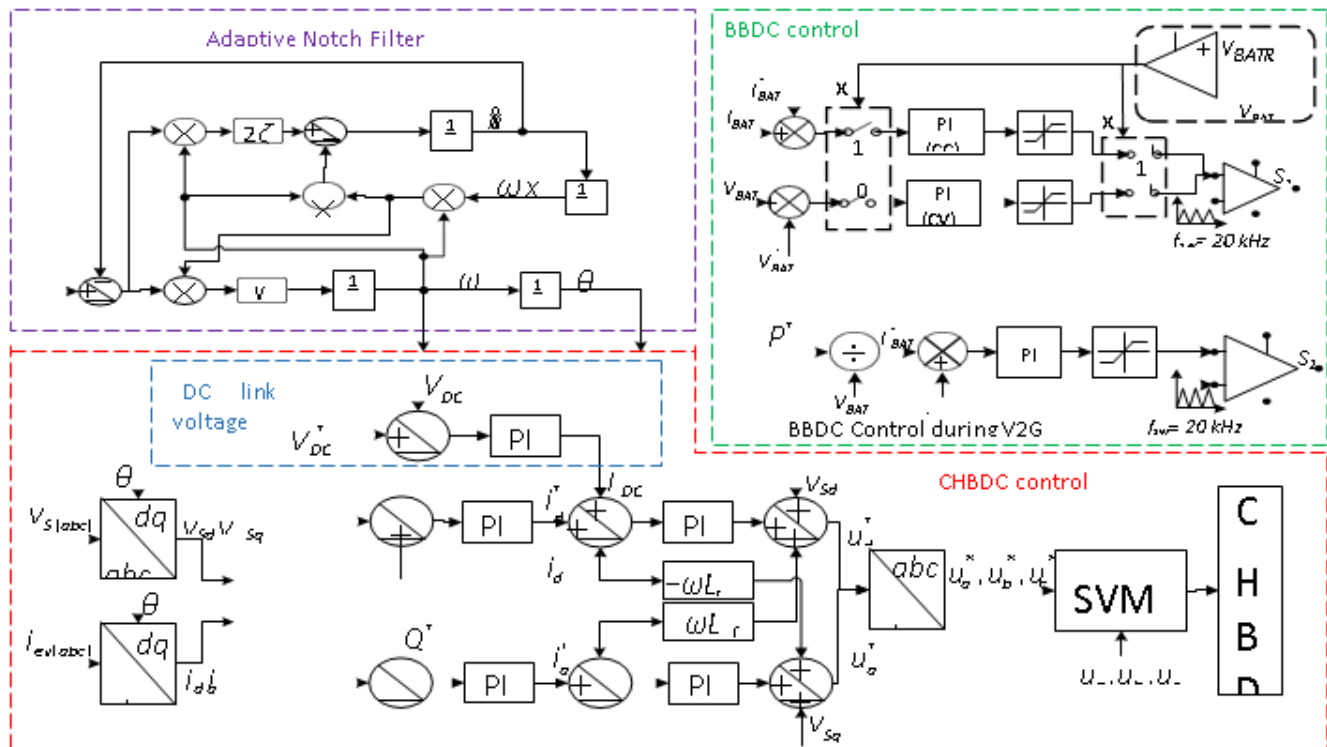


Fig 3: Bidirectional EV charger controller block diagram

A. Grid To Vehicle(G2V)

The charger draws the required active charging power for battery charging from the power grid when operating in the G2V mode. For battery charging, this study uses a constant voltage (CV) and constant current (CC) method. The reference battery charging current is set to the right power level under continuous current in the beginning condition of charging until the battery voltage reaches the manufacturer's rated permissible voltage level. The battery is then charged to its maximum potential.

B.Vehicle to Grid(V2G)

The EV charger transmits the battery-stored energy to the utility grid in V2G mode. When an EV is connected to the grid, the charger's principal function is G2 Set the reference power command P to a negative value and $Q = 0$ to maintain an 1800 phase shift between EV current and grid voltage. To generate the reference current, the EV charger control algorithm gets the required energy (reference power P and time interval) signal. The reference battery current is lost if the EV charger power is ignored V functioning. However, with the addition of a BBDC, power can flow in both ways for a short time. The electricity flows from the batteries to the grid as needed by the utility grid and as convenient as possible for EV owners. The CHBDC is controlled in this mode to Set the reference power command P to a negative value and $Q = 0$ to maintain an 1800 phase shift between EV current and grid voltage. To generate the reference current, the EV charger control algorithm gets the required energy (reference power P and time interval) signal. The reference battery current is lost if the EV charger power is ignored.

C.G2V with V4G

The EV charger, in addition to charging the EV batteries, offers reactive power support to the grid when needed in this mode. The charger controller supports the grid with both inductive and capacitive reactive power. In operation, the positive sign of power commands P and Q denoted battery charging with inductive reactive power assistance, whereas the negative sign denoted battery discharging. Capacitive reactive power is represented by the letter Q^* . The CHBDC controller in Figure 3 receives the appropriate power instruction and regulates the CHBDC switching to meet the required power demand. To charge the battery, the BBDC regulates the switching of S_{1a} as in G2V mode.

D. V2G in combination with V4G

The EV charger, along with discharging the stored energy of EV batteries, offers reactive power support to the grid when needed in this operating mode. The charger controller supports the grid with both inductive and capacitive reactive power. In this operating mode, the power command P is always a negative real number. The

positive sign of the power instruction Q denoted battery discharging with inductive reactive power assistance, while the negative sign denoted capacitive reactive power. In Figure 3, the CHBDC controller receives the appropriate power instruction and regulates CHBDC switching to meet the required power demand. To deplete the battery, the BBDC regulates the switching of S_2 in V2G mode.

Table-I
Simulation parameter specifications

Parameters	Specifications
Charger apparent power	12.6 kVA
CHBDC Filter	$L_f=2.5$ mH (25A)
BBDC elements	$L_b=3.7$ mH, $C_b=660\mu F$
Grid Impedance (Z_s)	$R_s=0.1\Omega$, $L_s=1.6$ mH,
DC link Capacitor(C_{DC})	$2200\mu F/500V$
Transformer (CHBDC)	1kVA, 1- ϕ , Toroidal core
Supply System	230Vrms, 50Hz
EV Battery	Nominal voltage= 192V,

IV. RESULTS

The suggested EV battery charger controller's performance is validated using a MATLAB/ Simulink model during the charger's various operating modes. Table-I lists the simulation model parameters that were employed in this study. G2V is used to start the charging procedure. charging the battery with the understanding that it will give reactive power whenever the utility grid requests it. If the grid wants reactive power, it permits the controller to function with a different charging power. Figure 4 depicts the charger's performance when charging with $P^*=12$ kW. The three charger voltages (u), EV current , EV output active power , EV output reactive power and DC link voltage are shown in Figure 4. (V_{DC}). The results demonstrate that the active power instruction P is followed by the EV power. Because Q^* is set to zero, the EV current is in phase with the voltage.

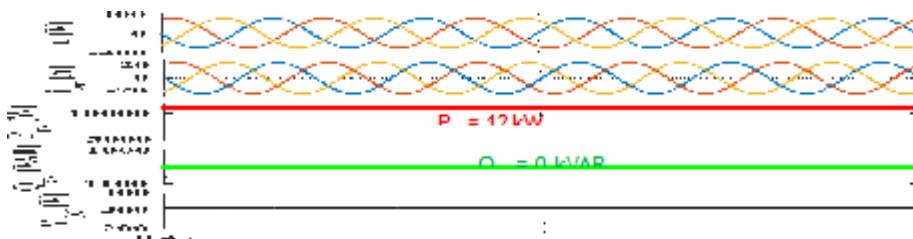


Fig. 4: EV charger performance in G2V operating mode

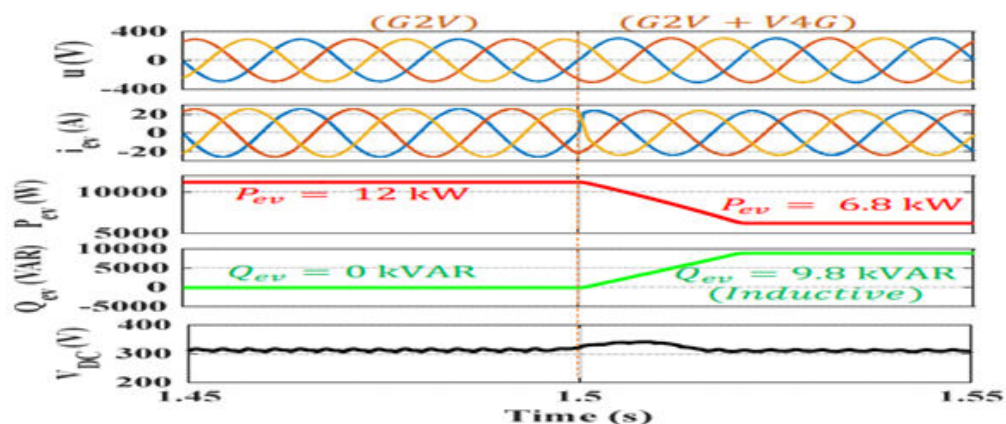


Fig.5: Transition from G2V operating mode to G2V with V4G(Inductive reactive power)

The grid requests inductive reactive power from the charger by changing its operational mode from G2V to G2V with V4G while charging at 1.5 s. $Q^*=9.8$ kVAR and $P^*=6.8$ kW are the power commands requested

from the grid. Figure 5 depicts the shift from G2V mode to G2V with V4G operating with inductive reactive power requirement. Following the reference power commands P^* and Q^* , the EV power output settles in the less two grid cycle time. The duration of a cycle. The DC link voltage overshoots at the transition point before settling to its reference value. Before the transition, the EV current is in phase with the EV voltage, but after the shift, it begins to lag behind the EV voltage. The amplitude of the EV current does not alter during the transition because the charger power is limited to its rated value. The grid requires capacitive reactive power from the charger with $Q^* = -9$ kVAR and $P^* = 8$ kW when operating at 3.5 s. This changes the charger's reactive power demand from inductive to capacitive. Reactive power demand is a term used to describe the amount of energy that is consumed when. With this power order, the charger's performance is shown in Fig.6. After the switch, the lagging EV current begins to lead the EV voltage, as predicted. The DC link voltage dropped during the transition and returned to its original setting in less than two grid cycles. As the charger power is limited to its rated value during the transition, the amplitude of the EV current remains constant.

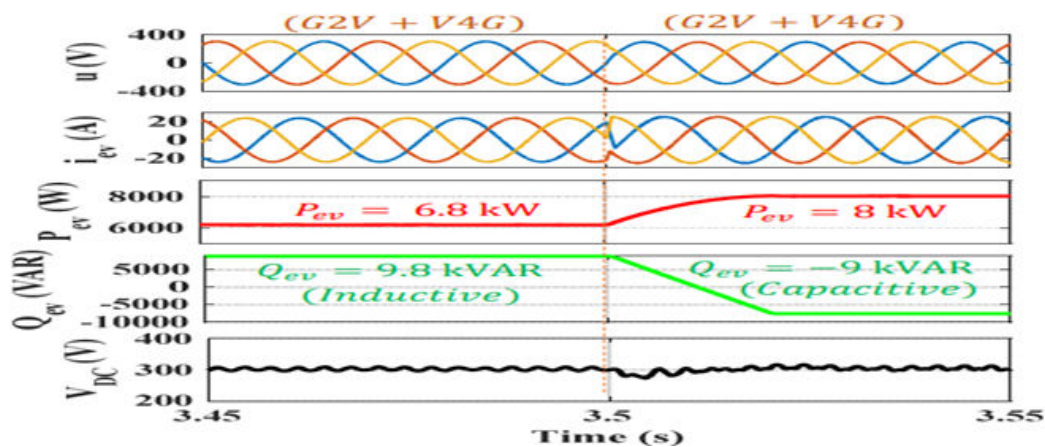


Fig.6: Transition from G2V with V4G(Inductive reactive power) operating mode to G2V with V4G(Capacitive reactive power)

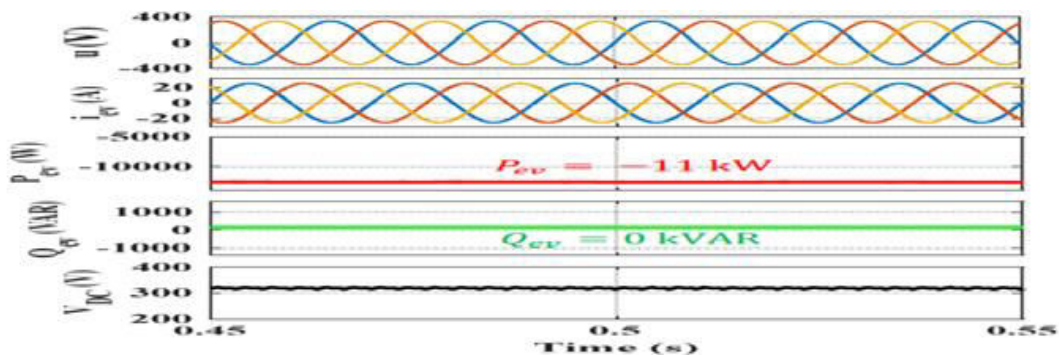


Fig.7: EV Charger performance in V2G operating mode

Figure:7 depicts the charger's performance in the V2G operating mode. $P^* = -11$ kW is the reference active power. In Fig. 8, the charger's operating mode changes from V2G to V2G with V4G operation, with power commands $Q = 9$ kVAR and $P^* = -6.3$ kW. The relevant electrical quantities change in response to the change in power command in order to meet the grid power demand. Fig. 9 shows the shift from inductive to capacitive reactive power command with $Q = -6.7$ kVAR and $P = -8.7$ kW. As expected, the data reveal fluctuations in the charger current

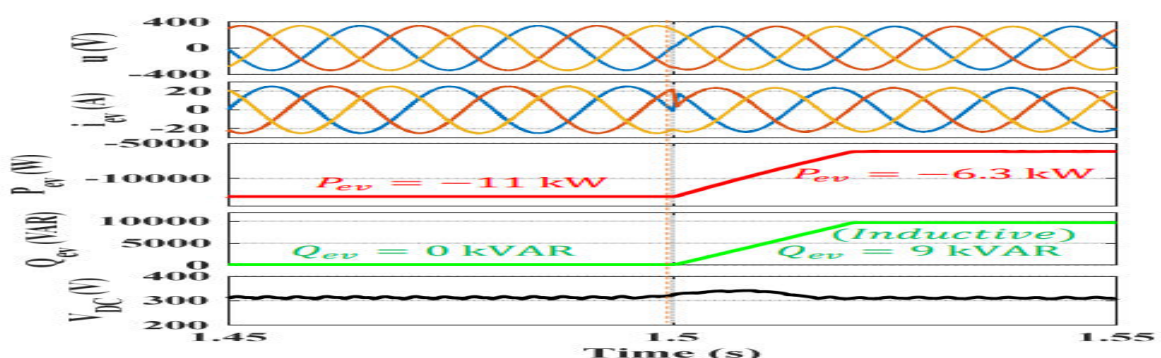


Fig.8: Transition from V2G operating mode V2G with V4G (Inductive reactive power)

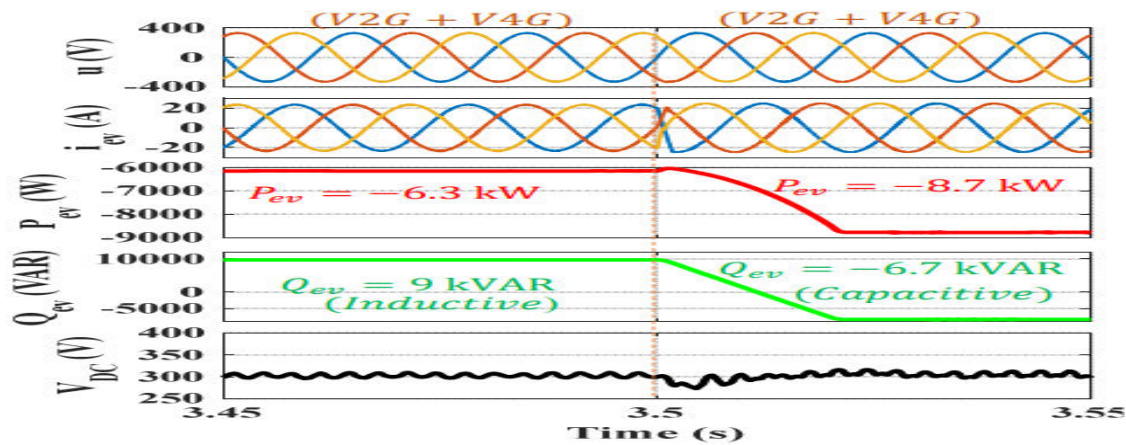


Fig.9: Transition from V2G with V4G (Inductive reactive power) operating mode to V2G with V4G (Capacitive reactive power)

V. CONCLUSION

In this study, an efficient control technique is proposed that incorporates EVs as an active element that may store, use, and provide energy, while also considering G2V and V2G modes and reactive power compensation. At the user's end, the charger arrangement provides galvanic isolation. safety precautions The designed control algorithm performs well in a variety of operating conditions, and the modes of operation are well performed when the power instruction is issued. The charger performs effectively in both steady-state and dynamic modes. In less than two grid cycles, the off-board charger responds to the power command transition. Reactive power operation has no effect on the EV battery, which extends its life. The simulation results demonstrate that the suggested controller performs well in a variety of power command circumstances. The collected results demonstrate that the proposed charger is a promising contender for utility grid reactive power support services.

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SCHEDULING ALGORITHMS IN OPERATING SYSTEMS: A CASE STUDY

¹Nisha. B, ²J. Naskath, ³Soundaryaa. S, ⁴Thaila shree, S and ⁵A. Shali¹UG Student, Department of CSE National Engineering College Kovilpatti²Assistant Professor (SG) Department of CSE National Engineering College Kovilpatti^{3,4}UG Student, Department of CSE National Engineering College Kovilpatti⁵Assistant Professor Department of CSE, Sri Sairam Engineering, Chennai**ABSTRACT**

The objective of this paper is to compare CPU scheduling algorithms, FCFS(First

Come First Serve), SJF(Shortest Job First), Priority scheduling algorithm(pre emptive and non pre emptive) and Round Robin. CPU is the most important resource in the computer system hence task must be scheduled in order to achieve maximum CPU utilization. Sometimes the FCFS algorithm is better than the other scheduling algorithms, in some other cases, the round robin scheduling algorithm is better. However, it cannot be predicted which algorithm best fits for the given processes. The target is to know which algorithm is more suitable for the certain process. This research paper describes how these algorithms are implemented, with the parameters such as average waiting time and average turnaround time, Gantt chart and how average waiting time and average turnaround time are calculated, merits and demerits of the scheduling algorithms.

Keywords: Operating System, Scheduling Algorithms, CPU utilization, Turnaround Time, Waiting Time

I. INTRODUCTION

When a process is waiting for an I/O request or some other requests that are needed for its execution, the CPU will be sitting idle. To maximize the CPU utilization time, the CPU is allocated to another process which is waiting in the ready queue. This can be achieved by scheduling [1&2]. Scheduling refers to a set of policies and mechanisms to control the order of work to be performed by a Computer system. The basic idea is to keep the CPU busy as much as possible by executing a process until it must wait for an event, and then switch to another process. In multiprogramming systems, when there is more than one runnable process, the operating system must decide which one to activate. The decision is made by the part of the operating system called the scheduler, using a scheduling algorithm [4, 7&8]. The main purposes of scheduling algorithms are to minimize resource starvation and to ensure fairness amongst the parties utilizing the resources. Scheduling deals with the problem of deciding which of the outstanding requests is to be allocated resources [5,6,9]. There are many different scheduling algorithms

II. SCHEDULING ALGORITHMS EXAMPLE:**A. First Come First Serve(Fcfs):**

FCFS, also known as First in First out (FIFO), is the simplest scheduling policy. Arriving jobs are inserted into the tail (rear) of the ready queue and the process to be executed next is removed from the head (front) of the queue. FCFS performs better for long jobs [3].

Table 1: Scheduling Process and its burst time

Process	Arrival time(ms)	Burst time(ms)	Priority
P1	0	7	3
P2	6	9	4
P3	7	6	1
P4	8	3	5
P5	11	5	2
P6	15	10	3

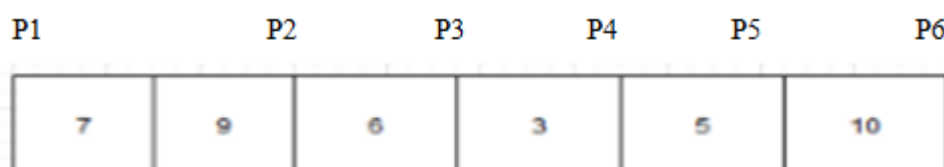
Gantt Chart:

Figure 1: Gantt Chart FCFS scheduling Algorithma)Turn Around Time:

Turn Around Time = Completion Time - Arrival Time $P1=7-0=7$

$P2=16-6=10$ $P3=22-7=15$ $P4=25-8=17$ $P5=30-11=19$ $P6=40-15=25$

Average Turnaround Time=15.5 ms

b) Waiting Time:

Waiting Time=Turnaround time-Burst time $P1=7-7=0$

$P2=10-9=1$ $P3=15-6=9$ $P4=17-3=14$ $P5=19-5=14$ $P6=25-10=15$

Average Waiting Time=8.83 ms

B. Priority Scheduling Algorithm (Non-Preemptive):

Each process is assigned a priority. The ready list contains an entry

for each process ordered by its priority. The process at the beginning of the list (highest priority) is picked first. A variation of this scheme allows preemption of the current process when a higher priority process arrives [10].

Gantt Chart:

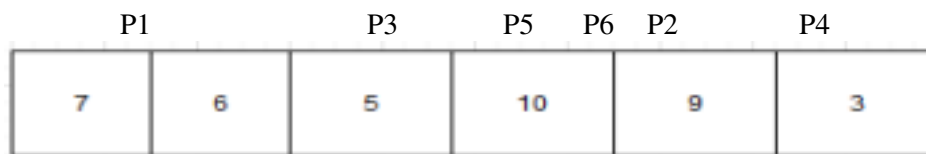


Figure 2: Gantt chart Priority Scheduling (Nonpreemptive)

ALGORITHM

a) Turn Around Time:

Turn Around Time = Completion Time - Arrival Time $P1=7-0=7$

$P2=37-6=31$ $P3=13-7=6$ $P4=40-8=32$ $P5=18-11=7$ $P6=28-15=13$

Average Turnaround Time=16 ms

b) Waiting Time:

Waiting Time=Turnaround time-Burst time $P1=7-7=0$

$P2=31-9=22$ $P3=6-6=0$ $P4=32-3=29$ $P5=7-5=2$ $P6=13-10=3$

C. PRIORITY SCHEDULING ALGORITHM (PREEMPTIVE):

Gantt Chart:

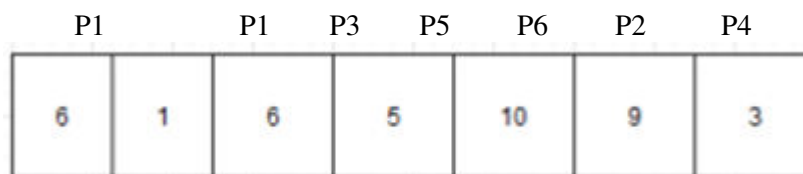


Figure 3: Gantt Chart Priority scheduling (Preemptive) Algorithma)Turn Around Time:

Turn Around Time = Completion Time - Arrival Time $P1=7-0=7$

$P2=37-6=31$ $P3=13-7=6$ $P4=40-8=32$ $P5=18-11=7$ $P6=28-15=13$

Average Turnaround Time=16 ms

b) Waiting Time:

Waiting Time=Turnaround time-Burst time $P1=7-7=0$

$P2=31-9=22$ $P3=6-6=0$ $P4=32-3=29$ $P5=7-5=2$ $P6=13-10=3$

Average Waiting Time=9.33ms

D. Round Robin Scheduling Algorithm:

The Round-Robin (RR) scheduling algorithm is designed especially for time-sharing systems. It is similar to FCFS scheduling, but pre-emption is added to switch between processes. A small unit of time, called a time

quantum or time slice, is defined. A time quantum is generally from 10 to 100 milliseconds. The ready queue is treated as a circular queue.[4 & 11] Gantt Chart:

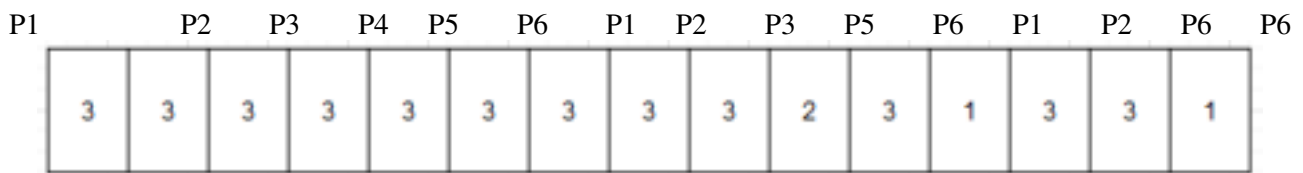


Figure 4: Gantt Chart RR scheduling Algorithm

a) Turn Around Time:

Turn Around Time = Completion Time - Arrival Time $P1=33-0=33$

$P2=36-6=30$ $P3=27-7=20$ $P4=12-8=4$ $P5=29-11=18$ $P6=40-15=25$

Average Turnaround Time = 21.667 ms

b) Waiting Time:

Waiting Time = Turnaround time - Burst time $P1=33-7=26$

$P2=30-9=21$ $P3=20-6=14$ $P4=4-3=1$ $P5=18-5=13$ $P6=25-10=15$

Average Waiting Time = 15 ms

E. Shortest Job First Scheduling Algorithm (NonPreemptive)

SJF policy selects the job with the shortest processing time first. Shorter jobs are always executed before long jobs. One major difficulty with SJF is the need to know or estimate the processing time of each job. Also, long running jobs may starve, because the CPU has a steady supply of short jobs.[3 & 12]

Gantt Chart:

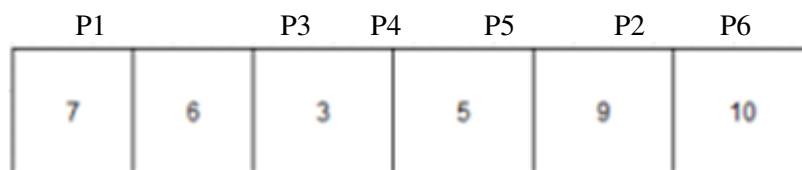


Figure 5: Gantt Chart SJF(Non Preemptive) scheduling Algorithm a) Turn Around Time:

Turn Around Time = Completion Time - Arrival Time $P1=7-0=7$

$P2=30-6=24$ $P3=13-7=6$ $P4=16-8=8$ $P5=21-11=10$ $P6=40-15=25$

Average Turnaround Time = 13.33 ms

b) Waiting Time:

Waiting Time = Turnaround time - Burst time $P1=7-7=0$

$P2=24-9=15$ $P3=6-6=0$ $P4=8-3=5$ $P5=10-5=5$

$P6=25-10=15$

Average Waiting Time = 6.67 ms

F. Shortest Job First Scheduling Algorithm (Preemptive):

Gantt Chart:

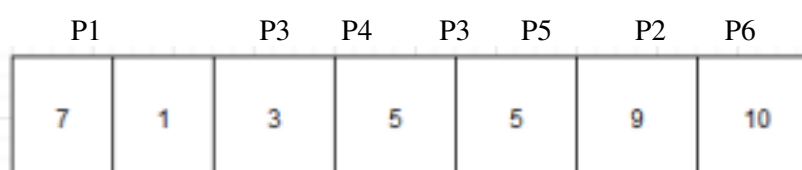


Figure 6: Gantt Chart SJF (Preemptive) scheduling Algorithm a) Turn Around Time:

Turn Around Time = Completion Time - Arrival Time $P1=7-0=7$

$P2=30-6=24$ $P3=16-7=9$ $P4=11-8=3$ $P5=21-11=10$ $P6=40-15=25$

Average Turnaround Time= 13 ms

b)Waiting Time:

Waiting Time=Turnaround time-Burst time $P1=7-7=0$

$P2=24-9=15$ $P3=9-6=3$ $P4=3-3=0$ $P5=10-5=5$ $P6=25-10=15$

Average Waiting Time= 6.33 ms

III. CONCLUSION

There is no universal “best” scheduling algorithm, and many operating systems use extended or combinations of the scheduling algorithms that are mentioned above. This study showed that optimized scheduling algorithms for different CPUs could reduce response time, wait time, and overheads in CPU, disk, and memory usage and increase productivity and efficiency. All algorithms are good, but the speed of the process depends on the processor load.

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SECURITY ANALYSIS OF DDoS ATTACKS USING MACHINE LEARNING

¹Ms.Varkha K. Jewani (Ms. Pragati Thawani) and ²Dr.Prafulla E.Ajmire¹Assistant Professor, K.C College, Churchgate Research Scholar in Computer Science Sant. Gadge Baba Amravati University, Maharashtra²Associate Professor in Computer Science& Application Sant.Gadge Baba Amravati University, Maharashtra G S Science, Arts & Commerce College, Khamgaon, Maharashtra**ABSTRACT**

Recent advances in Information Technology have created a new era called the Internet of Things (IoT). This new technology allows objects (things) to connect to the Internet like Smart TVs, printers, cameras, smartphones, smart watches, etc. This trend offers new services and improve the application and their lifestyle for many users. The rapid growth of IoT Installing and interconnecting multiple devices is a common practice. There are many advantages of IoT devices have various challenges that arise as network anomalies with this. The study was the current study on the use of deep learning (DL) in DDoS intrusion detection demonstrated. This study aims to implement various machine learning (ML) algorithms in WEKA. A tool for analysing the detection performance of DDoS attacks using the latest CICDDoS 2019 record. CICDDoS2019 turned out to be the model with the best results. In this survey $K_{\text{Nearest\_Neighbors}}$ (KNN), a super vector machine, various types of ML algorithms (SVM), Naive Bayes (NB), Decision Tree (DT), Random Forest (RF), and Logistic Regression (LR). The highest accuracy results in the evaluation presented were achieved using a decision tree (DT) and random forest (RF) algorithms, 99% respectively. However, DT is better than RF this is because the calculation time is as short as 4.53 seconds or 84.2 seconds

Keywords: Cyber Security; IoT, Machine Learning, Intrusion Detection System, IoT security, DDoS attack.

I INTRODUCTION

Distributed Denial of Service (DDoS) attacks are the most serious threats in many areas. IoT, smart cities, healthcare, information technology, commerce, etc. in our lives Parts [1]. DDoS attacks continue to threaten network security in all business areas despite its large size, it is steadily increasing in complexity, quantity, and frequency [2]. The author of [3] divides the DDoS attack into two parts. (I) First part is called a reflection-based DDoS attack. In this part, cyberspace gadgets sending attack traffic, such as an HTTP call, to the target hides the attacker's identity. These requests are sent over the source IP address, which points to the following IP address: Reflector server (bot). Therefore, these simultaneous requirements are placed on everything send on victim. Usually these attacks are application protocols (i.e. TCP, Individual UDP or their integration). MSSQL or SSDP can be used in TCP-based attacks, while CharGen, NTP, or TFTP can be used in UDP [3]. Collection of these logs Used in confirmed attacks. This is DNS, LDAP, NetBIOS, SNMP, or PORTMAP [3]. (II) The second part is an exploit-based DDoS attack. Use both TCP and UDP as well. The SYN flood attack is a TCP-based attack, UDP floods and UDP Flags are UDP-based attacks [3]. Figure 1 shows the detailed DDoS Attack classification.

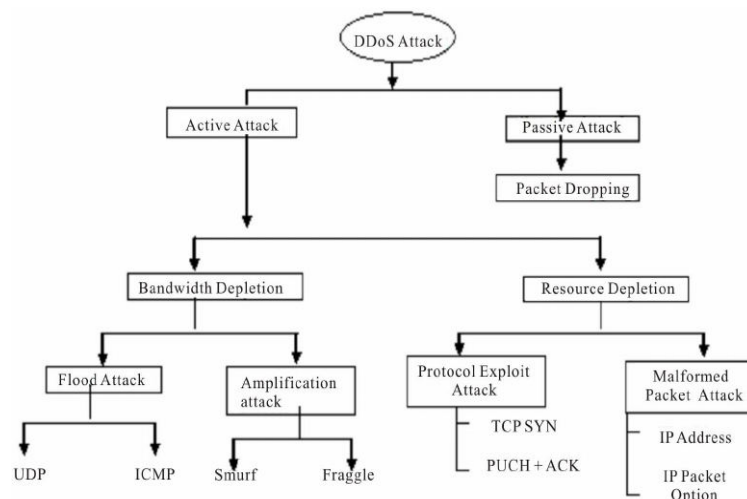


Figure 1: The Taxonomy of DDoS attack [3]

According to the CISCO report [3], the number of DDoS. Significant increase Attacks in the near future. According to the statistics of [3], the amount will increase by 2022. DDoS attacks will double to 14.5 million

compared to 2017. Figure 2 shows the global the number of DDoS attacks increased between 2017 and 2022. The amount and traffic of DDoS attacks is increasing rapidly, and service providers pose a serious threat. The largest attack reported was 1.7 Tb / s [2]. Recently, the cost of downtime is due to DDoS the attack was very expensive and cost \$ 221,836.80 [2]. Comparison with 2017 and in 2018, the number of attacks on IPS devices and firewalls almost doubled. 16% and 31% [2], respectively. During this time, DDoS attacks also increased by 11%. That's 34% compared to third-party cloud-based services and data centers. DDoS attacks are still at the forefront of threats due to their accessibility to business applications, services, and networks. There are similarities between DDoS attacks and non-malicious availability issues such as: B. A system administrator who performs network maintenance tasks or technical problems [4, 5]. These issues create significant challenges in accurately identifying and effectively defending against these types of attacks. Network performance to win and effectively defend against these types of attacks. Attempting to detect a DDos attack can reduce network performance due to file access or loss of access to certain websites.

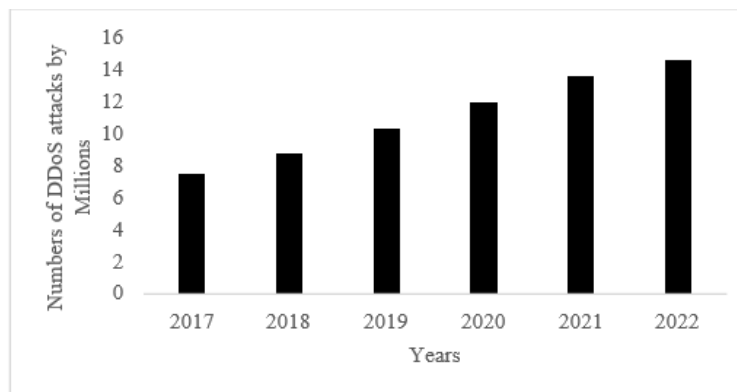


Figure 2: Global DDoS attacks forecast 2017–2022

The biggest motivations behind these attacks in 2017 were criminals who demonstrated attack skills, games, and blackmail. [2] Attackers are continually improving their computing power against DDoS attacks [7]. The main contribution of this research is to implement various machine learning (ML) algorithms in the WEKA tool and analyze the detection performance of DDoS attacks using the latest CICDDoS2019 dataset. This study used six ML algorithms: KNN, SVM, NB, DT, RF, and LR. One need to design and develop intelligent security solutions to protect your IoT devices and protect them from attacks by compromised IoT devices.

1.1. Motivation - Cybercriminals used DDoS attacks to disable targeted servers and break into risk networks that could overwhelm the outcome. Many organizations struggle to manage modern cyberattacks due to the increasing size and complexity of DDoS attacks. With the latest technologies, smart gadgets and IoT are particularly vulnerable to various DDoS attacks due to resource constraints such as storage and processing power limitations, so cybercriminals are aware of these latest technologies and their weaknesses. [8]. Many organizations, such as Netflix, CNN, and Twitter, were disconnected from the network for nine hours in 2016 by attacks on Internet service providers. This technical issue has caused many problems, including: Economic loss, loss of productivity, brand damage, poor insurance ratings, unstable relationships between customers and providers, and IT budget overruns [9]. Cyber criminals can use DDoS attacks to prevent clients from accessing servers and websites [1]. To protect your data processing, information technology, and commercial components, one need to set up an IDS system to detect and prevent DDoS attacks. Cybersecurity costs are significantly reduced when security teams use the latest innovative technologies such as ML, automation, and AI [10]. This project uses a variety of supervised machine learning (ML) algorithms to analyze the detection performance of DDoS attacks.

1.2. Main Contribution- This study provides a detailed overview of network threats from IoT networks and their devices using appropriate ML-based and DL-based attack detection technologies. This work aims to contribute to research in this field. The main contributions of this research are: This study provides an overview of ML and DL-based IDSs, including their strengths and weaknesses, and how to detect them. Coverage and comparison of various datasets available for network and IoT security research. This is done by showing the ML used and the accuracy detected. Presentation of current research topics and future research directions in this field. This white paper is organized as follows: Section 2 shows related work on various DL models and experiments with datasets containing DDoS attacks. Section 3 details the evaluation of research paper performance. Section 4 describes the evaluation criteria. Section 5 describes some challenges and future work. Finally, Section 6 shows the conclusions of the research paper.

2. RELATED WORK

Here are a number of studies on the use of DL in intrusion detection (ID) for DDoS attacks. This part summarizes data set experiments using various deep learning models and DDoS attacks. The validation procedures used for IDS can be divided into three systematic types: signature-based validation techniques, anomaly-based validation techniques, and hybrid-based validation techniques [11].

2.1. Signature-based Recognition Technology – This type of detection technique gets a collection of attack signatures and compares network traffic to this collection of signatures. If a match is found, a detection alert will be raised. This approach can detect known attacks whose signature is stored in the repository, but it cannot detect zero-day or new attacks even if it is ineffective against mutations in existing attacks [12]. This study, reference [13], suggests the use of the artificial immune system "AIS". To overcome the shortcomings of the signature-based approach. This technique uses the immune cell paradigm to create a detector based on the attack signature. This paradigm can determine whether a packet is legitimate or malicious based on its classification as a self-sufficient or non-self-sufficient element. Continuous system monitoring allows the system to adopt new patterns. However, in a resource-constrained IoT environment, the feasibility of such a detection method is questionable. Researchers in [14] solved the resource limitation issue for signature-based IDSs by using another Linux computer with an adaptive version of Suricata-based signature IDSs. Researchers, on the other hand, haven't shown anything about how to keep attack signatures up-to-date. Researchers in [15] extended their work in [14] by presenting changes to signature matching techniques. Another study by [16] investigated the limits of IoT processing power by combining auxiliary displacement values with multiple pattern recognition techniques to reduce the number of matching operations required between attack signatures and network traffic packets. The system used an open source IDS (Snort) and open source antivirus (ClamAV) signature repository. In this study [17], signature-based IDS was proposed to detect DDoS attacks in IoT networks. In a hybrid deployment, it consists of two units: (I) With IDS detector (II) IDS router. IDS routers are firewalls and discovery devices hosted on perimeter gateways. The sensor monitors the internal traffic used by the IDS detector. The results showed that the scheme identified a version number change and a hello flooding attack.

2.2. Anomaly-based detection technology - This type of detection technique is based on the general basic behavioural profile of the monitored environment [18]. Then use this regular baseline to compare the actions of the system at a particular point in time. Deviations from the permissible threshold are recorded by the alarm, but there is no classification of the type of attack detected. There are also attempts to use an ML-based behaviour detection model that learns normal and offensive events. However, creating a regular profile is preferable to learning about regular and attack events where the actual network cannot contain new attack events [19]. Anomaly-based detection approaches are more effective than signature-based detection methods in detecting new types of attacks. The ML algorithm is used in anomaly-based detection strategies to create a baseline health profile for monitored systems. Due to the large amount of computing resources required to train and test ML algorithms, implementation in resource- and energy-constrained IoT environments remains difficult. This study, reference [20], proposed a lightweight IDS scheme for the IoT. There are two levels of this scheme, training and evaluation. This technique is trained to reduce the weight of the system by using features derived from the packet arrival interval of the data received during the training phase. This scheme uses a Support Vector Machine (SVM) classifier to detect intrusion or anomalous traffic during the evaluation phase. The lightweight IDS method is effective in terms of recognition speed and classification accuracy. This study, reference [21], proposed a real-time scheme for detecting wormhole attacks in the RPL-based IoT. Use routing information and Received Signal Strength Indicator (RSSI) to detect malicious users and nodes. Real-time IDS systems are inspected in both central and distributed installations where users achieved a recognition rate of 90%.

2.3. Hybrid-based detection technology - This type of detection technique uses a combination of the previous two techniques to avoid shortcomings and optimize the benefits of detecting existing and new attacks. In this study [22], SVELTE is an IP-connected IoT system IDS that, according to the inventor, uses RPL as the routing protocol for 6LoWPAN networks. They sought to find a compromise between the storage cost of signature-based detection and the computational cost of anomalous-based detection strategies. In this study [23], SDN was used to track compliance with the behavioural profile of the manufacturer's usage description (MUD) and assign ML methods for DoS, reflective TCP / UDP / ICMP flooding, and ARP for IoT devices. A volume attack such as spoofing has been detected. The author of this study [24] proposed a new method for detecting device-class DDoS traffic based on individual device traffic characteristics. The authors of this study investigated the classification of machine-type communication traffic (MTC) generated by IoT devices. The purpose of their methodology is to see if the observed IoT device is

generating legitimate traffic or DDoS traffic by comparing the traffic fluctuations generated by the IoT device with the legitimate traffic class to which the device originally belonged. Was to evaluate. This study [25] explores the possibility of using such features to classify devices regardless of their operation or purpose. This type of classification is required for dynamic and heterogeneous environments. A total of 41 IoT devices were used in this study. The concept of supervised ML has improved logistic regression. The classification model was created with Logit boost. Researchers created a multiclass classification model using a set of 13 network traffic functions created by IoT devices. Studies have shown that devices can be classified into four classes with high performance and accuracy based on the traffic flow characteristics of the device. Model performance shows high results according to measurements such as accuracy, measure, true positive rate, false positive rate, and kappa factor. In this study [26], the author proposed a DDoS traffic detection model for various IoT device classes using a boosting method using a logistic model tree. Since the characteristics of network traffic can vary slightly from device class to device class, individual versions of the model are developed and applied to each device class. Their findings show high accuracy and effective methods for detecting DDoS activity. The following studies show the methods used to detect deep learning in DDoS attacks. Table 1 gives an overview of the various DL models. The author of this study [27] proposed a deep learning strategy to detect and prevent flood attacks known as DoS-based Hello in IoT health networks. They used the Deep Belief Network (DBN) model to identify this type of attack. This model sent a large number of Hello packets to slow down the network. DBN technology uses a bypass-linked attacker's update-based rider optimization algorithm (BAU-ROA) to achieve a variety of effective results and continue to work optimally. A metaheuristic algorithm called BAU-ROA has been developed to improve ROA execution. This is a powerful optimization technique with a simple computational approach and few computational parameters. Experiments have shown that the BAUROA algorithm is superior to other optimization algorithms in terms of DBN operating procedures. Through the proposed deep learning model, research [28] solved the problem of sampling-based methods used in network security, which were inadequate in the early stages of SDN exposure in IoT networks. Stacked Auto encoder (SAE) is the technique used in this study and includes a decoder that lowers the layer and a decoder that makes the layer asymmetric. They used the SAE method, a deep learning technique for optimizing the IDS of samples generated by adaptive questions and the sFlow approach, and investigated the impact on accuracy. As a result, after the two samples, it was clear that the CPU utilization was low, and the actual results of sFlow and adaptive polling were obtained from the accuracy averages of 91% and 89%, respectively. In this study [29], DDoS attacks at the SDN controller level were detected using a DL technology called LSTM implemented for cloud and fog computing security. The advantages of using the LSTM model are: Suitable for exercises using network packets collected in cycles. Interval- Interval, and, distribute information about the previous packet in the current package. Experiments have shown that three hidden levels and a 128-unit LSTM model are appropriate. LSTMs were used to parse botnet records named ISCX2012 and IDSCTU13. Experiments showed that the accuracy obtained was 98.88% and the model was successfully implemented. Researchers in this study [30] implemented DCNN technology to disclose DDoS attacks against OSN. The flat machine learning algorithm was unable to perform traffic analysis as needed, so we found it appropriate to use DCNN when the dataset sample was small. Experiments have shown that the accuracy is out of DCNN 99%, which is the best performance compared to KNN, SVM, and Naive Bayes. The flat machine learning algorithm shows 93% and correct answers, while the other algorithms show 88% and 79%, respectively. Another study [31] proposed an IDS with a security framework that uses both asymmetric deep auto encoder (NDAE) DL technology and RF associations. They used both models to secure the SDN. In NDAE, only the encoder part is basic, and the encoder structure is different from the decoder of the conventional auto encoder. The DL method used was ideal for overcoming the problems that arise from flat ML classification, such as extended training time, which requires large amounts of memory and processors. Therefore, the reason for choosing NDAE is that it consumes less CPU, has a shorter training period, and is more accurate. CICIDS 2017 and NSLKDD records continued to be used to assess the performance of the techniques used to detect DDoS attacks. By applying the NDAE hybrid method to the NSLKDD and CICIDS 2017 datasets, the results showed that 99.60% and 99.24% accuracy was achieved, respectively. The results show that the implemented model is suitable for use with IDS. In this study [32], the CNN and FNN methods, both learning models, were recommended for analysing network traffic and using DDoS IDS. It was developed an implementation using the NSL-KDD dataset. They found that both FNN and CNN techniques are more accurate than SVM, J48, Naive Bayes, RF, and RT, which are flat ML algorithm strategies for detecting network anomalies and determining the type of anomalies. Observed to achieve. This study [33] recommends using KNN with signature-based technology to detect DDoS attacks with IDSs that monitor disruptive movements in the

network. As a result of the implementation, when comparing both the ANN and the signature-based methods, we found that using these two methods together yielded a correct answer rate of 99.98. As a result of the investigation, the above investigation shows that DL technology has made great progress in analysing network traffic and detecting DDoS attacks. This study, reference [34], provides a comprehensive assessment of current and previous studies that characterize IoT traffic in terms of IoT applications and design. The main focus of publications on the topic of IoT was revealed in the research provided, focusing on the characteristics of traffic related to safety concerns. In this study, we compared the performance of the four ML algorithms, DT, KNN, NB, and gradient boosting (GRB) classifiers, in terms of various factors such as accuracy, precision, recall, and F1 score. They used the BoT-IoT dataset. The performance evaluation results of this study show that the performance of DT and GRB is excellent. These powerful results will help make your IoT network more secure.

Table 1: Summary of the utilize of deep learning in DDoS.

Study	Model	Dataset	Application Area	Feature	Result
[27]	DBN	Generated dataset	IoT Network	BAU-ROA optimization	Produces a better outcome than other optimization methods
[28]	SAE	Generated dataset	SDN of IoT	SFlow based adaptive polling	sFlow 91% accuracy and Adaptive polling 89% accuracy
[29]	LSTM	ISCX 2012 and IDS CTU-13	Fog and cloud	LSTM has 128 units and three hidden layers	The accuracy rate was 98.88%
[30]	DCNN	Generated dataset	Traffic classification	To analyse few number samples in the dataset	The accuracy of the model was 99%
[31]	NDAE and RF	NSL-KDD CICIDS2017	SDN	DL and shallow learning algorithms are combined in a hybrid model.	Accuracy was 98%.
[32]	FNN and CNN	NSL-KDD	Traffic Categorization	An efficient feature modelling ability	Higher accuracy than shallow machine learning algorithms
[33]	ANN	Generated dataset	IDS	An integration of signature-based detection and ANN	The accuracy value was 99.98%
[34]	DT, KNN, NB and GRB	BoT-IoT dataset	IoT Network	Analysis normal and attack traffic	Better accuracy In DT and GRB with 99.96% and 99.88%, respectively.

3. Evaluation of Performance

This study detected six monitored ML classifiers: K_Nearest_Neighbors (KNN), Super Vector Machine (SVM), Naive Bayes (NB), Decision Tree (DT), Random Forest (RF), and Logistic Regression (LR). The experiments in this study used the hardware specifications of the Intel® Core™ i7 860U. 16GB RAM with CPU @ 1.90 GHz processor and Windows 10 64-bit operating system. This study tests the ML technology of the WEKA tool for predicting DDoS attacks to use data pre-processing, classification, regression, assembly, and visualization and association rules. Java code is an open source tool used to create WEKA and established at the University of Waikato, New Zealand. All algorithms used are supported by WEKA. It has a graphical user interface and a

command-based interface that make it attractive to use in this study. File formats such as CSV and ARFF are required. Machine learning requires datasets to train the algorithms of choice to gain knowledge.

3.1 CICDDoS2019 Dataset

This study used the CICDDoS2019 dataset collected by the Canadian Cybersecurity Institute at New Brunswick University. To predict DDoS attacks, this complete dataset contains 50,063,112 instances with 80 functions and 11 class names. Table 2 shows the class specifications and the number of instances of each class.

Table 2: The amount number of instances in the dataset.

DDoS Attribute (Class Label)	Number of Instances
DNS	5,071,011
LDAP	2,179,930
MSSQL	4,522,492
NetBIOS	4,093,279
NTP	1,202,642
SNMP	5,159,870
SSDP	2,610,611
SYN	1,582,289
TFTP	20,082,580
UDP	3,134,645
UDP Lag	366,461

3.2 The Characteristics Utilized in the Implementation

This study used the 24 selected functions used in Survey [3] to predict DDoS attacks. RFR was used to determine the importance of individual features in the dataset. Table 3 contains a list and brief description of the functions used here.

Table 3. The feature set utilized in the IDS.

Feature	Description
Fwd Packet Length Max	Maximum packet size in the forward (outgoing) direction
Fwd Packet Length Min	Smallest packet size in the forward route
Min Packet Length	Minimum of a packet's length
Max Packet Length	Maximum of a packet's length
Average Packet Size	A packet's average size
FWD Packets/s	Number of forward packets (p/s)
Fwd Header Length	The extent of a forwarded packet's header
Fwd Header Length 1	Number of bytes in a header in the forward direction
Min_Seg_Size_Forward	Minimum segment size in the forward direction
Total Length of Fwd Packet	Packet size in the forward direction
Fwd Packet Length Std	The standard deviation of a packet in the forward direction
Flow IAT Min	The minimum amount of time passes between two packets in a flow
Subflow Fwd Bytes	The average number of bytes in a sub-flow in the forward direction
Destination Port	Address to accept the sent TCP or UDP packet
Protocol	TCP or UDP for data transference
Packet Length Std	The packet extent standard variation
Flow Duration	Flow Duration in μ s
Fwd IAT Total	In the forward route, the total time among two packets
ACK Flag Count	The number of packets with ACK
Init_Win_Bytes_Forward	In the forward route, the number of bytes in the early window.
Flow IAT Mean	Mean time amongst two packets in the flow
Flow IAT Max	Maximum time amongst two packets in the flow
Fwd IAT Mean	Mean time amongst two packets in the forward route
Fwd IAT Max	Maximum time amongst two packets in the forward route

3.3 Multibel Categorization Utilized in the Implementation

The eleven elegance labels applied within side the implementation for assault publicity are supplied on this study. Figure 3 suggests all of the training labels which can be hired within side the implementation. Based at

the 24 traits furnished in Table three above, those assaults are predicted. Table four offers the eleven elegance labels used and in brief produce an evidence of exploitation-primarily based totally and reflection-primarily based totally DDoS assaults. Using the WEKA device, the dataset CICDDoS2019 has been imported and analysed with CSV layout via way of means of converting the dataset characteristic from Numeric to Nominal. Then, we've selected 24 features, defined in Table three. Figure three suggests the selected function within side the WEKA device interface.

Table 4: The description of the 11 chosen classes of DDoS attacks

Type	Class	Description
Reflection based attack	NTP	The attacker uses publicly available NTP servers to overload the aim with UDP traffic in an expansion attack known as NTP [35].
	UDP Attacks	The buffer excess defenselessness in TFTP and server is taking advantage of TFTP attack [36].
	TFTP	An injection of the MSSQL allows malicious SQL declarations to be executed [37].
	MSSQL	An SSDP attack uses universal plug and play (UPnP) networking protocols to direct a massive volume of traffic to a victim, causing their computational properties to be overwhelmed [38].
	TCP Attacks	A DNS attack takes use of DNS flaws [39].
	SSDP	LDAP injection is an attack utilized to achieve web-based applications that structure LDAP declarations based on client information [40].
	DNS	A security flaw in NetBIOS permits an attacker to read data [41].
Exploitation based attack	TCP/UDP Attacks	An SNMP attack produces a huge amount of traffic that is pointed towards numerous networks' victims [42].
	LDAP	SYN flood is a type of DDoS attack in which an attacker forwards a series of SYN requests to a target system in order to exhaust server resources and render the system unusable to real traffic [43].
	NETBIOS	Flooding with UDP packets is an attack that sends a high amount of UDP packets to a victim to overload their capability to proceed and reply. As a result, the firewall that protects the victim server is overburdened [44].
	SNMP	UDP-Lag is a type of attack that deactivate the client-server relationship [3].
	TCP Attack	
	SYN Flood	
	UDP	
	UDP-Lag	

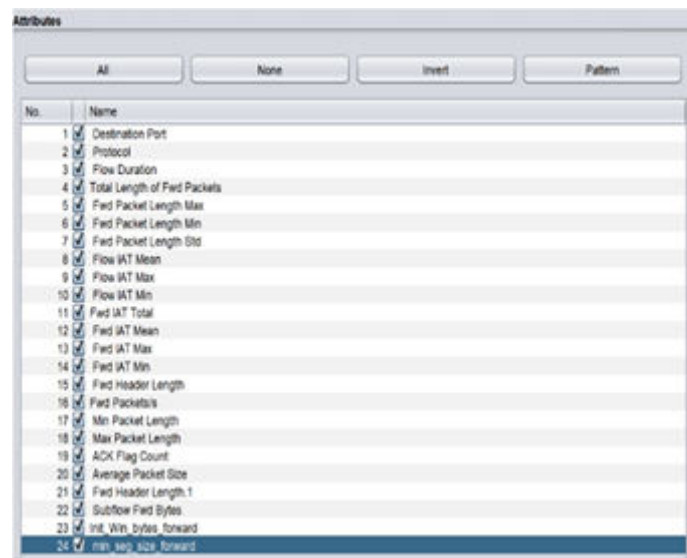


Figure 3: The 24 features chosen.

4. Measurement of Evaluation

An IDS should predict DDoS attacks with high detection accuracy. There can be significant inclusion for a community when the system does not guarantee success to expose an attack [8]. Table 5 shows a list of the measurement of evaluation

$$TPR = \frac{\sum tp}{\sum \text{DDoS attacks in dataset}} \quad (1)$$

$\sum \text{DDoS attacks in dataset}$

$$FPR = \frac{\sum fp}{\sum \text{Benign traffic in dataset}} \quad (2)$$

$\sum \text{Benign traffic in dataset}$

$$p = \frac{tp}{tp + fp} \quad (3)$$

$tp + fp$

$$r = \frac{tp}{tp + fn} \quad (4)$$

$$tp + fn$$

$$f\_measure = 2 \times p \times r \quad (5)$$

$$(p + r)$$

$$Accuracy = \frac{TP + TN}{TP + TN + FP + FN} \quad (6)$$

$$TP + TN + FP + FN$$

Table 5: List of Used Notations

Symbol	Meaning
True Positive (<i>tp</i>)	It is the amount of DDoS attacks that have been recognized as attacks.
True Negative (<i>tn</i>)	It is the amount of legitimate network traffic instances benign recognized as legitimate.
False Positive (<i>fp</i>)	It is the amount of legitimate network traffic examples benign misidentified as attacks.
False Negative (<i>fn</i>)	It is the amount of DDoS attacks that cannot be defined as legitimate.
TPR	The amount of DDoS attacks exposed as attacks is split by the total amount of DDoS attacks in the dataset and is calculated as shown in Equation (1).
FPR	Calculated by dividing the amount number of benign instances imperfectly distributed as DDoS attacks by the whole amount number of benign instances in a dataset, and it is calculated as shown in Equation (2).
Precision (<i>p</i>)	Defined as the amount number of <i>tp</i> among all instances that are forecast to be positive, and it is calculated as shown in Equation (3).
Recall (<i>r</i>)	The percentage of <i>tp</i> from all instances that are essentially positive and is calculated as shown in Equation (4).
<i>f-measure</i>	The weighted harmonic means of precision and recall and is calculated as shown in Equation (5).
<i>Accuracy</i>	It is obtained by the equation below, and it displays the model's exact forecast rate, and it is calculated as shown in Equation (6).

Table 6: Performance metrics for each algorithms

Selected Algorithm	Accuracy	Precision	Recall	F-Measure	Computation Time
K_Nearest_Neighbors (K-NN)	0.98	0.99	0.99	0.99	3.5 s
Super Vector Machine (SVM)	0.86	0.86	0.87	0.85	7.29 s
Naïve Bayes (NB)	0.45	0.66	0.54	0.38	1.3 s
Decision Tree (DT)	0.99	0.99	0.99	0.99	4.53 s
Random Forest (RF)	0.99	0.99	0.99	0.99	84.2 s
Logistic Regression (LR)	0.98	0.99	0.98	0.99	5.53 s

Figure 4: shows the performance metrics of selected algorithms. The best accuracy was found in the DT and RF algorithms.

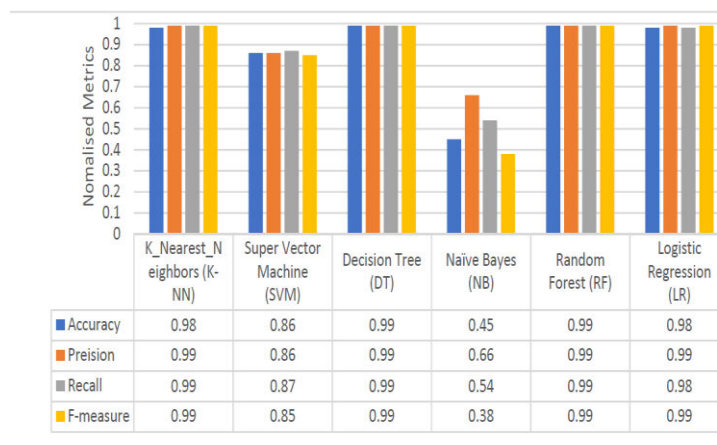


Figure 4: The performance metrics of selected algorithm

In Table 7, the studies on DDoS attack traffic detection using ML algorithms and the classification model we propose are shown comparatively. When Table 7 is examined, it is seen that different datasets were used to detect attack traffic. Some of the researchers used public datasets containing network traffic data from conventional network topologies [44] such as KDD Cup'99 [45] and UNB-ISCX [46]. The use of these datasets is positive for comparing the performance of ML algorithms used in the detection of attack traffic.

Table 7: The comparison of the related studies.

Datasets	Feature Selection	ML Algorithms	Accuracy
CIC DoS dataset [47]	No feature selection	RT, J48, REP Tree, SVM, RF, MLP	95%
KDD Cup'99 [48]	No feature selection	SVM and DNN	92.30%
UNB-ISCX [49]	No feature selection	Semi-supervised ML algorithm	96.28%
CICDDoS2019 (Our approach)	Feature selection RFR	SVM, K-NN, DT, NB, RF and LR	99%

The results show that ML models are quite successful in detecting attack traffic. The work in this paper aims to contribute to the research conducted in this field. The experimental results showed that using the random forest regressor (RFR) feature selection methods increases the accuracy of ML methods in detecting attack traffic. For attacks such as DDoS attacks that need to be intervened without wasting time, it is important to detect the attack traffic by using system resources as efficiently as possible.

Therefore, the most effective features should be selected when creating ML models. It can be seen from Table 7 that the performance of ML models in studies using feature selection algorithms is better than in other studies. It can be said that model classification performance contributes positively to the classification of attack traffic when used in conforming to feature selection algorithms. However, the presented studies are run by applying different models on different datasets, and it is difficult to make general evaluations on comparative results. Table 8 shows six different types of supervised machine learning algorithms that this research has been used in the experiment [50].

Table 8: Pros and cons of different ML-based methods

ML Method	Pros	Cons
KNN	— Simple to understand and easy to implement. — It works easily with multiclass dataset.	— It is difficult to figure out what the best value for K is and how to find missing nodes.
SVM	— Due to their simplicity, SVMs are extremely Scalable and capable of executing tasks such as anomaly-based intrusion detection in real time, as well as online learning. — SVMs are thought to be appropriate for data with a large number of feature attributes. — SVMs consume less memory and storage.	--The usage of an optimal kernel function in SVM, which is utilized to separate data that is not linearly separable, is still a challenge. — SVM-based models are challenging to understand and interpret
NB	--- It is simple and quick to forecast the test dataset's class. It also does well with Multi-class prediction. — When the assumption of independence is met, an NB classifier outperforms conventional models such as logistic regression while using Less training data.	---Conditional independence of the assumption Class, which may result in accuracy loss. For some attributes, the assumption of Independence may not be valid. Practically dependencies exist among variables.
DT	— Easy and simple to utilize.	— It requires bigger storage. — It is computationally complex. — It is easy to utilize only if few DTs are used
RF	— It generates a more reliable and accurate output which is resistant to overfitting. — It requires substantially fewer inputs and does not require the process of feature selection.	— Because RF creates multiple DTs, it may be impractical to employ in real-time applications that require big datasets.
LR	— It is easier to put into practice, interpret, and train with. — It does not make any assumptions about class distributions in feature space. — It is very fast at classifying unknown records. — It performs well when the dataset is linearly separable and has good accuracy for many simple datasets.	— If the number of observations is smaller than the number of features, LR should be avoided; otherwise, overfitting may occur. — The assumption of linearity between the dependent and independent variables is a major limitation of LR.

5. Challenges and Future Work

Memory and other limited resources and computing abilities, as well as a diversity of standards and protocols, characterize the Internet of Things. These variables add significantly to the difficulties in researching IoT security issues, including anomaly mitigation utilizing IDS. In spite of the extensive study on anomaly detection in IoT networks, there are numerous key outstanding challenges that require additional investigation. The following are a few of these issues: 1. there are no publicly available IoT network traffic datasets. Evaluate It will be difficult to verify the anomaly prevention strategy in the actual network Creating IoT records is essential. It proposes evaluation and verification Abnormality mitigation technology is much easier with the IoT. 2. There is no standard authentication app for IoT. Implemented verification of the structure is very important to ensure that it is developed to be acceptable. The implemented structures are put to the test in a variety of ways, including simulations and tests. However, because of a lack of standard authentication applications, most

Of implemented IDS structures in the IoT are not evaluated in contrast to other IDS structures in the IoT. As a result, efforts must be made to produce standard authentication, which will assure duplication, reproducibility, and research continuity.

3. RNN and CNN are examples of supervised and unsupervised ML techniques, a both can be discovered using the CICDDoS2019 dataset. 4. It is possible to gather and examine real-time packets against the classified training dataset. It is possible to use a technique for splitting the data and comparing it with the performance of the classifiers utilized fold cross authentication.

6. CONCLUSION

In this study, DDoS attacks are a serious challenge for many areas of our lives. This Guides us to try to find a comprehensive intruder detection system to reduce the number the number of attacks faced by many sectors. This study used the latest CICD DoS 2019. A complete dataset accessible from the Canadian Institute for Cybersecurity. I checked again 6 different ML algorithms: SVM, KNN, DT, NB, RF, and LR. The following measurements Accuracy, precision, recall, true positive rate, false positive rate, and F-Measure Used for evaluation. Experimental results show that the highest accuracy is found Uses 99% and 99% of the DT and RF algorithms, respectively. Both DT and RF have we achieved the same results with 99% accuracy, 99% recall, and 99% Measure. However DT is superior to RF because it has a short calculation time of 4.53 seconds and 84.2 seconds, respectively. The results show that the ML model is very successful in detecting attack traffic. This paper contributes to it experimentally demonstrated random forest regressor (RFR) feature selection method Improves the accuracy of ML methods when detecting attack traffic. Implementation of This study can be used in real-world systems in various areas of the IoT. Finally, Limitations and future opportunities for network anomaly mitigation systems in the IoT Being explored.

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SMART USER AUTHENTICATION USING KEYSTROKE DYNAMICS

¹Kailash Nair, ²Manoah Jeyaraj, ³Dr. Sapna Prabhu and ⁴Noel James

Department of ECS Fr. C.R.C.E., Bandra Mumbai, India

ABSTRACT

Among the various methods used for authentication, “Keystroke Authentication” is the process of identifying a user based on his typing behavior where ‘Keystrokes’ represents the various timing parameters collected when using the keyboard. Previous research has shown that using keystroke dynamics adds more security to the process of authentication and is greatly helpful in case of a password leak. It is also one of the cheapest biometric systems in case of implementation since no special hardware is required. In this paper, we have verified the sustainability of this biometric technology by developing a keystroke biometric application which authenticates a user in real-time using Machine learning algorithms like Random Forest, Gaussian Mixture and MLP Classifier on both fixed-text and semi-free text-based datasets. The custom data collected was also further processed using data modification methods like SMOTE, PCA which were found to be helpful in increasing the precision of the model during the real time authentication process.

Keywords—Keystroke Dynamics, Random Forest, Semi-Free Text, Data Analysis, SMOTE, PCA

I. INTRODUCTION

In the current society where technology has become a part of our daily life, securing the data and preventing unauthorized users from accessing it has become a necessity. One of the most important aspects of information security is User Authentication where the virtual or physical identity of the user is verified. In general, there are two methods of authentication: Password-based Authentication which is employed across all major web applications and Biometric-based Authentication where the biometric features of the person like fingerprint, face, etc are used to identify the said person. Password authentication methods can take several forms, including user IDs, passwords, and PINs. Such techniques generally do not consider user-specific data and can thus be prone to phishing attacks. On the other hand, Biometric Authentication based on human features like iris, fingerprint, face, voice, etc. relies on the user's unique biological traits, making them more difficult to infiltrate. Such systems can be seen employed across government institutions, military bases, airports, etc due to its high security features. Keystroke Dynamics authentication is one such Multi-factor Authentication method which uses both biometric and password authentication at its core. Having been popular among machine learning research groups in recent years, keystroke dynamics is the study of typing behavior or typing rhythm of users to distinguish between them. Such data can be collected through monitoring keyboard inputs and recording time intervals between keystrokes. It has been demonstrated that even among specialists, there are subtle differences in typing styles. For example, one user might be holding onto a key 40-50 milli-second more compared to a second user. It is a highly challenging task to replicate an individual's keystroke pattern with high accuracy. If a solid profile of the user is successfully generated, his keystroke pattern can be considered the same as his/ her signature. When used side by side with password authentication, the keystroke features of the password can be collected and by using a machine learning model, the identity of the user can be predicted through the collected keystrokes. This can act as an additional security measure which will be extremely useful when dealing with important websites or applications like bank apps, etc.

In this paper, we will be creating a keystroke-based password authentication web application whose Machine learning model will be selected by comparing various machine learning algorithms like SVM, Random Forest, MLP and XGBoost. For datasets, we will be using various fixed text datasets available on the internet and a custom generated one for semi-free text data where the user can type in his own password. Data analysis methods will be used to find the redundant features and entities in the dataset. Such redundancies will be further removed using oversampling methods like SMOTE, under sampling methods like RandomUnderSampler and data dimensionality reduction methods like PCA (Principal Component Analysis). The structure of the paper is in the following manner: Section II discusses the related work in keystroke dynamics as well as motivation for our work. Section III details the methods and approaches utilized in the study of datasets. It will also go through the machine learning models used along with the way our keystroke authentication application was developed. Section IV presents the results and conclusions obtained by the model in terms of both fixed and semi-free text.

II. RELATED WORK

Since Keystroke dynamics is a form of behavioral biometrics that can be used for continuous authentication of users while working at a terminal, the support vector machine (SVM) was used in H. Çeker et al [1]. By creating a one-class SVM for each user and utilizing a dataset of 34 users, they were able to authenticate

legitimate users and reject impostors with negligible error (close to 0% equal error rate). The data was gathered in two sessions which consisted of a survey and a static long-text typing process. Digraphs with a latency of more than 200 milliseconds were excluded from the dataset. It was also observed that receiver operating characteristics (ROC) change by the number of most common digraphs. By using flight and dwell times of 12 most common digraphs, they were able to distinguish all 34 users enrolled in the experiments with an appropriate scale of RBF kernel in one-class SVM. Their EER varied from 2.94% to 0%, when 4 and 12 (or more) numbers of digraphs are used.

Neural network has the ability to handle large amounts of dataset and it can also implicitly detect complex non-linear relationships between dependent and non-dependent variables. Purvashi Baynath et al, used a multilayer perceptron (MLP) neural network to train and authenticate the features.[2]. The main focus was made on the dwell time and flight time of the user's typing to recognize or reject an imposter. The integration of keystroke dynamic characteristics and Neural Network has shown to be a promising method, with a recognition rate of 98.5 %.

Gutha Jaya et al. employed a XGboost algorithm with the CMU dataset which consists of 51 participants each typing a password 400 times [3]. Their idea behind using boosting algorithms was to predict error at every stage when developing a weak learner and employ weight to the error samples to predict them accurately. Boosting gives larger weights to observations that were misclassified by the first weak learner, allowing the following weak learners to properly identify them. All the approaches were subjected to a 10-fold cross validation. The data was separated into ten folds for 10-fold cross-validation, with nine folds used for training and the remaining one-fold used for testing. They then compared the results with other algorithms from previous papers and found that XGboost gave higher accuracy. An accuracy of 93.79% was achieved. However, this method cannot be directly compared with other techniques since other techniques might not use whole features of the dataset.

Jonathan Graham et al. used a strong password, one sentence, and two sentences to evaluate four different machine learning algorithms namely Decision Trees, Random Forest, Support Vector Machines, and Neural Networks [4]. Based on the input size, the predictions of each algorithm were compared. When employing two sentence data, the Random Forest method was found to have a 100% accuracy rate. The percentages were found to be higher for one sentence and two sentences compared to the strong password.

III. METHODOLOGY

Our keystroke biometric application was developed by going through the following phases namely (A) Comparing various Machine learning algorithms across a common keystroke dataset known as CMU dataset which is used in the majority of other keystroke biometric papers. After obtaining the algorithm giving the best result, it was tested across an additional dataset to further validate the results obtained by the created machine learning model. (B) Constructing a website which will aid in creation of a custom keystroke dataset for user defined passwords. (C) Performing data analysis on the custom dataset for purposes like understanding the importance of various features and entities in the dataset. Based on the inferences generated, data modification methods were used accordingly which were found useful in removing the redundant data or features present in the dataset. (D) Deploying the final machine learning model obtained through the various phases mentioned above in a web server to check its real time applicability and integrating it with a keystroke-based password authentication web application.

Datasets Used and ML Algorithm Deduction

In the previous research done on the topic of keystroke dynamics, each paper specified various different machine learning algorithms to be better than others in identifying a user. Among them, the ones that were mentioned more frequently included algorithms like Support Vector Machine (SVM), Random Forest, Multilayer Perceptron (MLP) and XGBoost. So, to determine the best algorithm which can be used for our application, a comparison of them was done across various datasets.

The first dataset selected for this process was the famous keystroke dataset known as Carnegie-Mellon University (CMU) dataset or DSL Dataset which can be seen used across the majority of the research papers related to keystroke dynamics. This dataset contains information on 51 users' keystroke behaviour, where each user typed the password ".tie5Roanl" 400 times, including 50 repetitions in each of the eight sessions. Between sessions, a user had to wait at least one day, so that the day-to-day variation of each subject's typing was captured. Furthermore, since it has 5 special symbols, a number, lowercase letters, and a capital letter, this password was considered to be a strong 10-character password. There are 31 time-based features captured each time this password is typed. The dataset has three different categories of features for each character in the

password, i.e., hold out, down-down, and up-down timing vectors. Hold time represents the time between a press and release of a key1. Updown time denotes the time between a release of key1 and press of key2. Down-down time denotes the time between a press of key1 and press of key2. For every character in the password, these three timing vectors are mentioned in the dataset. On the custom dataset generated by us later on, the features generated based on a user's typing behavior will also behold, down-down and up-down time similar to the features in CMU Dataset.

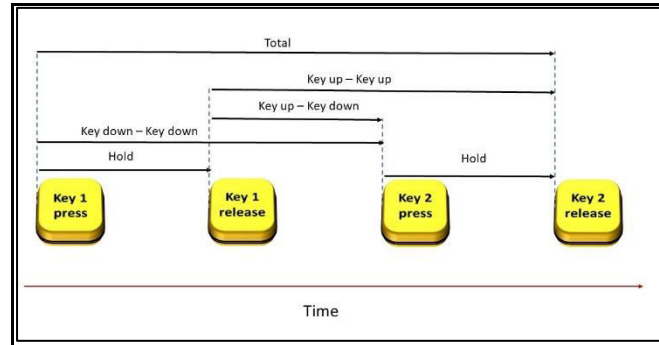


FIGURE 1: CRCE DATASET FEATURES

The second dataset used was “IITbh Small”. It consisted of timing parameters of 5 users who each typed an unknown password a total of 250 times. The features extracted from these timing parameters were also similar to the ones in the CMU dataset namely hold, down-down and up-down time.

The keystroke timing parameters in these datasets were used as entities or inputs to the machine learning algorithms with the target being the username or subject-name. Repeated stratified KFold method which repeats Stratified K-Fold n times with different randomization in each repetition was used to exclude coincidental high or low accuracy values which might be produced due to a certain combination of data.

When tested, it was found that Random Forest Algorithm gave the best accuracy of 94.6% (± 0.5) and a precision-recall value of around 0.94 when compared to other algorithms. This result remained the same in both the datasets as shown in Table I and Table II. This might be because Random Forest is based on trees, so scaling of the variables doesn't matter. Also, any monotonic transformation of a single variable is implicitly captured by a tree. It also uses the random subspace method and bagging to prevent overfitting. But this result cannot be finalized as the dataset was based on a fixed-password which when typed by each user makes it easier for the machine to distinguish between users. To solve this issue, we decided to create a custom dataset of free text data as mentioned in the next section.

Creation of Custom Dataset

To understand the real time applicability of the algorithm and to also further verify the machine learning model, a custom dataset named ‘CRCE Dataset’ was created which consisted of data generated from users typing their own passwords. To create the dataset, a website named ‘<https://keystrokemaker.site>’ was built using html, JavaScript, PHP where a user can register himself with his own unique username and password with the only requirement being that he/she should have a special character and a number in his password. HTML, CSS and Bootstrap were used for the front end designing of the website while JavaScript was used for the keystroke data collection purpose. PHP was used to communicate with the server-side database to store and retrieve various data. The user was then asked to login daily using those credentials and type in the

Table I: ACCURACY OF VARIOUS ALGORITHMS

Algorithms	Datasets	
	CMU	IITB-H
Random Forest	94.6%	99.2%
SVM	81.4%	94.6%
MLP	92.27%	97%
XGBoost	92.08%	98.1%

Table II: PRECISION-RECALL OF RANDOM FORESTS

Algorithm	Precision	Recall	F1-Score
Random Forest	0.942	0.94	0.94

password at least 10 times a day for 12 days. This resulted in the generation of a dataset with around 1500 rows consisting of 11 users each having typed their password around 120 times. The keystroke data of a certain user was collected by storing the timestamps of a key being pressed and released by the user in the database of the server. These timestamps will then be converted keystroke timing parameters as shown in Figure (I). Hold time denotes the time between a press and release of a key1, Updown time denotes the time between a release of key1 and press of key2 and Down-down time denotes the time between a press of key1 and press of key2. For any machine learning model to work, each instance or entity in the dataset must have the same number of features. But in the semi-free type dataset created, each user might have his own password of varying length. So, a minimum length requirement of 8 and maximum 15 was implemented. If a certain password was less than 15 characters, it was zero padded till the length becomes 15. The discrepancies caused by this zero-padding method like reduction in the importance of features will be addressed in the next data analysis section.

Data Analysis and Modification

The custom dataset created can be considered somewhat faulty due to the zero-padding performed in it. Since each character of the password will be having its own three timing parameters, for a 15-character password, the number of features will be $15 \times 3 = 45$ features. If the length of the password is equal to minimum length of 8, then the number of important features will be around $8 \times 3 = 24$ features and the rest of the 21 features will be filled with zero which implies that around 50% of the total features would be useless for that certain password and such useless features would be used by the machine learning algorithm.

Algorithms like Random Forest have their own internal property which assigns importance to certain features. So if the number of users having passwords with low length (8-10) is greater than those having passwords with greater length (>10); the importance of features of characters at the end will become very low which might make the model ignore those features in real time. This might greatly increase the number of false positive predictions by the model as certain important features which might have helped in distinguishing the

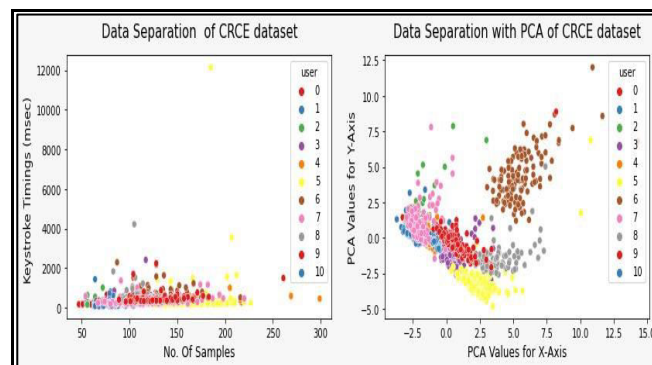


Figure 2: Data segregation with and without PCA

imposter will be ignored by the model due its low importance score. To prevent this from occurring, we decided to reduce the dimensionality of the dataset using methods like Principal Component Analysis (PCA).

Principal Component Analysis (PCA) is an unsupervised statistical technique that is used to reduce the dimensions of a dataset. It helps in identifying relationships among different variables and then by coupling them reduces the redundant features like zero valued features in the dataset. It also involves the transformation of variables in the dataset into a new set of variables which are called PCs (Principal Components) which are equal to the number of original variables in the given dataset. By applying PCA to our dataset, the number of features were compressed from 45 to 20 which not only helped in improving the precision of the model but also helped in reducing the computation time required for the user prediction process. The instances in the dataset were also grouped together as shown in Figure 2.

The amount of data collected from each user in the CRCE Dataset was around 120 which might be enough to get a good accuracy score. But when using the application in real life, the data of each user wouldn't be so uniform, and the number of samples collected from each user in the initial stages of the application also wouldn't be so high. To combat this issue of imbalanced distribution of data and low amounts of data, Synthetic Minority Oversampling Technique (SMOTE) was used. It works by selecting samples that are close in the feature space and draws a line between the samples in the feature space while drawing a new sample at a point along that line. Here, a random sample from the minority class is chosen and k of the nearest neighbors for that sample are found. Among them, a randomly selected neighbor is chosen, and a synthetic sample is created at a randomly selected point between the two samples in feature space. The feasibility of this technique was tested

by running our random forest model across 40 random samples of each user which were later oversampled to 300 samples. The accuracy obtained was almost similar to the unmodified version with a variation of around (± 0.5) which is bearable when compared to the benefits it provides. This concludes the process of creating the machine learning model for our application. The deployment part will be explained in the next section.

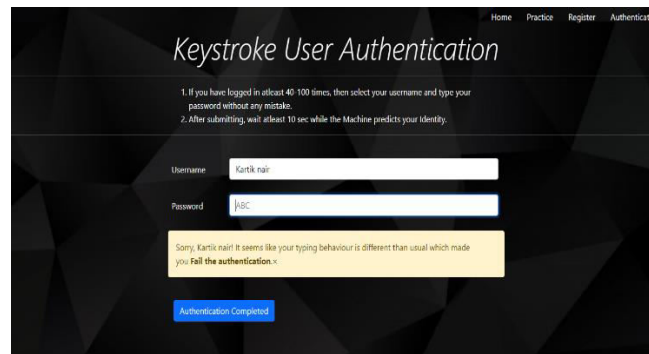


FIGURE 3: KEYSTROKE AUTHENTICATION WEBSITE

D. Real-Time Testing of the Final Model

After performing the necessary modifications on the data, our model was ready to be deployed on the server. After creating a password authentication page on our keystroke collection website, we linked it with the machine learning code available on the server. Thus, when a user inputs his username and password, the web application first checks whether the password for that certain username is correct or not. If it is found to be correct, the authenticity of the user is confirmed by using his/her timing parameters collected when typing the password to predict his/her identity using our machine learning model. Based on the prediction result, it displays the corresponding message on the screen which can be seen in Figure 3. If the prediction is found to be different from the given username, two more chances will be given to the user to type his password. If the authentication still fails after the third try, the possibility of the user being an imposter increases greatly and thus we can go onto further authentication measures like One Time Password (OTP) to prevent a possible Cyber Crime which might happen due to a leaked password. The results and benefits of our application will be explained in the next section.

IV. RESULTS

For quantifying the results of our keystroke prediction model, the metrics used were accuracy, precision-recall, ROC curve and Confusion matrix. Accuracy is a metric which describes how the model performs across all classes. It is useful when all classes are of equal importance as it is calculated as the ratio between the number of correct predictions to the total number of predictions when the prepared model was tested with the CRCE dataset using train-test split method, it gave an accuracy of 97.4% (± 0.3) which can be considered as an excellent result.

However, the issue with accuracy is that it only considers true positive and true negative values predicted, not the false negative or false positive values. For our authentication application, we can tolerate some false negative predictions as it might at most cost some inconvenience to the users. But if the number of false positive predictions are higher, it might cause a much larger issue as the application might give entry to imposters more frequently which is completely intolerable from a security standpoint. So, to understand more in detail about our model, we decided to use the precision-recall metric and ROC curve.

	precision	recall	f1-score	support
0	1.000	0.950	0.974	40
1	1.000	0.960	0.980	25
2	1.000	0.917	0.957	24
3	0.958	1.000	0.979	23
4	1.000	0.944	0.971	36
5	1.000	1.000	1.000	43
6	1.000	1.000	1.000	25
7	0.857	1.000	0.923	24
8	1.000	1.000	1.000	20
9	0.962	1.000	0.980	25
10	0.920	0.958	0.939	24
accuracy			0.974	309
macro avg	0.972	0.975	0.973	309
weighted avg	0.976	0.974	0.974	309

FIGURE 4: PRECISION-RECALL VALUES OF CRCE DATASET

The precision is calculated as the ratio between the number of Positive samples correctly classified to the total number of samples classified as Positive. When the model makes many incorrect Positive classifications, or few correct positive classifications, the denominator increases which makes the precision smaller. Whereas the recall is calculated as the ratio between the numbers of Positive samples correctly classified as Positive to the number of Positive samples correctly classified and negative samples falsely classified. For our model, precision would be a more important metric as it involves positive predictions. The precision recall values for each class in our dataset are shown in Figure 4. On average, we got a score of 0.972 for both precision and recall for the CRCE dataset.

Another metric typically used in biometric authentication systems is the Receiver Operating Characteristics (ROC) curve and Area Under the Curve (AUC). A ROC curve is used to plot True Positives vs. False Positives at different classification thresholds whereas AUC is used to get an average measure of performance across all possible classification thresholds. One way of interpreting AUC is as the probability that the model ranks a random positive example more highly than a random negative example. The ROC curve and AUC value for our model is shown in Figure (5).

When the model was uploaded onto the server, the predictions were checked manually where certain users were given the password of another username. In this test, it was found that the model had more than 90% accuracy when the passwords included were strong with a special character, and numerical. But if the password were very weak and only contained characters and numerals, the accuracy drops significantly to around 70% as the typing behavior for such passwords can be easily imitated by a person. Also, passwords with greater length were found to have better precision values than passwords with lengths of 8-10. But using PCA also had its downsides like higher processing power. Our low end server with 512 RAM took around 15-30 seconds for each prediction as the whole dataset needs to be processed for PCA. A server with higher processing power would definitely help in reducing this large spike in time to a minimal 3-5 seconds.

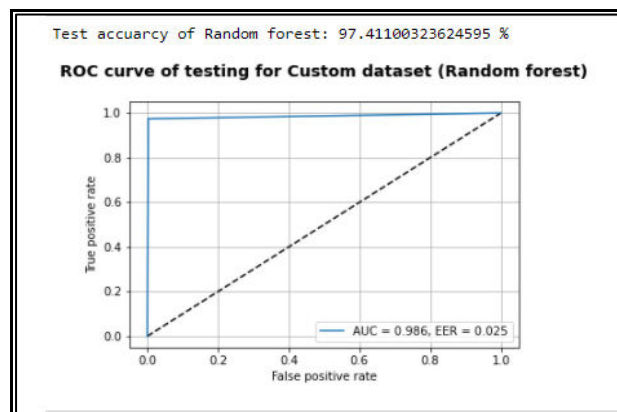


FIGURE 5: ROC CURVE OF CRCE DATASET

V. CONCLUSION

Keystroke Dynamics is a technology which is still being slowly explored. In an era where any person can do irreplaceable harm to another person by just stealing their important data, constantly improving the security measures used to access these data has become an important task. Among the multitude of methods being employed for the purpose, our research had tried to focus on using keystroke dynamics on top of a password authentication system. It successfully achieved an excellent accuracy of 97.4 and a minimal EER of 0.025 due to various data modification methods employed like SMOTE, PCA, etc. which helped in increasing the reliability of the system by a great margin. If a password authentication system employs a keystroke biometric software similar to ours, the users would no longer have to worry about a data theft happening due to a password leak or a hacker gaining access to their virtual account by using the brute force method.

For our future work, we would like to increase the accuracy and precision-recall much further than the current values. We would also like to implement the keystroke biometric system onto mobile browsers and mobile applications so that it can work universally in whichever device the user might be using.

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STATUS OF PROFESSIONAL COMMITMENT AMONG THE TEACHER EDUCATORS

¹Mangpineng Kipgen and ²Dr. Keisham Shitaljit Singh**¹M.A., M.Ed., NET (UGC) ²Associate Professor, Department of Education Manipur University Canchipur – 795003 INDIA****ABSTRACT**

Education is critical in shaping the lives of all. It requires dedication and committed teachers. The teachers are equipped to entrust the lives of the learners. Teacher educators take the driver's seat as they train the prospective teachers in the teacher education program. Only professionally committed teacher educators can they produce efficient and well-equipped future teachers. The professional commitment of teacher educators is a critical component in developing teacher education programs. The purpose of the study was to understand the professional commitment among the teacher educators in Manipur. In the present study, the Normative Survey method was employed. The data was collected from 50 teacher educators using the Random Sampling technique. Professional Commitment Scale for Teacher Educators developed by Dr. Vishal Sood (2011) was used as a tool for collecting data. Statistical techniques such as frequency, percentage, mean, standard deviation, and t-test were employed to analyze the data. The study's main findings revealed that the professional commitment of teacher educators is moderate in level. The professional commitment between male and female teacher educators differs from each other. In contrast, the professional commitment between married and unmarried teacher educators tends to be equally committed.

Keywords: Professional Commitment, Teacher Educators, Prospective Teachers, Teacher Education

INTRODUCTION

Teacher educator plays a crucial role in producing a well-equipped and efficient prospective teacher. Teacher education program imparts training to future teachers in the form of formal and informal activities, skills, and experiences to efficiently take up the duties of a teacher's productivity. In India, Teacher Education emerged in the last part of the 17th century by the European and Danish Missionaries by setting up many schools. Many teachers are trained in many schools. Many teacher training institutions were set in different parts of India with the coming of the recommendations of Wood's Despatch of 1854. Various education committees and commissions (Education Commission of 1854, the Kothari Commission of 1964-1966, the National Policy on Education, 1986 – 1992) have given serious thought to improving teacher education in India.

Regarding Manipur, the need to train teachers was felt as early as 1906. And the movement of the secondary school teacher began in 1928, which marked the beginning of a training program for secondary school teachers in Manipur. Teacher education colleges play a pivotal role in imparting education amongst the pre-service and in-service teachers. And for this, teacher educators are responsible for preparing teachers for any of the levels of school education, viz. pre-primary, primary, and secondary stages. The scope of tasks and responsibilities of teacher educators is broad. Teacher educators are educational professionals who actively facilitate prospective teachers' formal and informal learning. They have wide-ranging roles, including organizing pre-service training of teachers and delivering training and development workshops and programs for in-service teachers. They are responsible for the education of future teachers.

The quality of teachers rests upon the quality and commitment of teacher educators responsible for preparing prospective teachers. There is no substitute for individual commitment to professional responsibilities. Every educator must be a keeper of the professional conscience.

As experts in bringing quality teacher education programs, teacher educators are called to assist and guide the prospective teachers who are expected to strive for their continuous professional commitment. This assumption makes it imperative that teacher educators themselves build up their professional commitment and make themselves competent to undertake the task of teacher development.

REVIEW OF RELATED LITERATURE

Choudhury, G (2018) studied "Professional Commitment of Teacher Educators in Relation to Institutional Climate: A study on the B.Ed. Colleges Affiliated to Gauhati University." The study intended to find out the professional commitment level of teacher educators of the B.Ed. Colleges affiliated with Gauhati University. It also tried to investigate the professional commitment of teacher educators concerning gender and locality. The sample of the study consisted of all 32 B.Ed. Colleges where 209 teacher educators are working in B.Ed. Colleges by the end of 2013 were taken. A saturated sampling technique was employed for sample selection. Professional Commitment for Teacher Educators, developed by Dr. Vishal Sood (2011), was used as the study

tool. The statistical technique employed for the analysis was mean, SD, t-test, correlation matrix, and percentage. The study's findings indicated a significant difference in the professional commitment level of teacher educators. It was also found that rural teachers' training colleges have more highly committed teacher educators than urban teachers. It has been observed that there exists no significant difference between male and female teacher educators in terms of professional commitment.

Preeti, G (2020) carried out a study on "A Study of Development of Professional Commitment and Values Among Student Teachers in Haryana." The study had intended to evaluate the status of professional commitment among student teachers and to study the development of professional commitment and professional values across gender, academic qualification, and type of B.Ed. College. The sample selected comprises 690 student teachers, which contained 335 males and 355 females from 26 colleges. Cluster sampling and stratified sampling techniques were used in drawing out the sample. Professional Commitment Scale for Teachers developed by Ravinder Kaur, Sarbjit Kaur Ranu, and Sarvjeet Kaur Brar (2011) was used as the study tool. The finding from the survey implied that student teachers showed more commitment to their profession than the Professional Commitment Scale for Teachers on test norms: the gender categorization, the type of B.Ed. Colleges and academic qualifications interactions were found to be significant in their effects.

SIGNIFICANCE OF THE STUDY

The study aimed to analyze the professional commitment of teacher educators in the Colleges of Teacher Education under Manipur University. We have observed various changes in the education system with the development and enhancement in the globalized world. The need for quality education is favored than ever before. Quality education rests upon the quality of the teachers, and the quality of teachers, in turn, depends on teacher educators. Teacher educators train the prospective teachers in various skills so that they will be able to discharge their roles and responsibilities in their teaching profession, where they shape and mold the learners who are the future nation builders. Commitment is an integral part of any given work field. The professional commitment of teacher educators cannot be overlooked or neglected. They take the driver's seat in leading and paving the way for a desired teacher education program for the prospective teachers. Teacher educators cannot take the easy way to carry out their tasks. Being committed to their profession as teacher educators will produce a well-equipped and efficient teacher. In the absence of professional commitment of teacher educators, the vision of turning the scenario of the educational system into a quality-based educational system will not be possible. Education is the greatest investment one can give in. It enhances the lifestyle of an individual for the better.

There is growing interest in the professional commitment of teacher educators as the demands, expectations, and requirements of teacher education are increasingly under scrutiny. The professional commitment of teacher educators is not just about passing on the necessary competencies to the prospective teachers, which they will need as they take up their role in the school; what equally important is to instill in them the values of the teaching profession. A committed teacher educator will embrace the journey of teaching and learning and develop new ideas for the welfare of the teacher education program and the student teachers in particular. In providing training to the prospective teachers, the responsibility of the teacher educator is imminent. The commitment of teacher educators cannot be ruled out as they are the ones who prepare and assist the school teachers. The entire growth and development of the learners with quality-based education given by the teachers greatly depend on the commitment of teacher educators. Hence, how teacher educators discharge their world of work in the commitment of their knowledge, skills, and abilities is essential. This study becomes crucial in finding out the professional commitment of teacher educators and providing valuable input so that teacher educators can meet new demands and challenges in their professional lives.

OBJECTIVES OF THE STUDY

1. To study the professional commitment level of teacher educators in the Colleges of Teacher Education, Manipur.
2. To find out the difference between male and female teacher educators of the selected colleges with regard to their professional commitment.
3. To find out the difference between married and unmarried teacher educators with regard to their professional commitment.

HYPOTHESES OF THE STUDY

4. There exists a different professional commitment level of teacher educators in the Colleges of Teacher Education, Manipur.

1. There exists a significant difference between male and female teacher educators of the selected colleges with regard to their professional commitment.
2. There exists a significant difference between married and unmarried teacher educators with regard to their professional commitment.

METHODOLOGY

The normative survey method has been employed in the present study.

Population and Sample

The population of the study covered all the Teacher Education Colleges in Manipur. At present, there are 13 Teacher Education Colleges under Manipur University. For the present study, the sample was drawn from 50 teacher educators of 5 Teacher Education Colleges under Manipur University, keeping the sample's representativeness. A random sampling technique was employed in drawing out the sample.

TOOLS USED

Professional Commitment Scale for Teacher Educators developed by Dr. Vishal Sood (2011). The scale consists of 70 items consisting of 5 dimensions:

Dimension I: Commitment to the Learner

Dimension II: Commitment to the Society

Dimension III: Commitment to the Profession

Dimension IV: Commitment to Achieve Excellence for Professional Actions

Dimension V: Commitment to Basic Values

Statistical Techniques Used

Appropriate statistical techniques such as frequency, percentage, mean, standard deviation, and t-test were applied according to the nature of the data. Detail of data analysis and results are given in the tables below.

DATA ANALYSIS

Analysis and Interpretation of Objective No. 1: "To study the professional commitment level of teacher educators in the Colleges of Teacher Education, Manipur"

Table No. 1: Level of Professional Commitment Among Teacher Educators

Sl. No.	Level of Professional Commitment	No. of Participants	Percentage (%)
1.	Extremely High Commitment	4	8
2.	High Commitment	10	20
3.	Above Average Commitment	13	26
4.	Average Commitment	21	42
5.	Below Average Commitment	2	4
	Total	50	100

From the table no. 1, it can be observed that 8% of the teacher educators fall in the level of extremely high commitment, 20% have a high level of commitment, 26% have above average level of commitment, 42% have an average level of commitment which is the highest percentage among the 5 categories, and 4% have a below-average level of commitment which is the lowest percentage among the level of commitment. Thus, the alternate hypothesis that there exists a different professional commitment level of teacher educators in the Colleges of Teacher Education, Manipur is accepted.

Analysis and Interpretation of Objective No. 2: "To find out the difference between male and female teacher educators of the selected colleges with regard to their professional commitment"

Table No. 2: Difference Between the Male and Female Teacher Educators

	Sex	N	Mean	Standard Deviation	t-value
Professional Commitment	Male	20	3.50	.688	2.043
	Female	30	2.90	1.185	

The above table no. 2 indicates that male teacher educators showed a significantly higher level of professional commitment than female teacher educators. The t value obtained of 2.043 is significant at a 0.05 level of significance, thereby rejecting the null hypothesis that there is no significant difference between male and female teacher educators regarding their professional commitment.

Analysis and Interpretation of Objective 3: “To find out the difference between married and unmarried teacher educators with regard to their professional commitment.”

Table No. 3: Difference Between the Married and Unmarried Teacher Educators

	Marital Status	N	Mean	Standard Deviation	t-value
Professional Commitment	Married	31	3.23	1.146	.735
	Unmarried	19	3.00	.882	

The above table no. 3 shows that married teacher educators showed a higher mean score (3.23) than unmarried teacher educators. Yet, there is no significant difference between married and unmarried teacher educators. The t value obtained of .735 is not significant at a 0.05 level of significance, thereby accepting the null hypothesis that there is no significant difference between married and unmarried teacher educators regarding their professional commitment.

MAIN FINDINGS OF THE STUDY

1. The study revealed that the professional commitment of teacher educators of Teacher Education Colleges (B.Ed.) was of a moderate level at 42%. Thus, more teacher educators have an average level of commitment toward their professional commitment based on the five dimensions: Commitment to the Learner, Commitment to the Society, Commitment to the Profession, Commitment to Achieve Excellence for Professional Actions, and Commitment to Basic Values.
2. The study revealed that the professional commitment between male and female teacher educators is significantly different. It has been found that the professional commitment of male and female teacher educators differs from each other. It can be pointed out that the commitment between male and female teacher educators does not tend to be equally committed based on the five dimensions: Commitment to the Learner, Commitment to the Society, Commitment to the Profession, Commitment to Achieve Excellence for Professional Actions, and Commitment to Basic Values.
3. The study revealed that the professional commitment between married and unmarried teacher educators is not significantly different. It can be pointed out that the professional commitment between married and unmarried teacher educators tends to be equally committed based on the five dimensions: Commitment to the Learner, Commitment to the Society, Commitment to the Profession, Commitment to Achieve Excellence for Professional Actions, and Commitment to Basic Values. The factor of being titled married and unmarried does not hamper their professional commitment as teacher educators.

Educational Implications of the Study

Quality education is a term every institution or organization would want to reach and achieve as its outcome. When the commitment of the teacher educator becomes low and is neglected by all, then inevitably, there will be a problem with the functioning of the teacher education program, which imparts the essential skills and experiences to the prospective teachers. When the student teachers are not facilitated and assisted at the optimum level in the teaching profession, the learners will see the effects. When the learners fail to receive the best from the teachers, the quality education that all policies and commissions focus on will be in vain. So, the policy framers need to adopt the essential measures for the maximum performance of the teacher educators. The professional commitment of teacher educators cannot be overtaken and excluded. To avail and enable the teacher educator to be committed, the following are some of the suggested points to consider:

1. Conducive academic atmosphere should be offered in the teacher education institutions so that the teacher educator will feel secure and safe. The academic surrounding is one of the most critical factors in the teaching-learning process. It is essential to focus on the professional commitment of teacher educators to give their best and contribute significantly to the development of teacher trainees.
2. No one can substitute the place of a teacher educator. They play an integral role in developing efficient and well-equipped prospective teachers. The teacher educators should be provided with opportunities in various forms to build their professional commitment and be updated in all forms. Teacher educator, a unique entity, requires their own specific need for professional development.

3. The regulatory bodies which look into the teacher education program should ensure proper codes of conduct for the teacher educators as they carry out their roles and responsibilities. The teacher educators are accountable for shaping the professional commitment of the teacher trainees. They cannot simply cover up the teacher education curriculum. The teacher educator needs to take the extra mile as they perform their duty.
4. The teacher educator should be given due regard in all aspects and be given a desirable salary and various facilities which will motivate and boost the teacher educators towards their professional commitment. The welfare of the teacher educators should be taken into account.

CONCLUSION

Education remains the only consistent means of transforming the lives of all. For education to bear fruits in the lives of the learners, no one can replace teachers. Teachers have to be armed with the necessary skills, knowledge, and experiences to complete their tasks. For this, teachers will need the assistance of the teacher educators, who are the master in delivering the critical competencies to the prospective teachers. Having the title of teacher educator is not enough. It requires commitment from the teacher educators as they carry out their duties. Professional commitment is very much pertinent in the field of the educational process. In the absence of professional commitment, there will not be long-term development and productivity in the education system.

The present study of the findings highlights a valuable glimpse of the professional commitment of teacher educators of Manipur. The study tries to find out the level of professional commitment among the teacher educators of Manipur. It further looks into the professional commitment and whether there is a significant difference between the male and female and married and unmarried teacher educators. The study's findings showed a more substantial number of teacher educators falling under the moderate level of professional commitment.

Further, the result showed a significant difference between the male and female teacher educators regarding their professional commitment. It also showed no significant difference between married and unmarried teacher educators in Manipur.

SUGGESTIONS FOR FURTHER STUDY

The following are the suggestions for further study:

1. The study can be conducted in all the Colleges of Teacher Education in Manipur.
2. A comparative study can be done between the colleges of Teacher Education of Manipur.
3. A similar study can be conducted on primary, secondary, and higher education teachers.
4. A study of the professional commitment of teacher educators regarding their emotional intelligence can also be conducted.

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STUDY OF WASTE MANAGEMENT PLAN AT ONGOING UNDERGROUND WORK AT MUMBAI METRO RAIL LINE -3, PACKAGE -6

Syed Adnan Ejazuddin^{1*}, Pallavi Chakole² and Nikhil Borkar³¹Student, Department of Environmental Engineering, Yeshwantrao college of engineering and technology, Nagpur, India²Professor, Department of Civil Engineering, Yeshwantrao College of engineering and technology, Nagpur, India³Environmental manager, J.Kumar – CRTG (JV) line 3, package 06, Mumbai, India**ABSTRACT**

INDIA is the developing country and various part of the country is getting developed .Such as Mumbai is also the one of the most developing city in the country. In Mumbai the population is getting increased which is leading to the problem of traffic and overcrowding to overcomes this issues the MMRC has planned for the development of underground metro rail project. This paper is about underground metro rail project line 3, package 06 where the construction of Underground metro rail work is carried out at CSIA station, Sahara station And Domestic airport station. The lead of construction work of the underground metro line will lead to the generation of the waste which is required to get managed and properly planned. In this case study have understood about the waste generation at the station and the waste management plan to make the site pollution free and sustainable and to help the environment in its protection.

Keyword: Disposal, Environmental impact, Pollution, Underground Metro line, Waste Management.

INTRODUCTION

Mumbai is known as the dream city for lot of aspiring individual in various stream of their work. Mumbai is also known as the finical capital of the country .The city is going on developing and gives lot of opportunity .This lead to the increase of the population in the city as people from various parts of the country come to Mumbai for making their future bright. The increase in population leads to increase in traffic the city. As about 52% of public travels with the local train, 36% of public travels with bus services and 12% other transport system to reach their destinantion.The rise in population give the rise of traffic problem. 22M population & 11M people travel daily by Public Transport The share of PT > 85%. Many areas in city and suburbs are not served by rail based system. Rail network expansion failed to keep pace with demand resulting in severe congestion on road network & Environmental pollution.4000 passengers travel per train against the carrying capacity of 1750 resulting in unbearable overcrowding. Thus the Underground Metro rail project comes into the existences to reduce the traffic of city and save the time of the public.MMRC has planned the underground tunnel metro line from colaba to seepz with almost 27 stations.

Waste management

Waste management is the plan provided by the environmental specialist to manage the waste from its generation to its disposal with proper treatment to reduce the pollution and make the environment sustainable without harming the Environment. At the underground metro project line 03 &package 06 the waste management plan is prepared as the development and the construction work the underground metro line lead to the generation of waste from the different sources. The major parts of the waste management is reducing, reusing, recycling and composting as key to sustainable materials management.

METHODOLOGY

The methodology adopted by me for the waste management is as to first understand concept of waste management from internet, literature review and other sources of information. Then by visit site and get study the process adopted for the construction and waste management techniques adopted by them. After getting it understand find the sources and different type of waste get generated on the site. Suggest them for 3Rs concept to get applied and different handling and treatment process and other.

Different Type of Waste and Their Sources:

- C&D Waste (Construction and Demolition Waste)
- Food WASTE
- Plastic WASTE
- Wood WASTE

- E-Waste
- Paper Waste
- Bio Medical Waste
- Metal Waste
- Rubber Waste

• C & D WASTE

Types

- Excavation Soil
- Muck
- Debris
- Concrete
- Mud
- Rocks
- Tiles
- Block
- Bricks and other

Sources of generation

of the C&D Waste is from various ongoing activity of drilling, concreting, blasting, excavation and casting, finishing and other works

- Bricks and other



Figure 1: concrete Debris

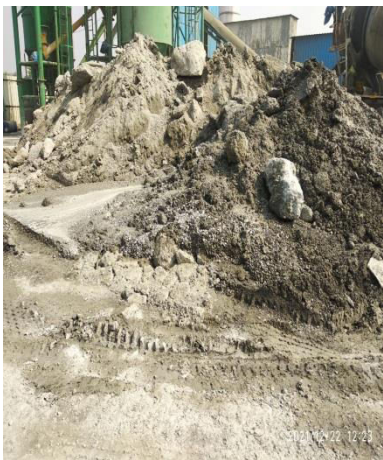


Figure 2:Muck

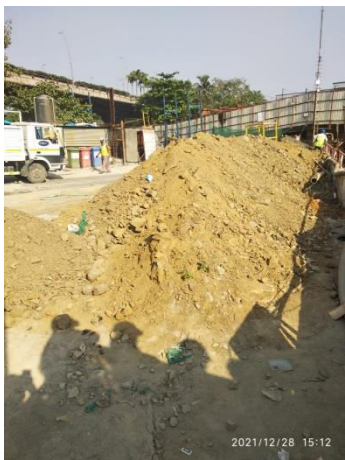


Figure 3: Excavated Soil

• PLASTIC WASTE

Types

- Cement Bags
- Helmets
- Safety jacket
- Drinking cans
- Painting Drums
- Chairs
- Thermocol
- Warping Plastic For materials

Sources of generation

of Plastic Waste is from various materials which are not in use such as Unused cement bags, helmets, Empty Drums, Plastic wrap around the materials for their safety and other.



Figure 4: Drums



Figure 5:Helmets



Figure 6:Cement bags

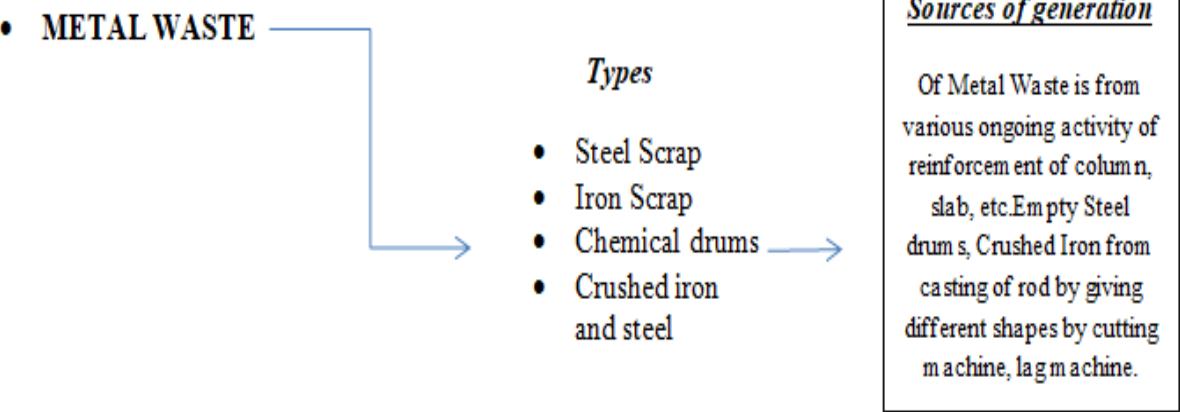


Figure 7: Crushed metal



Figure 8: Paint Cans



Figure 9: Iron Scrap

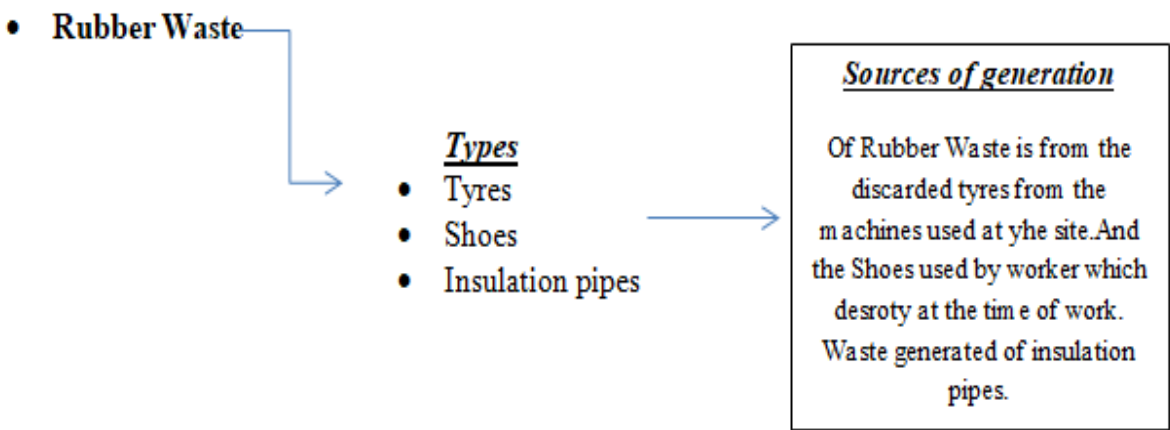




Figure 10: waste Shoes



Figure 11&12: Tyres Waste

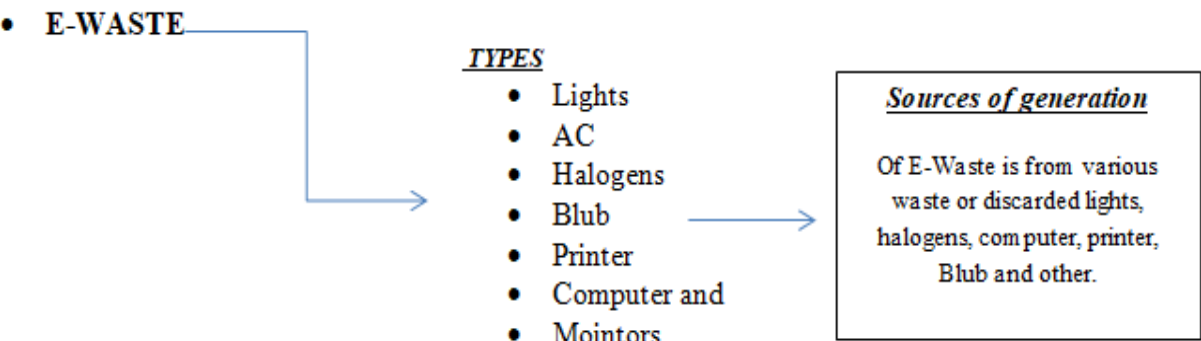


Figure 13: Lights

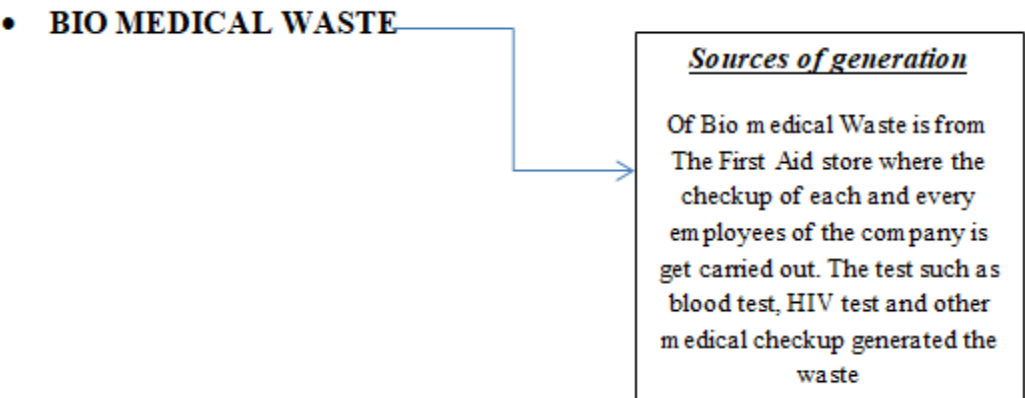


Figure 14 & 15: Bio Medical Waste

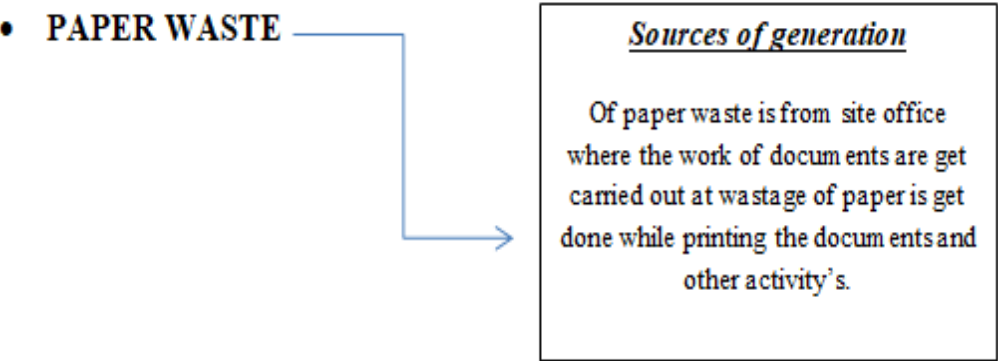


Figure 16: Paper Waste

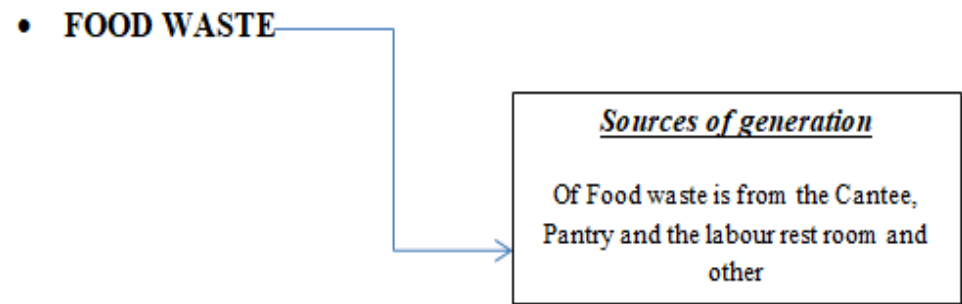


Figure 17: Food Waste

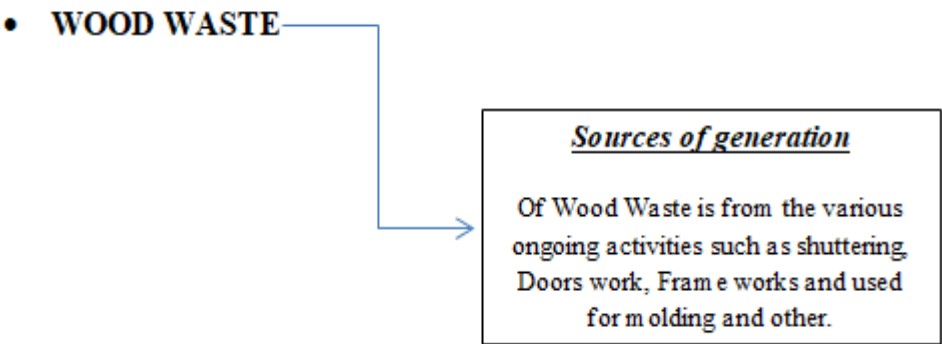




Figure 18: Shuttering Waste

Collection and Transport

Every Waste at the site is need to be Collected and required to get transfer at the specific location.Same At underground metro project line 3,Package 6 metro work is also required to collect the waste which is get done by housekeeping team at the site. For the different types of waste collection Different waste container are get arranged at site. For the different type of waste different colour waste bins are available Such as Landfill / Biodegradable waste the Green colour bins is there ,For Recyclable such as plastic And paper the Blue Colour bins is present,For Burning / Combustible waste The Red colour Bins is kept and for the Scrap metal waste the brown colour Buns is get Arranged to collect the waste .For the Bio Medical waste there are different colour bins such as Red,Blue,Yellow and Black Waste bins are there this different bins are used for the different segregation of Bio medical Waste At site. After The collection and segregation of waste its get transferred at specific location.



Figure 18: Bio Medical Waste Bins



Figure 19: Segregation Waste bins

Disposal

Disposal Of waste At site is done by different agency is hired by the infra company for their disposal and treatment process .For Solid Waste Such Food, general waste etc is get disposed by MCGM agency. Non-Hazardous Waste such as scrap waste disposal is done by S.A. Traders. Hazardous Waste is disposed by North East Lubrica PVT LTD. the hazardous waste is as Oil filters, Oily cotton, used oil etc. Bio-medical Waste such as Needles, blades, infectious waste bandages, cotton etc is done by SMS Envoclean Pvt. Ltd. and Recyclable waste such as paper & plastic is done by Swachh Sustainable Solutions Pvt. Ltd now it's their duty to dispose or to give the treatment to the waste without harming the environment.

3Rs

The 3Rs concept is REDUCE, REUSE & RECYCLE.I have planned to apply this rule over some waste to get further used at the underground metro rail site. Now a days this concept is important at the construction site to be get used and prevent site from getting polluted and to save the environment.

Table 01: 3Rs Tables at Underground Metro rail Line 3,package 6

Waste Construction material	Identification of waste utilization	3Rs	Photos Before 3Rs	Photos after 3Rs
Waste Drums	Used for plantation	Reusing		

Waste pipes	Used for the Covering the nails and hooks at site	Reusing		
Waste Concrete	Used for making of manholes cover and blocks for walking path	Reusing		
				

Legal Requirements

Legal Requirements which are applicable during the Waste management is get followed by the J.kumar CRTG (JV) at the site of Underground Metro rail Line 3,package 6 and the legal laws and requirements are as follows.

Table 02: List of Legal Rules and Requirements

Sr.No	Legal Laws Applicable during the Waste management
1.	The Environmental (protection) Act 1996 and rules 1986
2.	The Hazardous Waste (Management, Handling & Trans-boundary Movement) Rules, 1989 (amended 2003).
3.	The Manufacture, Storage and Import of Hazardous Chemicals Rules, 1989 (amended) 2000.
4.	The Bio- Medical wastes (management and handling) Rules, 2003 (Amendment 2016).
5.	The Batteries (Management and Handling) Rules, 2010.
6.	BOCWA 1996 and Maharastra Building and other construction workers rules 2007
7.	Solid Wastes Management Rules 2016 / Greater Mumbai Municipal corporation / local municipal corporation
8.	BS 6164: 2011
9.	E- Waste management and Handling rules 2016
10.	Plastic waste management rules 2016
11.	Recycled Plastic Usage Rules, 1998
12.	Fly ash utilization notification, Sept 1999 as amended in August 2003
13.	The hazardous Waste (Management & Handling) Rules, 1989
14.	Construction and Demolition Waste Management rules, 2016
15.	Maharashtra plastic and thermocol products notification 2018
16.	The Maharashtra (Urban Areas) Protection and Preservation of Trees Act, 1975.
17.	The Factories Act, 1948
18.	Single use Plastic waste rule 2019

SUGGESTION

- Concrete waste can be get used for the making the pavement and also by crushing it can be used as the recycled aggregates.
- Waste wood can be get used for making the particles cardboard and used for other shuttering work by crushing it.
- Waste plastic can made RPF by melting and crushing the waste.
- Waste of the bricks can be get utilized for the water proofing work.
- Proper segregation of waste should be get done at site rather than mixing the waste.

CONCLUSION

The waste management plan at site can give the effectiveness in carrying out the project environmentally friendly. The waste management plan is growing toward a sustainable world and the environmental development. By following the proper waste management plan the green resources can be planned to save and also protect the environment. The use of construction waste management techniques which rely on salvage, recycle and reuse of materials have proven to have economic benefits for the construction industry. In my contribution to the waste management plan I have suggested the site for applying the 3Rs concept so that the reused of various waste materials can be get done such as waste drum can plan be reused for the plantation work, waste pipes can be get used for the covering of nails and hooks which are open at the site And the used of the construction and demolition waste materials can be used for the various development of the work and can be get reused for the new construction works. Understanding waste management plan and implementation of it at the site make the underground metro rail line sustainable and environmental friendly and protect the environment and can creates the better future.

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TEACHERS' EMOTIONAL INTELLIGENCE AND TEACHER EFFECTIVENESS: A CORRELATIONAL STUDY

¹Thokchom Somiya Devi and ²Dr Keisham Shitaljit Singh**¹Research Scholar and ²Associate Professor Department of Education Manipur University Canchipur-795003, INDIA****ABSTRACT**

With the increasing demand for emotional intelligence in the educational context, several studies have been conducted on emotional intelligence in relation to teacher effectiveness. The research findings of different studies have revealed that emotional intelligence has greatly contributed to teaching and learning effectiveness. The present study has highlighted the level of emotional intelligence and teacher effectiveness. It has also explored the relationship between emotional intelligence and teacher effectiveness among higher secondary school teachers. For this purpose, a sample of 100 (60 males and 40 females) teachers of higher secondary schools has been selected through a simple random sampling technique. Two questionnaires, namely Emotional Intelligence Scale (EIS) developed by Anukool Hyde, Upinder Dhar and Sanjyot Pethe and Teacher Effectiveness Scale (TES-KU) developed by Dr Umme Kulsum, have been used to collect the data. Statistical techniques like percentage, frequency and Pearson's product-moment coefficient of correlation have been employed to analyse the data. The study findings have found that most of the teachers have a high level of emotional intelligence and the majority of the teachers are the most effective teacher among the higher secondary school teachers. It has further revealed a positive and high correlation between emotional intelligence and teacher effectiveness of higher secondary school teachers.

Keywords: Emotional Intelligence, Teacher Effectiveness, Correlational Study.

INTRODUCTION

Education is the basic tool for developing consciousness and reconstruction of society. The teacher is the basic tool for developing consciousness and reconstruction of society. The teacher is the medium to achieve the goal. The teachers who are the reformer of future citizens need to be emotionally mature. S. Radhakrishnan once said, "A teacher's place in society is of vital importance. He acts as the pivot for transmission of intellectual traditions and technical skills, from generation to generation and helps to keep the lamp of civilization burning". The teachers need to be high emotional intelligence to be successful and effective teachers. Teachers play a guiding and directing role in student's life. He must bring out the best in students and inspire them to strive for greatness. Students are the future of a nation. So, the development of any nation is in the hands of the teachers. Emotional intelligence helps teachers to face certain stressful situations in which their actions can impact the students' learning and well-being.

As being a new concept in education and psychology, emotional intelligence is one of the most important skills to adapt to the changing situation in today's world. People with high emotional intelligence have a happy and successful life. It is the ability to make adjustments to live, learn from experiences, and think at the abstract level. Salovey and Mayer (1990) defined emotional intelligence as the ability to monitor one's own and others' feelings and emotions, to discriminate among them and to use this information to guide one's thinking and actions. Emotions play an active role in guiding and directing our behaviours. Many studies revealed that emotional intelligence accounts for 80% of a person's success in life, and the remaining 20% could be attributed to intelligence quotient. Goleman (1998) defined emotional intelligence as the capacity to recognize our feelings and those of others, motivate ourselves, and manage emotions well in ourselves and our relationships. Further, he has laid out that emotional intelligence consists of five components: self-awareness, self-regulation, motivation, empathy, and social skills. The first three components are internal factors, and the last two are external factors.

Paite, V (2014) conducted a study on "Emotional intelligence and teacher effectiveness among high school teachers in Lunglei district of Mizoram" and found a high and positive correlation between emotional intelligence and teacher effectiveness. Emotional intelligence plays an essential role in teacher effectiveness. Vishalakshi, K.K (2013) studied "teacher effectiveness, emotional intelligence and self-esteem of secondary teachers-a correlational study". The results revealed that secondary school teachers of two gender groups-males and females of different age groups, qualifications and teaching experience, did not differ in their level of teacher effectiveness. But there had a significant difference between males and females and different lengths of experience of secondary school teachers in their emotional intelligence level. It further revealed a significant positive relationship between teacher effectiveness and emotional intelligence.

Studies have been conducted in these areas due to the increasing value of emotional intelligence in teaching and learning. Sharma, S (2006) reported a study of job satisfaction and teaching effectiveness of secondary teachers in relation to their emotional intelligence. The study's finding was that almost all secondary school teachers are above emotionally intelligent, and there existed a highly significant relationship between the level of teacher effectiveness and emotional intelligence. So, it can be concluded from the past study that the higher the emotional intelligence, the better the level of teacher effectiveness would be.

OBJECTIVES

The following are the objectives of the present study:

1. To determine the level of emotional intelligence among the higher secondary school teachers in Kakching district of Manipur.
2. To determine the level of teacher effectiveness among the higher secondary school teachers in Kakching district of Manipur.
3. To investigate the relationship between emotional intelligence and teacher effectiveness among the higher secondary school teachers in kakching district of Manipur.

HYPOTHESES

The following are the hypotheses of the study:

1. There exists different emotional intelligence among the teachers of the higher secondary schools in Kakching district of Manipur.
2. There exists different teacher effectiveness among the higher secondary school teachers in Kakching district of Manipur.
3. There is no significant relationship between emotional intelligence and teacher effectiveness among the higher secondary school teachers in Kakching district of Manipur.

Justification of the Study

Education is the basic tool for developing consciousness and reconstruction of society. The teacher is the basic tool for developing consciousness and reconstruction of society. The teacher is the medium to achieve the goal. The present educational scenario of the 21st century has focused more on quality than quantity. The education quality depends on the quality of teachers. With the advancement of science and technology, emotional intelligence is one that artificial intelligence (AI) and machines can't replace especially in the field of education. The teachers mediate the quality of education because they have the potential to enhance the quality of education. The quality of teachers needs to improve to meet the challenge these days. Quality education is based on the capabilities and competence of the teacher. Emotional intelligence is much needed in the teaching profession as it could make teaching and learning effectively. V.S Mathews has rightly said, "No system of education, no syllabus, no methodology, no textbooks can rise above the level of its teachers. If a country wants to have quality education, it must have quality teachers".

The teacher's level of EQ is the most important variable in creating a classroom environment. High emotional intelligence teachers can motivate their students better and understand their needs and feelings. It helps them to deal with different varieties of students tactfully and thoughtfully. Teaching is an emotional practice that involves emotional relationships, understanding, and labour. Teachers' emotional competence is necessary both, in general, for their well-being and effectiveness and quality in creating the teaching-learning process in the classroom and, in particular, for students' socio-emotional development (Sutton and Whealhy, 2003). They should know how to deal with students accordingly to their interests, needs and feelings. They should be able to make the lesson interesting so that the students are eager to learn. The teacher should have the right positive feelings and emotions towards students to create a love for education, hope, good ideas and development. They have to value emotional bonds with students and educate them on social and emotional being. Meera, T (2017), in a study of teacher effectiveness as related to cognitive style and emotional competence, found that teachers having high overall emotional competence had significantly better teacher effectiveness than secondary school teachers having low overall emotional competence.

Effective teachers should have positive feelings and emotions toward students to eradicate the feelings of fear and anger from the mind of young learners. The teachers should know how to handle different students. Emotional intelligence helps them to deal with such things. They try to understand and be aware of the students' needs, interests, and feelings. They play different roles in guiding student's life. They should teach every student with love, care and dedication. There is a need to have a heart-to-heart relationship between the teachers and

students. They are the architect of student's life. They need to have the high emotional intelligence to meet the challenges in the teaching-learning process. To be an effective and successful life, one needs to have self-awareness, self-regulation, empathy and management of oneself and others' emotions and feelings. To fulfil all these, the teachers should possess high emotional intelligence.

METHODOLOGY

Population and Sample of the Study

In the present study, the population has comprised all the higher secondary school teachers in the Kakching district of Manipur. Male and female teachers working in 6 higher secondary schools have been included in the study. Out of these, 100 teachers of higher secondary schools (60 males and 40 females) have taken part in the study to collect the data. Simple random sampling has been used for the selection of samples.

Statistical Techniques Used

1. Frequency and percentage have been used to determine the level of emotional intelligence and teacher effectiveness.
2. Pearson's product-moment coefficient of correlation 'r' has been used to compute the relationship between the teachers' emotional intelligence and teacher effectiveness among the higher secondary schools in Kakching district of Manipur.

Tools Used

The following are the tools used for collecting data:

1. Emotional Intelligence Scale (EIS):

This emotional intelligence tool was developed by Anukool Hyde, Upinder Dhar and Sanjyot Pethe. It has ten factors. They are self-awareness, empathy, self-motivation, emotional stability, managing relations, integrity, self-development, value orientation, commitment, and altruistic behaviour. It has consisted of a 5-point scale of 1- strongly disagree, 2- disagree, 3-uncertain, 4-agree, and 5-strongly agree.

2. Teacher Effectiveness Scale (TES):

The teacher effectiveness scale developed by Dr Umme Kulsum has been used to determine teacher effectiveness. It has 60 items and is administered on five areas/ dimensions, namely-

1. Preparation and planning for teaching,
2. Classroom management,
3. Knowledge of subject matter, its delivery, and presentation, including B.B summary,
4. Teacher's characteristics, and
5. Interpersonal relations.

DATA ANALYSIS AND INTERPRETATION

Table 1.0: Frequency distribution of variable sex

Sex	Numbers of teachers	Percentage
Male	60	60.0
Female	40	40.0
Total	100	100.0

Table no. 1.0 shows the description of the variable sex. It can be interpreted that the maximum number of representative samples of the study was male, i.e., 60% and females with a percentage of 40% were minimum.

Table 1.1: Level of Emotional Intelligence (EI)

Emotional Intelligence Level	Range of Scores	Frequency	Percentage
High	85 and above	85	85
Normal	52-84	10	10
Low	51 and below	5	5

From the above table 1.1, it can be illustrated that 85% of teachers fall under the level of high emotional intelligence, 10% of teachers fall under the level of normal, and 5% of teachers fall under the level of low emotional intelligence. So, it can be concluded that the majority of teachers in higher secondary schools are at the level of high emotional intelligence, and only a few of the teachers are at the level of normal and low emotional intelligence.

Table 1.2: Level of Teacher Effectiveness (TE)

Teacher Effectiveness Level	Range of Scores	Frequency	Percentage
Most Effective Teacher	435 and more	71	71
Highly Effective Teacher	401-434	20	20
Above Average Effective Teacher	367-400	6	6
Moderately Effective Teacher	321-366	3	3

From the given table no. 1.2, it can be concluded that 71% of teachers are under the level of a most effective teacher, 20% of teachers are under the level of a highly effective teacher, 6% of teachers are under the level of an above-average effective teacher, and only 3% of teachers are under the level of a moderately effective teacher. It can be interpreted that the majority of the teachers of higher secondary schools are at the level of the most effective teacher.

Table 1.3: Relationship between Emotional Intelligence and Teacher Effectiveness

Variables		Emotional Intelligence	Teacher Effectiveness
Emotional Intelligence	Pearson Correlation	1	.714**
	Sig. (2-tailed)		.000
	N	100	100
Teacher Effectiveness	Pearson Correlation	.714**	1
	Sig. (2-tailed)	.000	
	N	100	100

**Correlation is significant at 0.01 levels (2 tailed)

From the above table 1.3, it can be observed that there is a positive and high correlation between emotional intelligence and teacher effectiveness among the higher secondary school teachers in Kakching district of Manipur ($r=.714$). It can be interpreted that emotional intelligence has a significant relationship with teacher effectiveness. As such, the null hypothesis is rejected.

MAIN FINDINGS

1. Levels of Emotional Intelligence

with regards to the overall level of emotional intelligence of higher secondary school teachers in Kakching district of Manipur, the majority of the teachers, i.e., 85%, have been found to have a higher level of emotional intelligence, 10% of teachers of higher secondary school have been found in the level of normal and 5% in the low level of emotional intelligence.

2. Levels of Teacher Effectiveness

With regards to the level of teacher effectiveness of higher secondary school teachers in Kakching district of Manipur, it is found that the majority of the teachers, i.e., 71% are in the level of most effective teachers, 20% of teachers of higher secondary school are in the level of a highly effective teacher, 6% of teachers of higher secondary are in the level of an above-average effective teacher, and only 3% of teachers of higher secondary school are in the level of a moderately effective teacher.

3. Relationship Between Emotional Intelligence and Teacher Effectiveness

A high and positively significant relationship exists between emotional intelligence and teacher effectiveness of higher secondary school teachers in Kakching district of Manipur ($r=.714$). It indicates that the higher secondary school teachers with high emotional intelligence enjoy a high degree of teacher effectiveness, while the teachers with average or low emotional intelligence enjoy average and low teacher effectiveness, respectively.

EDUCATIONAL IMPLICATIONS

Emotional intelligence is a critical factor for sustaining high achievement in professional, positive behaviour and improving life success. To be an effective and productive teacher, he should possess high emotional intelligence. The progress and prosperity of a nation depend upon the development of a teacher. They are capable of producing a good citizen and a good nation. The teachers should develop the thinking capacity of the students regarding rationalization and wholeness, as emotional intelligence is the ability to think, organize and evaluate work. They should try to develop good interpersonal relationships with their students.

Teachers, teacher educators, policymakers, administrators, and stakeholders should be able to understand the emotions, feelings and attitudes and accordingly set the curriculum contents. The curriculum should be framed under the social and emotional components of students. The teachers can also provide different programmes

dealing with social and emotional management, understanding of emotional change, sensation and lessons related to emotional and social learning to improve their emotional intelligence.

It is commonly understood that the training programs are resource centres for human development. For this, the training institutes must adopt adequate and innovative measures to provide quality training programs for teacher education. They require to produce teachers who are realistic, responsible, expressive, confident, assertive, emotionally stable, mature, resourceful, controlled, independent, ready to try new things, and more tolerant of change.

CONCLUSION

The present study highlights the level of emotional intelligence and teacher effectiveness of higher secondary school teachers. It further highlights whether there is any correlation between emotional intelligence and teacher effectiveness among higher secondary school teachers. The chief conclusions of the study are that most of the teachers of higher secondary schools in Kakching district have a high level of emotional intelligence, and some teachers are found in the normal and low levels of emotional intelligence. Regarding teacher effectiveness, the majority of teachers are at the level of most effective teachers, some of them are at the level of highly effective teachers, and a few teachers fall under the level of above average and moderately effective teachers. Further, the study has revealed that there existed a high and positive correlation between emotional intelligence and the teacher effectiveness of higher secondary school teachers in Kakching district of Manipur. The results of the finding suggest that with the increase in emotional intelligence, the effectiveness of teachers of higher secondary increases to a great extent. So, emotional intelligence plays a remarkable role in guiding and directing teachers' behaviours. It is the skills that the teachers require in an effective teaching-learning process and also in their professional lines. They should know how to handle students and situations. Most researchers have found that emotional intelligence is an independent variable and has a significant role in the effectiveness of teachers.

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THE CHANGE FROM AFFIRMATIVE TO NEGATIVE MEANING OF DIFFERENT SENTENCES IN BODO: A STUDY

Sanhang Mushahary

Research Scholar Department: Bodo Bodoland University, Kokrajhar

ABSTRACT

Different sentences of Bodo can be changed from positive to negative meanings. On the basis of meaning, the sentence can be divided into Assertive Sentence, Alternative Sentence, Imperative Sentence, interrogative sentence and etc. All these sentences have Affirmative connotation as well as a negative connotation. Affirmative sentences express true or correct meaning. But the negative form of a sentence conveys the opposite meaning of the positive one. A negative sentence is formed in Bodo by using negative meaning builder words like 'nonga' (no/not), 'gwiya' (no/ not) followed by a positively meaningful sentence. A negative meaningful sentence is also formed in this language by adding a negative prefix {da-} and a negative suffix

{-a, -ja, -wa} before and after a verb. Apart from this, the formation of a negative sentence can be seen in the Bodo language by using the opposite word to the verb and opposite words of different words. The changing from affirmative to negative sentence does not change the structural form of an affirmative sentence. The subject, predicate, word order, phrase and clause of an affirmative sentence are the same as in a negative sentence. This study discusses how the positive meaning of a sentence turns into a negative meaning in the Bodo Language.

Keywords: Sentence, Change, Affirmative, Negative

1.0 : INTRODUCTION

Bodo is the oldest language of North-East region of India. The Bodo people mostly live in the North-Eastern region of India (especially in Assam). As compared to different region or state, the Bodo people of Assam are mostly developing in education, Political, Economics and various field. They are also mostly playing an important role in the development of their language, culture and literature. The Bodo language continues to evolve to this day. Because Bodo is a acceptance language as scheduled language of India. Sino-Tibetan is the main source of the Bodo language. So to this day, some similar features of the Tibeto-Burman language can be observed in the areas of Phonology, Morphology, Syntax and the various linguistics part of Bodo. A word in a language has the opposite meaning. Similarly, a sentence in the language also has the opposite meaning. This process is also in Bodo language. Because the changed from one meaningful sentence into another meaningful sentence can be seen in Bodo. This process is an old process of Bodo. Because Bodo people are using sentences with true or false meaning since time immemorial. A sentence has two meanings. These are Positive or Affirmative and Negative. The change from positive to negative meanings of different sentences in Bodo is discussed below.

1.1 Area of the Study: This study of change from positive to negative sentences is based only on the division of sentences based on the meaning of Bodo. These are Assertive Sentence, Optative or Alternative Sentence, Imperative Sentence, Exclamatory sentence and Interrogative Sentence. Here have not studied about different types of sentences like simple, complex and compound sentences which are divided on the basis of structure in Bodo.

1.2 Aims and Objectives of the Study: The main objective of this study is to clearly describe how a sentence changes from positive to negative meaning in Bodo and to give complete information to the readers it.

1.3 Methodology: The Analytical and Observational method is applied here to study the change of positive or affirmative meaning of a sentence into negative meaning. The related data on this topic are based on primary source. Because in this study different sentences that are used by the Bodo people are used as data.

2.0 DISCUSSION

The various sentences of Bodo can be divided mainly on the basis of two processes. These processes are based on meaning and based on structure. The various sentences divided into these processes can be found with positive and negative connotations. The true meaning is reflected in positive or affirmative sentences and their opposite meaning is reflected in negative sentences. The people of a society cannot express their feelings with only one affirmative sentence. In many moments people of a society need to express their feelings even with negative connotative sentences. Hence the change from affirmative to negative process has been used in a language.

In Bodo, the different sentences can be divided into five types based on their meanings. These are Assertive sentence, Optative sentence, Imperative sentence, Exclamatory sentence and Interrogative sentence. These five meaningful sentences can be further divided into two main meaningful parts. These have positive and negative connotations. How the positive connotation in Bodo turns into negative connotation is discussed below.

2.1 The change from Affirmative to Negative meaning of Assertive sentence:

A sentence that defines an action or work is called Assertive sentence. The Assertive sentence has two meaningful forms. These are Affirmative or Positive and Negative. By adding a negative meaningful word like 'noŋa' (no/not), 'guija' (no/not) after an affirmative sentence, a new negative sentence is formed in Bodo. How the affirmative or positive meaning of an Assertive sentence changes into a negative meaning is given below with examples. E.g.

Affirmative Meaning

1. sɔmira sase muɜaŋ gelegiri.

(Samir is a good player.)

2. zuŋni pʰɔraisaliao gɔŋse bibarbari dɔŋ.
garden in our village.)

Negative Meaning

sɔmira sase muɜaŋ gelegiri noŋa.

(Samir is not a good player.)

zuŋni pʰɔraisaliao gɔŋse bibarbari guija. (There is a
(There is no garden in our village.)

2.2 The change of Affirmative to Negative meaning of Imperative sentence

A sentence that defines a command, request or advice is called an Imperative sentence. In Bodo, a negative prefix {da-} is added before the verb of an affirmative to change the positive meaning of an Imperative sentence to the negative. The examples are given below. E.g.

Affirmative Meaning

1. pʰuŋao kʰar.

(Run in the morning.)

1. duimajao sansri.

(Swim in the river.)

Negative Meaning

1. pʰuŋao dakʰar.

(Do not run in the morning.)

2. duimajao dasansri.

(Do not swim in the river.)

It is seen in the above examples that a new negative Imperative sentence is formed by adding a negative prefix {da-} before the verb of the Affirmative Imperative sentence.

2.3 The Change of Affirmative to Negative Meaning of Optative Sentence:

The sentence which defines to bless or convey a good message to a person is called Optative sentence. A negative prefix {da-} is added to the verb of an affirmatively expressive sentence to change the positive meaning of the optative sentence to the negative meaning. The examples are given below. e.g. :

Affirmative meaning

1. nuŋ anzadau utʰrisarnu hatʰuŋ.

(You pass the exam.)

2. nuŋha guzuun zatʰuŋ.

(May you be happy.)

Negative meaning

1. nuŋ anzadau utʰrisarnu dahatʰuŋ.

(Don't pass the exam.)

2. nuŋha guzuun dazatʰuŋ.

(May you not be happy.)

In both the examples above have seen that a new negative optative sentence is formed by adding a negative prefix {da-} before the verb of affirmative optative sentence.

2.4 The Change of Affirmative to Negative Meaning of Interrogative Sentence

The sentence which tells the meaning of asking a question is called Interrogative sentence. The Interrogative sentence also have Affirmative and negative meaningful form. Adding the negative suffix {-a} after the verb of a positive semantic Interrogative sentence creates a new Interrogative sentence in Bodo, which defines the negative meaning of the affirmative. The negative connotative Identifier suffix {-a} has some secondary form. These are {-ja, -wa}. These secondary forms depend on the final vowel of the verb. The changing affirmative meaning of Interrogative sentence into negative meaning is discussed below with examples. E.g. :

Affirmative meaning

1. nuŋ duijao geleu?

Negative meaning

1. nuŋ duijao geleja?

(Do you play in the water?)

(Do you not play in the water?)

2. nuŋ gabuŋ p^huiŋuŋ ne?

2. nuŋ gabuŋ p^huija ne?

(Will you come tomorrow?)

(Will you not come tomorrow?)

In both the examples above, a new negative interrogative sentence is formed by adding the negative semantic identifier suffix {-a} after the verb of the affirmative Interrogative sentence.

2.5 The change of Affirmative to Negative meaning of Exclamatory sentence:

The sentence which conveys the suddenly feeling of good or happy, amazed and bad or sad of the speaker is called exclamatory sentence. Exclamatory sentence also have affirmative and negative meaning. Adding an opposite word to the verb changes the affirmative meaning of the exclamatory sentence to the negative meaning. Exclamatory words also change when exclamatory sentences change affirmative to negative meaning. The examples are given below.

Affirmative meaning

1. ba! zuŋ k^helajau derhabai.

(Harrah: we have won the match.)

2. ba! nuŋ sase k^hap^halguŋaŋ.

(Harrah! You are lucky.)

Negative meaning

2. hai! zuŋ k^helajau zenbai.

(Alas! We have not won the match.)

2. hai! nuŋ sase k^hap^halguiui.

(Alas! You are unlucky.)

3.0 : CONCLUSION

From the above discussion it is found that all the sentences of Bodo have two meaningful forms. These are affirmative or positive and negative. Truth meaning is reflected in affirmative sentences and their opposite meaning is reflected in negative sentences. In the change from affirmative to negative meaning of different sentences of Bodo, the four procedures are used. These are, using an opposite word to the affirmative sentences, adding a negative prefix {da-} before the verb of affirmative sentences, adding a negative suffix {-a} after the verb of an

affirmative sentence and using some negative connotative words such as /noŋa/ (no/not), /guija/ (no/not) after an affirmative sentence in Bodo.

The discussion on the change from affirmative to negative meaning of different sentences in Bodo will be helpful in knowing about the sentences structure of Bodo. The upcoming research scholar of Bodo will get many research areas to study on this topic. Because Bodo has many procedures where a sentence is change into another sentence. For example, the change from simple to complex sentence and from simple to compound sentences can be noted.

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THE STRUCTURAL-LOGICAL MODEL FOR THE CLASSIFICATION OF DISTURBED AND OIL-CONTAMINATED LANDS USING REFERENCE OBJECTS

Ph. D. S.V. OstakhAssistant professor of National University of Oil and Gas «Gubkin University», Leninsky Av., 65, building 1
119991, Moscow (Russia)**ABSTRACT**

Conducting one-time and regular observations by remote methods allows you to acquire information about the possible state of natural and anthropogenic landscapes, including soil and vegetation cover, for the period of short-term forecasting.

Similarity analysis and dimension analysis are carried out for the observed object, which makes it possible to trace the dynamics of the variability of the territory over the established period of time. In particular, when implementing a monitoring system using methods of remote sensing of the Earth, such data includes models of objects based on a geometric feature and corresponding geospatial bindings.

The purpose of the study is to form a structural and logical model for predictive and analytical studies that allow remote diagnostics of oil-contaminated areas with reliably deciphered dynamics of soil cover structures. The possibility of using long-term artificially created model objects for classification tasks of hard-to-reach, little- and unexplored areas of disturbed and oil-contaminated territories is shown.

Key words and phrases: diagnostics, remote, information, observation, soil, reference object

INTRODUCTION

An important task of industrial ecology is the timely determination of the level of environmental impact depending on the operating life of the production system.

To obtain the most complete and reliable information about the situation in the disturbed and oil-contaminated territories, it is rational to use complex methods for predicting the dynamics of migration of the main pollutants (Tsvetkov, V., 2015).

Conducting single and continuous observations by remote methods makes it possible to acquire information about the possible state of natural and anthropogenic landscapes, including the soil and vegetation cover, for the period of short-term forecasting.

Hydrocarbon pollution in remote diagnostics is detected in the form of local anomalies, such as: discoloration of tree crowns, wilting of grasses and plants, loss of humus, the appearance of color against the background of the earth and technogenic soil geochemical (Ostakh, S., Bakhtina, E., & Kusheeva V., 2020), geochemical and temperature local anomalies (Meshalkin V., Ostakh S., & Kusheeva V., 2020).

For the purpose of ecological zoning of such pollution, a complex of technologies of various types is used (Yarotskaya E., Kovalenko E., 2019). It usually includes three main stages of research:

- Deciphering and interpretation according to a certain algorithm of data obtained by remote sensing of the Earth in various ranges of the electromagnetic spectrum;
- geospatial linking of terrain points to maps (which is the initial stage of pollution mapping in the area under consideration) and engineering surveys that show the results immediately in the area under study. At the stage of engineering surveys and geospatial referencing, geophysical and electrical research methods are usually used, supported by gas geochemical analyses;
- Sampling and their comprehensive analysis to determine the main pollutants and their concentrations.

Remote methods of soil analysis find their application for the implementation of monitoring studies in the following areas:

- Detection and mapping of disturbed and oil-contaminated territories;
- zoning of soil degradation;
- Analysis of the development and consequences of emergency environmental situations and the possibility of resolving litigation;
- Assessment of the effectiveness of reclamation activities.

For the observed object, a similarity analysis and a dimensional analysis are carried out, which makes it possible to trace the dynamics of the variability of the territory over a set period of time. In particular, when implementing a monitoring system using remote sensing methods, such data include object standards by geometric feature and corresponding geospatial references (Ostakh S., Kusheeva V., Bakhtina E., 2020).

The choice of standards is determined by the researcher on the basis of the information received about the disturbed diagnosed lands.

An erroneous definition of the model can significantly affect the result of determining the similarity of the studied areas.

At the same time, it is necessary to provide an optimal combination of information content analysis and speed of predictive-analytical estimation algorithms.

The choice of benchmark sites should be carried out taking into account the features of the landscape-ecological zoning of disturbed and oil-contaminated lands (Avessalomova I., 2018), the nature and nature of them falling into the zone of influence of the enterprise (Ozigis, M., Kaduk, J., Jarvis, C., da Conceição Bispo, P., & Balzter, H., 2019).

The need to ensure the informative and targeted significance of remote diagnostics of disturbed and oil-contaminated lands and the reliability of the data obtained using the system of created reference and control plots (standards) determines the relevance of this work.

To implement the chosen methodological approach to deciphering data on the study area, artificial inert models of various configurations and design age of use in the observation system are created.

The considered variant of diagnostic monitoring differs from traditional soil-agrochemical and engineering-ecological surveys, first of all, by the complexity of the study program, predictive modeling, and the continuity of research over time.

The local version of monitoring is carried out at reference sites, which are located in typical technogenically polluted areas near large enterprises and highways.

Automated processing of space images using reference objects can be considered as an integral expert-analytical approach in ecological interpretation (Ostakh S., Kusheeva V., Bakhtina E., 2020).

At present, the greatest interest in the methodology of remote methods of soil analysis is represented by logical sequential methods based on step-by-step training on standards and division of the analyzed area according to a set of features into piecewise homogeneous areas and pattern recognition procedures.

On (Figure 1) shows a general classification scheme for diagnosed disturbed and oil-contaminated lands using model objects.

The purpose of this work is to form a structural-logical model for predictive-analytical studies that allow remote diagnostics of oil-contaminated territories with reliably decipherable dynamics of soil cover structures.

MATERIAL AND RESEARCH METHODS

In this work, the model is understood as an artificially created study area, delineated by the boundaries of the research task of the decoded space image.

The models as training samples are used to interpret data and classify study areas according to environmental aspects.

To solve environmental problems, the use of phytomodels and inert systems with a given landscape configuration is most in demand.

The inert models are applicable to assess the erosion and degradation processes associated with oil pollution.

In this case, the reference areas are fixed on topoecological profiles by long-term benchmarks.

Phytomodels are suitable for assessing the state of indicator plant communities exposed to the negative impact of hydrocarbons (Ran Pelta, Eyal Ben-Dor, 2019), the integral state of soils, the dynamics of their fertility, and even the quantitative content of petroleum hydrocarbons.

Changes in the geospatial reference and spectral characteristics (Xiyue Jia, David O'Connor, Zhou Shi, Deyi Hou, 2021) of reference objects are interpreted precisely from the position of assessing the course of

degradation-recovery processes (Lei Xu, Peyman Abbaszadeh, Hamid Moradkhani, Nengcheng Chen, Xiang Zhang, 2020).

The listed requirements determine the possibility of using models for interpretation of satellite images.

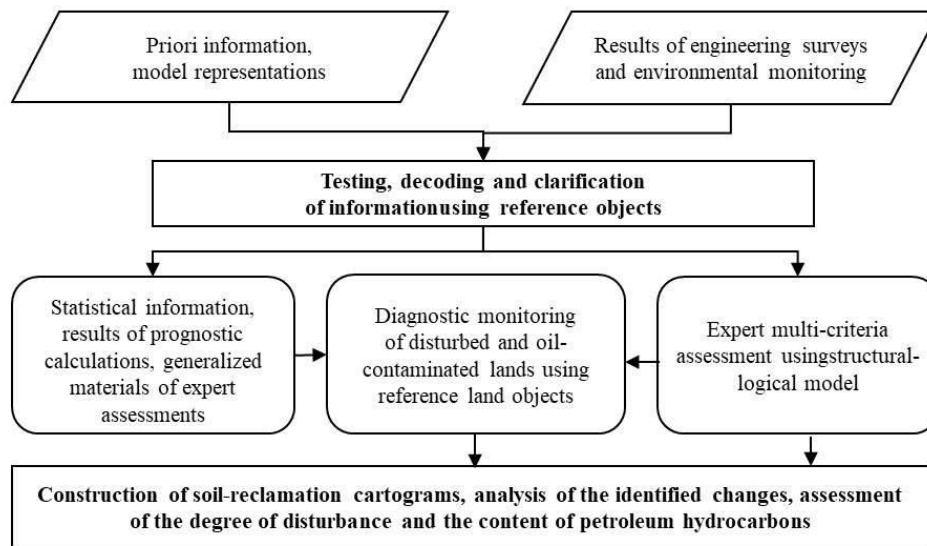


Figure 1: - Scheme of classification of disturbed diagnosed lands during remote sensing using model objects

The reference site is characterized by the absence of signs of degradation of the natural ecological system (Paweł Prokop, 2020).

The indicators of the natural background are determined on the basis of data from observations of the state of the environment, sampling and (or) measurements of chemical and physical indicators at the reference site.

The choice of the location of the models is carried out taking into account the peculiarities of the landscape-ecological zoning of the diagnosed areas of oil pollution of the lands (Figure 2).

Polluted areas are integrated into a contour with landscape-indicating patterns relative to reference areas and brightness contrast, taking into account long-term complex relationships.

For predictive and analytical studies that allow remote diagnostics of oil-contaminated territories with reliably decipherable dynamics of soil cover structures, a structural-logical model is applicable. It uses retrospective information for a certain time interval in the past in the form of a retrospective depth.

The structural-logical model is focused on thematic processing of images according to their spectral and spatial features, observation of genetic horizons or layers of a given soil type, and evaluation of the results of rehabilitation measures (Figure 3).

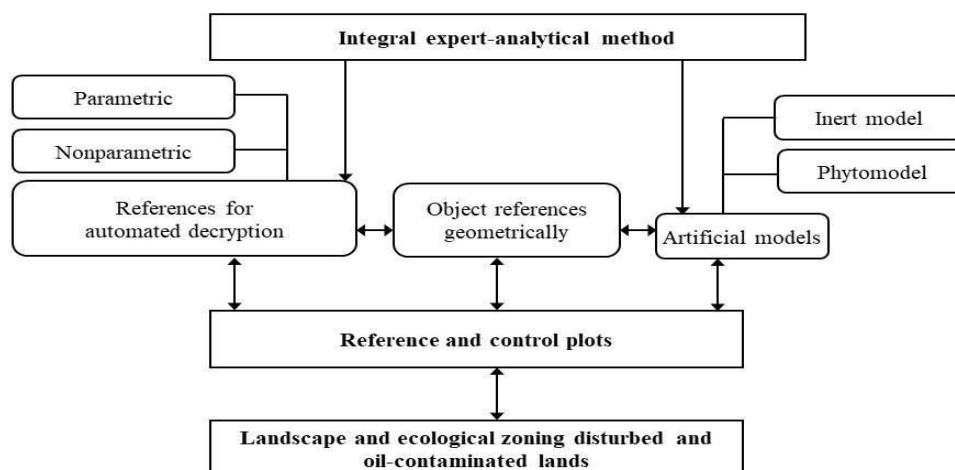


Figure 2: General classification scheme for models of remote methods for soil analysis

The algorithm implemented by the structural-logical model compares subject-oriented cartographic material with a digital terrain model, observation data and construction of soil-reclamation cartograms of the thematic polygon, the results of prognostic calculations using statistical information (area, dynamics of identified changes over periods) and mathematical models. Expert assessments are also needed using the tools of computer analysis of spectral-zonal space images with element-by-element restoration of an informative set of features.

RESULTS

As part of the study, a pilot industrial approbation of the described methodological approach was carried out with the creation of reference sites and their use as elements of the monitoring system.

To test the system of inert models, soil-like mixtures were created, applied to the slope of the site of the reference section. Also, geospatial referencing of reference areas was carried out, by changing which it will be possible to subsequently obtain information about the nature of erosion processes, as well as about the preservation or expansion of the boundaries of negative impact.

This provides for the correspondence of the characteristics of the study area in accordance with the geosystemic regional dimension.

CONCLUSIONS

Within the framework of the described heuristic-linguistic approach, it is proposed to classify the control plots with respect to the geometric dimensions characteristic of certain reference objects and the environmental aspects identified during the development of reclamation projects.

The proposed structural-logical approach to the classification of hard-to-reach, little- and unexplored areas of disturbed and oil-contaminated territories using reference objects is applicable for the classification of disturbed and oil-contaminated lands with varying degrees of accessibility to them.

The proposed classification of models and the methodological approach to the interpretation of space images can be included in the software and analytical complex of data processing centers that combine computing hardware and software, communication, engineering and security systems.

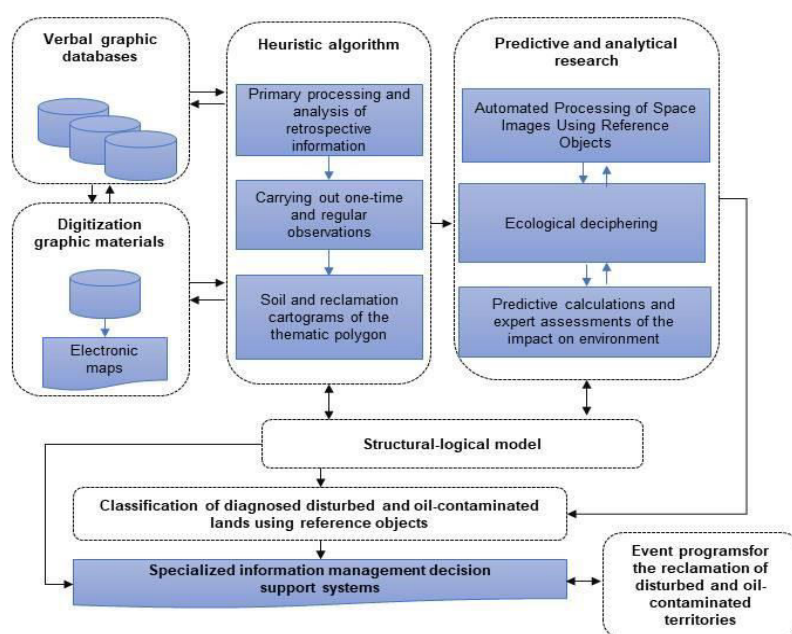


Figure 3: Block diagram of the classification of diagnosed disturbed and oil-contaminated lands

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UTILIZATION OF CUPOLA SLAG IN SUSTAINABLE CONSTRUCTION MATERIAL: A REVIEW

Dhiranjay Rathod¹, Shailesh Bind², Subodh Gaykwad³, Rahi Ingale⁴, Sahil Jagtap⁵, Ritesh Dhumne⁶ and S.S.Meshram⁷

¹⁻⁶UG Student and ⁷Assistant Professor, Department of Civil Engineering, Yeshwantrao Chavan College of Engineering, Nagpur, India

ABSTRACT

Rapid industrialization and urbanisation in emerging countries have resulted in the accumulation of diverse industrial wastes. As a result, converting these wastes into ecologically beneficial, cost-effective, and long-lasting building materials may be the most effective strategy to lower their environmental impact. More of these wastes are being dumped on land, causing degradation of both the land and the ecosystem. As a result, its proper exploitation and management has become a global challenge for its reusability and safe disposal. As a result, the current research reviews the use of cupola slag (CS) in the creation of sustainable construction materials, taking into account the potential of such waste in construction operations. For the improvement of sustainable construction materials, waste cupola slag is used full and as partial substitute for coarse aggregate, fine aggregate and cement, with or without extra components. Concrete, mortar, and paving blocks have all been made with cupola slag. However, there has been no research on the usage of cupola slag in the manufacture of bricks in the past. As a result of this study, the discovered gaps such as techno-economic feasibility, life cycle assessment, and thermal performance of produced products using various slags have been suggested.

Keywords: Cupola slag, Concrete, Mortar, physico-mechanical properties, sustainable construction material.

1. INTRODUCTION

Concrete, wood, brick, glass, stone, clay, mud, steel and other materials are used in construction projects. Cement concrete, on the other hand, continues to be the most commonly utilised construction material in the manufacture industry, because of its applicability and flexibility in terms of the changing environment. Concrete must be designed to preserve resources and safeguard the environment. Environment, save money, and ensure that energy is used properly. Major efforts are required to do this. Incorporation of wastes in concrete for new projects must be emphasised [1]. Infrastructural needs are rapidly increasing as a result of the continuously growing population, and demand for building materials is also increasing. With the growing demand for housing in both rural and urban regions, this demand will continue to rise [2]. The cupola furnace is a device for the secondary melting and for heating the products of the primary melting and secondary materials. It also makes it easier to process lower-quality materials. It requires a low investment cost and it is easy to operate. Slag is a by-product generated during the production of pig iron in blast furnace, as well as during the production of cast iron in cupola furnace [5]. The use of cupola slag as a cement substitute is a long-term solution for which there are few research, despite the fact that cement manufacture accounts for 7% of world CO₂ emissions. In terms of the environment, utilising this waste in concrete structures might mean preventing the development of waste that would otherwise end up in a landfill, as well as lowering the carbon footprint associated with reduced cement use [8]. Waste, on the other hand, can be precious resources if correctly managed, helping to conserve natural resources, encourage sustainable development, and limit the amount of landfill space necessary. In most developing countries, solid waste management has been acknowledged as a key issue. To assess the economic viability and feasibility of reusing trash in the concrete manufacturing process, researchers and creative concepts are being pursued all over the world [10]. Changes in ferrous alloys manufacturing methods have resulted in various industrial waste in recent years, which, given the necessary criteria of sustainability, must be reused as much as feasible [11]. Because natural concrete supplies are limited and we currently receive it from natural deposits, a new material that can effectively replace traditional concrete while maintaining its strength and durability is required [12]. This study examines the possible usage of waste cupola slag in the creation of sustainable building resources.

2. MATERIALS AND PROPERTIES**2.1 Development of Sustainable Construction Materials Using Cupola Slag:**

Cupola slag is the by-product material obtained from the cast iron manufacturing process. It's made when cast iron is melted in cupola furnace. A slag is formed as molten liquid that solidifies when it cools. The slag from cupolas is a complicated mixture of oxides and oxides. Cupola furnaces are cylindrical melting devices used in the steel industry to melt cast iron with diameters ranging from 0.5 to 4 metres. A door can slide in and out of the bottom of the furnace. The furnace's top is left open. The air supply in the furnace is provided through an air

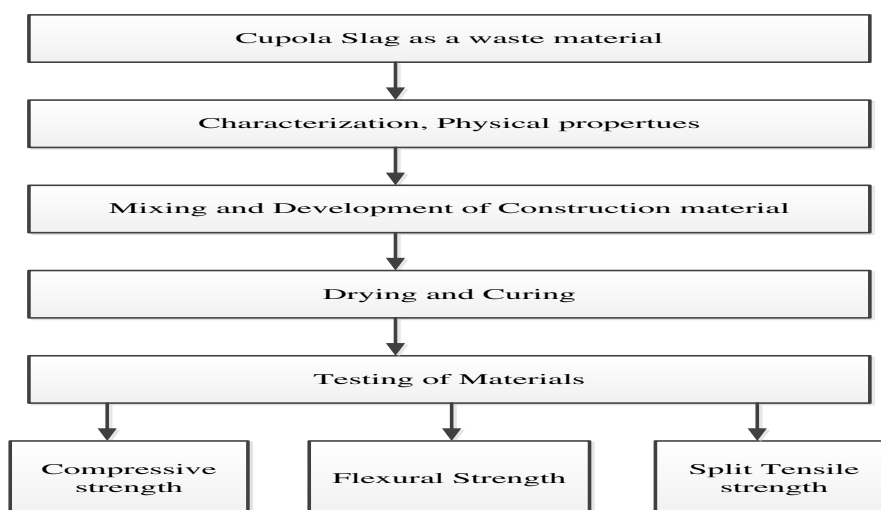
vent. Steel and refractory bricks make up the furnace shells. There is an one slag hole from which the slag with a low viscosity emerges at a greater temperature and forms into black coloured lumps when cooled. The size of the lumps ranged from 100 to 450 mm. A Cupola slag is a denser solid substance that ranges from grey to black in colour. Cupola slag has a higher calcium oxide which could help with pozzolanic activity. SiO_2 and CaO make up the majority of chemical composition. More cementitious hydration products were generated when Al_2O_3 and MgO were present. As seen in table 1, cupola slag has larger amount of lime, which helps to improve binding characteristics. Physical properties of cupola slag include specific gravity, water absorption, bulk density, fineness modulus. Physical parameters of cupola slag are within the standard limit, according to Table 2. Figure 1 depicts a method for generating environmentally friendly building material such as clay bricks, concrete, mortar and paver blocks.

Table 1: Chemical Properties of Cupola slag

Composition	Reference No								
	2	4	5	6	7	8	9	10	12
Al_2O_3	14.28	11.8	9.95	9.5	11.80	13.6	24.30	10.4	15
MnO	-	-	0.5	2.9	-	2.8	2.18	-	2.5
SiO_2	43.89	48.7	45.27	45.0	48.70	43.6	50.20	42.83	45.5
MgO	2.77	1.3	5.82	2.35	1.3	2.1	2.14	0.22	18.5
TiO_2	1.21	-	-	1.00	-	0.5	-	-	-
CaO	32.89	21.2	24.08	14.250	21.20	30.0	7.6	10.54	23.5
Fe_2O_3	1.59	11	1.12	23.50	11.10	6.3	15.50	20.76	7.5
Cr_2O_3	0.02	-	-	0.30	-	-	-	-	-
Na_2O	0.16	-	0.93	0.50	-	-	0.78	0.32	-
K_2O	0.71	1.4	1.26	0.20	1.41	-	0.78	-	-

Table 2: Physical Properties of Cupola slag

Properties	Reference No.							
	2	4	6	7	8	9	10	12
Fineness modulus	-	-	4.60	3.53	-	-	-	-
Specific gravity	2.93	3.15	2.50	2.93	2.89	-	2.72	2.58
Bulk density(kg/m^3)	1471	2359	1640	1640	-	1650	-	-
Water absorption(%)	-	-	0.4	0.4	-	-	-	-
Moisture content(%)	-	-	0.004	-	-	0.66	-	-
Crushing Value(%)	-	-	27	-	-	-	-	-
Flakiness Index(%)	-	-	11	-	-	-	-	-
Elongation index(%)	-	-	14	-	-	-	-	-
Coefficient of Uniformity(Cu)	-	-	-	-	-	-	3.00	-
Coefficient of curvature(Cc)	-	-	-	-	-	-	0.93	-

**Figure 1.** Methodology for development of construction material

3. RESULTS AND DISCUSSION

3.1 Compressive Strength

The compressive test is carried out on concrete samples measuring 150 mm x 150 mm x 150 mm in compliance with IS 516-1999 specifications on both conventional and cupola slag concrete. The sample is centred on the platform of the compressive testing machine, and the load is gradually applied till the sample fails. Figure 2 shows the compressive strength of concrete incorporating cupola slag. When compared to ordinary concrete, compressive strength of the cupola slag replacement at 50 percent and 100 percent at 28 days increases by 50 percent while decreasing by 100 percent. It can be inferred that when cupola slag is used for fine aggregates instead of molarity, it exhibits good mechanical qualities. The greatest compressive strength achieved for 50% replacements is 31.5 N/mm² [3]. A 20% substitution of coarse aggregate with cupola furnace slag results in the greatest gain in compressive strength [4]. For accelerated concrete curing 60% replacement gives higher strength [6].

When 5% and 10% of the cement was replaced with pulverized cupola furnace slag (GCFS), the compressive strength was much higher than the control. Compressive strength was poor at other percentage replacements of 15, 20, and 25%. The compressive strength obtained was higher than the control for 10%, 20%, and 30% substitution of sand with Fine cupola furnace slag (FCFS) [10]. Compressive strength rises until it reaches 10% replacement, and then begins to decline at 15% replacement [12]. When more cupola slag is replaced with Portland cement, the fresh mortar becomes more consistent, but it loses up to 27% of its compressive strength after 7 days. Because pozzolanic reactions are sluggish, resistances for any replacement tend to converge after 90 days [8]. The usage of CEM III B 32.5 R cement instead of Portland cement in the production of the mortars for the inside lining of water-channeling centrifuged cast iron pipes was investigated in this study [6].

As an additive, finely powdered slag from the production process was combined with the CEMI 52.5 R cement. According to the trial programme, optimum replacement was reached with a percentage replacement of 20% of the cement and w/c = 0.38. Because the mortars are also set down by centrifugation, they have the same workability as the reference mortars now in use. As a result, ensuring a high compressive strength at a young age (2 days) is also crucial, which was more than met (40 MPa). Furthermore, the pozzolanicity of the slags was demonstrated, which helped to the long-term strength of the slags, which reached 80 MPa at 28 days and remained nearly unaffected until 90 days (85 MPa) [11].

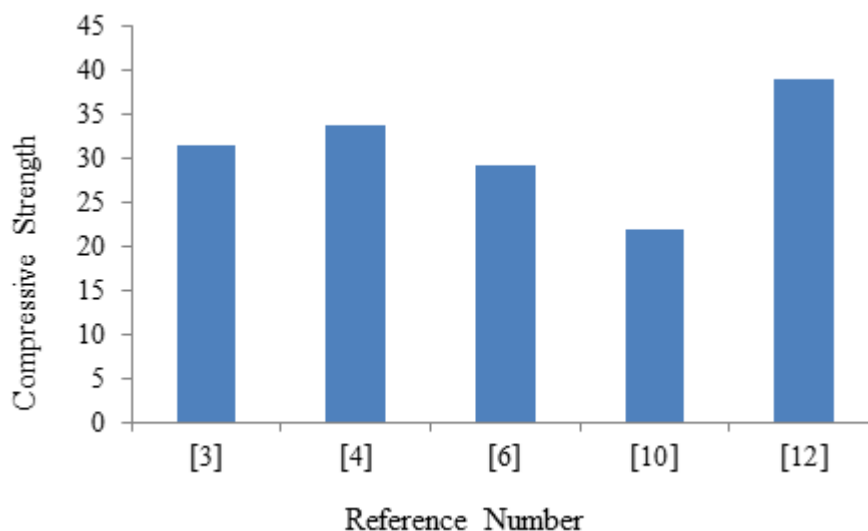


Figure 2: Compressive strength of Concrete incorporating cupola slag

3.2 Flexural Strength

For all replacements, flexural strength improves with curing age in a similar way as compressive strength. Then after seven days of curing, strength of a 30% replacement mortars is 25% less than that of a control mortars. The losses are 10% and 6% for people who are 28 and 60 days old, respectively. When cupola slag is added into the mortar, the age strength growth is more pronounced [8]. When Bagasse Ash is partially replaced with cupola Slag and cement is replaced with coarse aggregate in concrete. Flexural strength grows until it reaches 10% replacement, after which it begins to decline at 15% replacement [12]. Flexural strength decreases as the percentage of replacement increases. However, flexural strength increases when the curing duration is increased for the same proportion when cupola slag utilized in concrete as a partial replacement [13].

3.3 Split Tensile strength

A 20% substitution of coarse aggregate with the cupola furnace slag results in the greatest gain in split tensile strength [4]. Split tensile strength rises until it reaches 10% replacement, and then begins to decline at 15% replacement. When Bagasse Ash is partially replaced with cupola slag and cement is replaced with coarse aggregate in concrete [12].

3.4 Durability

When cupola slag is used as a coarse aggregate in geo-polymer concrete, it loses more weight when immersed in H₂SO₄ than when immersed in HCL. Sulphuric acid has a stronger effect on geo-polymer concrete. The weight loss with a 10% replacement is 1.19 percent, while it is 4.65 percent for sulphuric acid [13].

4. CONCLUSION

The numerous methodologies for developing sustainable building materials such as mortar, concrete, have been thoroughly examined. Various microscopic examinations, physicochemical tests, and mechanical tests are studied based on the evaluated literature and industry standards in the production of cupola slag integrated sustainable content. The following conclusions have been taken from this review study:

- i. For cupola slag, the optimal replacement proportion ranges from 10% to 60%.
- ii. When 5% and 10% of the cement was replaced with GCFS, the compressive strength was much higher than the control.
- iii. When 10%, 20%, and 30% of the sand was replaced with FCFS, compressive strength values obtained were higher than the control.
- iv. This study looked into the impact of cupola furnace slag and recycled construction aggregates as natural aggregate and cement substitutes. The utility of concrete deprecates as the proportion of recycled construction aggregates and cupola slag in all combinations increases.
- v. Replacing more cupola slag with Portland cement results in a more consistent fresh mortar, but a deprivation of compressive strength of up to 27% after 7 days. When a high starting strengths are unrequired or the binder that creates less heat of hydration than a Portland cement is expected, the results suggest that the slag cupola can be used in the manufacture of mortars/concrete.
- vi. Structural concrete can be made stronger by partially replacing standard Portland cement with cupola furnace slag as a novel construction ingredient. All of these factors lead to the strong potential and possibility of using furnace slag in concrete manufacturing, particularly in hostile media due to its lower permeability than 100% OPC concrete.
- vii. Several researchers have employed cupola slag as a partial substitute for cement, fine and coarse aggregates, and clay in the development of sustainable construction materials. However, there has been no research on the utilization of cupola slag in making of bricks in the past.

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A NEW CHAOTIC MAP DEVELOPMENT THROUGH THE COMPOSITION OF THE LOGISTIC MAP AND CIRCLE MAP

Makmun¹, Suryadi MT² and Sarifuddin Madenda¹

¹ Department of Information Technology, Universitas Gunadarma, Depok, 16424, Indonesia

² Department of Mathematics, Universitas Indonesia, Depok, 16424, Indonesia

ABSTRACT

In the new world, security is a prime significant issue, and encryption is one of the most amazing elective method for guaranteeing security. A new chaotic map is designed, that is obtained from the composition of two chaotic maps, that is, the Logistic Map and the Circle Map. The composition process starts from the Logistic Map, followed by the Circle Map. The resulting composition is a new chaotic function. This is shown by the bifurcation diagram analysis result, Lyapunov Exponents, and the NIST randomness test. The bifurcation diagram shows that the best densities occur at $r \in [-3, 0) \cup (0, 3]$. The Lyapunov Exponents has nonnegative values for $r \neq 0$. The NIST randomness test with initial value and parameters $x_0 = 0.9$, $K = 1000$, and $\Omega = 3000$ shows that the new chaotic map passes 11 out of 16 NIST tests.

1. INTRODUCTION

As the world has become increasingly digitized, the volume of data that we bring into our systems has ramped up exponentially. The increasingly severe network security situation in recent years, information transmission and sharing based on digital data often face the problems of data theft, deletion, and attack, that will caused great losses to the owners or publishers of digital images. Therefore, the security of data and informations are very important because these are served digitally in various storage media that allows public access. A method of protection is required for these digital assets, such as an encryption method [1].

Currently, encryption is one of the most popular and effective data security methods used by organizations. Data encryption's purposed is to protect digital data confidentiality as it is stored on computer systems and transmitted using the internet or other computer networks. Many algorithms are researched for data encryption, and one of them is the chaos based algorithms. Chaos-based cryptographic algorithm is an efficient encryption first proposed in 1989 and it has many unique characteristics different from other algorithms such as the sensitive dependence on initial conditions, non-periodicity, non-convergence and control parameters [2].

Chaotic functions have been commonly used for keystream generation for data encryption [3]. Hence, many chaotic maps have been produced from researches applied in digital data encryption process. Moreover, some observations shows that a random number generator (RNG) that utilizes chaotic maps can be resulted from the combination of two or more chaotic functions [4-5]. This is done for resistance improvement against various attacks when the chaos map is applied for digital data encryption.

Referring from the previous results, specifically that uses the Logistic Map [6] and the Circle Map [7], in this paper, a new chaotic map which is the result of the composition of the Logistic Map and the Circle Map is developed. This composition is also chaotic, so it can serve as a new alternative as a chaotic RNG.

2. RESEARCH METHOD

The new chaos function in this research is formulated through the composition process of two chaos functions, namely the Logistic Map and the Circle Map chaos function. The composition process of the chaos Logistic Map and Circle Map functions can be done because they both have the same degree and dimension. If the Logistic Map function is expressed as $f(x)$ and the Circle Map function is a function $g(x)$, then the Logistic Map and Circle Map composition functions are expressed as $h(x)$ functions. The Logistic Map's equation is:

$$f(x) = x_{n+1} = rx_n(1 - x_n) \quad (1)$$

The Circle Map's equation is:

$$g(x) = x_{n+1} = \left(x_n + \Omega + \frac{K}{2\pi} \sin(2\pi x_n) \right) \bmod 1 \quad (2)$$

Here, the new chaotic map is a composition of the form $(f \circ g)$ with f and g respectively are as in equation (1) and (2)

$$h(x) = (f \circ g)(x) = f(g(x))$$

$$= r \left(x + \Omega + \frac{K}{2\pi} \sin(2\pi x) \bmod 1 \right) \left(1 - \left(x + \Omega + \frac{K}{2\pi} \sin(2\pi x) \right) \bmod 1 \right) \quad (3)$$

Therefore, the new map can be defined as

$$x_{n+1} = r \left(x_n + \Omega + \frac{K}{2\pi} \sin(2\pi x_n) \bmod 1 \right) \left(1 - \left(x_n + \Omega + \frac{K}{2\pi} \sin(2\pi x_n) \right) \bmod 1 \right) \quad (4)$$

We name this newly recursion as the LC Map (Logistic Circle Map).

3. RESULT AND ANALYSIS

This LC Map exhibits chaotic behaviour. This is shown by the bifurcation diagram and the Lyapunov Exponent analysis. Therefor, referring to the sequence of numbers this map generates, the 16 NIST tests of randomness indicates shows that the sequence is random [8].

Here, the initial value and parameters of the LC map used for the test is $x_0 = 0.9$, $K = 1000$, and $\Omega = 3000$.

3.1 Bifurcation Diagram

The bifurcation diagram is a diagram in nonlinear dynamics, which shows the possible long-term values (equilibria/fixed points or periodic orbits) of a system as a function of a parameter. Based on the new map equation, we can detect chaotic behaviors, that is, when the points are sufficiently dense, the system is chaotic [9].

Algorithm 1. Bifurcation Diagram :

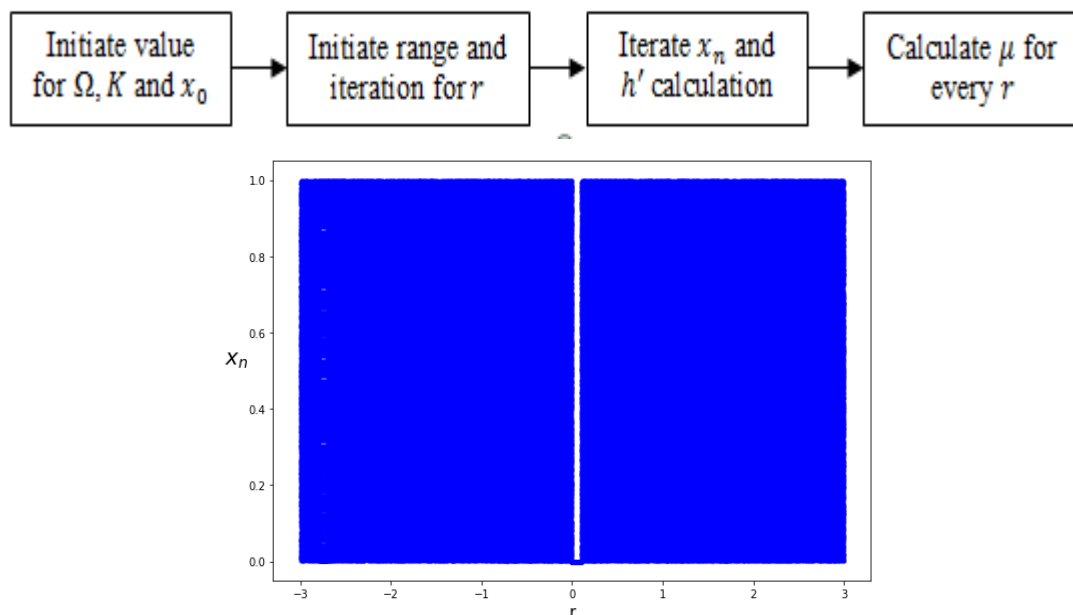


Figure 1: LC Map bifurcation diagram

As seen in Figure 1, the diagram is dense for every r except $r = 0$. Hence, the system is chaotic if $r \neq 0$.

3.2 Lyapunov Exponent Graphic

Lyapunov exponent is an essential tool in studying chaotic signal. The Lyapunov's exponent of a dynamical system can detect the presence of chaos and quantify the stability or instability of the system [10].

Definition 1. [8] :

Suppose X is a set. The mapping $f: X \rightarrow X$ is chaotic in X , if f is sensitive to initial conditions, f is topologically transitive, and its periodic points are dense.

A function f is chaotic if its Lyapunov Exponent is positive. The Lyapunov Exponent equation is defined as

$$\mu = \lim_{n \rightarrow \infty} \frac{1}{n} \sum_{i=0}^{n-1} \ln \left| (f^{(i)})' (x_0) \right| \quad (5)$$

For this purpose, the derivative of LC map is needed. The derivative from the LC map is defined as $h'(x)$ as described below

$$h'(x) = r \left[1 - 2x + (K \cos(2\pi x)) \left[1 + 2\Omega + 2 \left(\frac{k}{2\Omega} \sin(2\pi x) \right) \right] \right] \quad (6)$$

According to Definition 1, a function is chaotic if its Lyapunov Exponent is positive. Algorithm 2. Lyapunov Exponent:

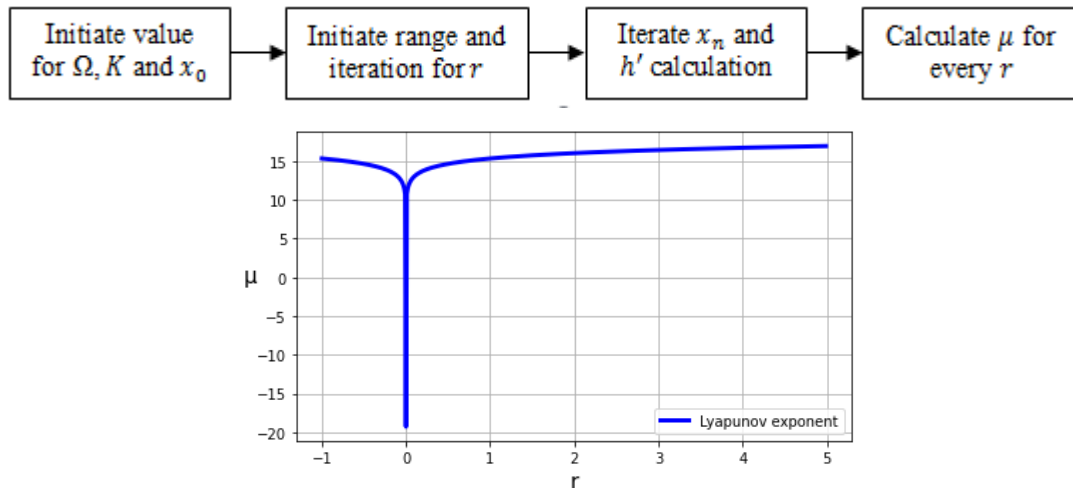


Figure 2: Lyapunov exponent graphic of the LC Map

As seen in Figure 2, for $r \in [-1, 0) \cup (0, 5]$, the map has positive lyapunov exponent values. This means that the LC Map is chaotic in that interval. From lyapunov exponents calculation and bifurcation diagram, r can be used in this system is $r \neq 0$.

3.3. NIST Randomness Test

This test is administered to level the randomness of the number sequence generated by the LC map as in equation. The NIST Test Suite is a statistical pack containing 16 tests developed to test the randomness of binary sequences [8]. Table 1 shows the test results for the LC map. In this test, $r = 3.6$ is used.

Table 1: NIST Randomness Test Results of the LC chaos map

Type of Test	P-Value	Conclusion
Frequency Test (Monobit)	0.011022	Random
Frequency Test within a Block	0.999999	Random
Run Test	0.000000	Non-Random
Longest Run of Ones in a Block	0.000001	Non-Random
Binary Matrix Rank Test	0.437154	Random
Discrete Fourier Transform (Spectral) Test	0.000000	Non-Random
Non-Overlapping Template Matching Test	0.000003	Non-Random
Overlapping Template Matching Test	0.003299	Random
Maurer's Universal Statistical Test	0.343773	Random
Linear Complexity Test	0.108275	Random
Serial Test	0.000000	Non-Random
	0.000000	Non-Random
Approximate Entropy Test	0.000000	Non-Random
Cummulative Sums (Forward) Test	0.021176	Random
Cummulative Sums (Reverse) Test	0.021176	Random
Random Excursions Test	0.577859 ^a	Random
Random Excursions Varian Test	0.354881 ^a	Random

^aaverage test value

Table 1 shows that the LC chaos map passes most of the NIST randomness test. Consequently, this map is an excellent RNG with randomness quality over 68.75%

4. CONCLUSION

The development done by composing the Logistic Map and the Circle Map successfully generated the chaotic LC Map. This is shown by the dense bifurcation diagram and the continuously positive Lyapunov Exponent for $x_0 = 0.9$, $K = 1000$, $\Omega = 3000$, and a level of 68.75% in randomness from the NIST test result.

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A STUDY RELATIONSHIP BETWEEN DIGITAL FINANCIAL LITERACY AND DIGITAL FINANCIAL INCLUSION AMONG THE URBAN YOUTHS OF GUJARAT

Mr. Dilipkumar J. Gangani¹ and Dr. Dharmesh Raval²¹Research Scholar, RK University, Rajkot²Faculty Member, School of Maritime Management, Gujarat Maritime University**ABSTRACT**

This paper aims to identify the relationship between level of digital financial literacy and level of digital financial inclusion among the urban youth of Gujarat state. Current study was conducted on urban youth of Gujarat State residing in four major cities i.e., Ahmedabad, Surat, Vadodara and Rajkot. 159 urban youth were selected using non-probability convenient sampling method. A number of statements (16) including knowledge/awareness level were prepared to know level of digital financial literacy of urban youth. And 20 statements including Access, Uptake and Usage of Digital Financial Services were prepared to know level of digital financial inclusion. Chi-square test was applied to know the relationship between level of digital financial literacy and level of digital financial inclusion among the urban youth of Gujarat. It is found that there is a significant relationship between level of digital financial literacy and level of digital financial inclusion among the urban youth of Gujarat.

Key words: Digital Financial Inclusion, Digital Financial Literacy, Financial Inclusion, Financial Literacy, Youth

1. INTRODUCTION

Universal financial inclusion has been one of the main development priorities for the Government of India over the last two to three decades. Indian Government and Reserve Bank of India have under taken plenty of initiatives to ensure access and affordability of formal financial services to each section of society, especially the weaker and lower income groups. Digital technology can be game changer in tackling this multi-decadal challenge of achieving universal financial inclusion. In general terms, digital financial inclusion means usage of digital financial services to financial underserved as well as unserved populations with formal financial services suitable to their demand at affordable cost. Over last few years, the rapid adoption of digital technology in India has been the foundation of various growth stories. Digital Financial Literacy is likely to become an important aspect of education for the digital age. Digital financial literacy means getting the knowledge and skills of usage of digital devices for making financial transaction.

2. REVIEW OF LITERATURE

Tony, N., & Desai, K. (2020) focused to understand the level of digital financial literacy and digital financial inclusion among the household of Bangalore. This study is descriptive in nature. Researcher used structure questionnaire as research instrument for collection of primary data. Questionnaire was framed to getting idea about level of digital financial literacy and digital financial inclusion. Researcher consider awareness as level of digital financial literacy and usage as level of digital financial inclusion. Percentage score used to know level of digital financial literacy and digital financial inclusion. Smart PLS version was used to check the reliability and validity of the questionnaire. The model suggested that the relationship between the variable of digital financial literacy and digital financial inclusion. The result shows that there is 65.8% of impact by digital financial literacy on digital financial inclusion.

Shen, Y., Hu, W., & Hueng, C. J. (2018) suggested that digital financial literacy positively and significantly affect digital financial inclusion. The access and use of digital financial products creates potential to make formal financial services available to each and every section of society. Innovative financial product offered by banks offers new path to expanding the goal of financial inclusion. In current study, data was collected from 218 respondents using self-administrated questionnaire by online as well as offline modes. Cronbach's alpha was applied for reliability test. Researchers used partial least square (PLS) for data analysis to test the effect of digital financial literacy on digital financial inclusion.

Widyaningsih, D., Siswanto, E., & Zusrony, E. (2021) noted that financial literacy level and digital financial innovation has a significant effect on financial inclusion. The financial literacy has a significant effect on digital financial innovation. Primary data was collected from 40 sample using non probability sampling method. Data was collection through questionnaire. Multiple regression used as statistical tools for data analysis using SPSS.

4. OBJECTIVES

1. To find relationship between level of digital financial literacy and level of digital financial inclusion among the urban youth of Gujarat state.

5. HYPOTHESES OF THE STUDY

- H0: There is no significant association between level of digital financial literacy and level of digital financial inclusion among the urban youth of Gujarat state.

6. METHODOLOGY

For this objective of research, the study considered both private and public sector bank in four major cities Ahmedabad, Surat, Vadodara, and Rajkot of Gujarat state has been selected. The study has been used both primary as well as secondary data. The primary data have been collected from classes of Salaried, Businessman, Self Employed and Daily Wager (Worker). A structure questionnaire was designed, and data was collected online using google form. Total 149 respondents were selected by using convenient sample technique. The statistical tools were used in this study are Percentage Analysis, Frequency Analysis and Chi-square test.

7. DATA ANALYSIS AND INTERPRETATION

Table 1: Demographic Profile of Respondents

	Frequency	Percent
Gender		
Male	84	56.4
Female	65	43.6
Total	149	100
Age		
Between 15 to 24 Years	43	28.9
Between 25 to 30 Years	47	31.5
Between 31 to 35 Years	59	39.6
Total	149	100
City of Living		
Ahmedabad	39	26.2
Surat	30	20.1
Vadodara	24	16.1
Rajkot	56	37.6
Total	149	100
Marital Status		
Unmarried	88	59.1
Married	61	40.9
Total	149	100
Education Qualification		
Below SSC	18	12.1
SSC	27	18.1
HSC	15	10.1
Graduate	29	19.5
Post Graduate	60	40.3
Total	149	100
Profession		
Salaried	67	45
Businessman	26	17.4
Self Employed	33	22.1
Daily Wager (Worker)	23	15.4
Total	149	100
Monthly Income		
Below Rs. 10000	33	22.1
Rs. 10000 to 25000	42	28.2
Rs. 25000 to 50000	34	22.8
More than Rs. 50000	40	26.8
Total	149	100

To test the reliability of data collected to study level of digital financial literacy the reliability test run Cronbach's alpha coefficient value for 15 variables studied is 0.931 which is more than 0.70. and to study level

of digital financial inclusion the reliability test run Cronbach's alpha coefficient value for 20 variables studied is 0.788. Thus, the research instrument used was consider as reliable.

Table 2: Crosstabulation Analysis of Level of digital financial literacy and level of digital financial inclusion.

Level of DFI * Level of DFL Crosstabulation				
Count				
		Level of DFL		Total
		Low level of DFL	High Level of DFL	
Level of DFI	Low	48	30	78
	High	23	48	71
Total		71	78	149

Table 3: Pearson Chi-square Test Analysis between level of digital financial literacy and level of digital financial inclusion.

Chi-Square Tests					
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	12.656 ^a	1	.000		
Continuity Correction ^b	11.514	1	.001		
Likelihood Ratio	12.857	1	.000		
Fisher's Exact Test				.001	.000
Linear-by-Linear Association	12.571	1	.000		
N of Valid Cases	149				
a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 33.83.					
b. Computed only for a 2x2 table					

Table 4: Phi & Cramer's V between level of digital financial literacy and digital financial inclusion.

Symmetric Measures			
		Value	Approximate Significance
Nominal by Nominal	Phi	.291	.000
	Cramer's V	.291	.000
N of Valid Cases		149	

The Chi-square test was applied to test the significance between the level of digital financial inclusion and level of digital financial literacy. The significant level for the test is 5%; the chi-square result is shown in table 3, the Pearson's chi-square value is 0.000 with the degree of freedom 1. Therefore, the null hypothesis is not accepted, and the alternative hypothesis is accepted. So, there is a significant association between level of digital financial literacy and level of digital financial inclusion. The respondents' level of digital financial literacy and level of digital financial inclusion depend on each other, and these variables are significantly associated.

The chi-square test doesn't tell us about the strength of association between two variables; for this purpose, Cramer's V value is used, which shows that from table 4, the Cramer's V value is significant that is 0.000. The association between the two variables is 29.1%.

9. CONCLUSION

This paper has focused on appraising the urban youth level of digital financial inclusion and level of digital financial literacy. A research objective guided the study and data were collected by structured questionnaire and analysed descriptively using frequency analysis, percentage, and chi-square test analysis. It is found that, there is positive relationship between level of digital financial literacy with level of digital financial inclusion. So, digital financial literacy is very helpful to expanding the digital financial inclusion.

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CHILD LABOUR IN DELHI - A STUDY

Dr. Richa Mehta

Associate Professor, Lady Irwin College, University of Delhi

ABSTRACT

The policy prohibiting child labour exists but lack of enforcement of labour restrictions is responsible for child labour. It has been a major reason for poverty in India and depriving children of their right of Education. In India child labour act has been working since 1986 to protect child labour, still child labour persist in slum areas of India. This study was conducted in different areas of Delhi among children doing Labour work through purposive technique. The interview schedule was used to collect data from samples. Data was analysed using percentage and presented diagrammatically using pie-chart. The main objectives of the study is to understand the situation of children working at different place in the city and to find out the causes, effect and present condition of child labour. The result shows that more number of boys were victim of child labour and mostly attained primary level of education and mostly living in slum areas. 4-6 members were there in most of the family and children working on daily wages. There is need of government of launch few more acts and programmes to prevent child labour.

INTRODUCTION

Child Labour has been defined by many organisations. Government of India enacted the Child Labour (Prohibition and Regulation) Act in 1896. According to the act anyone who are under the age of fourteen are considered as child. India's census 2001 office participation also defines child as someone who is less than 17 years in economically productive work in return for money, wages come under child labour. International Labour organization also defines child labour as a term for those children who are deprived of their childhood and rights and are victims of poor mental and physical development.

Characteristics of Child Labour:

- Violates a nation's minimum wage laws
- Threatens children's physical, mental, or emotional well-being
- Child abuse are involved such as child slavery, child trafficking, debt bondage, forced labour, or illicit activities.
- It prevents children from going to school
- Uses children to undermine labour standards

Constitutional provision

- Article 24 restricts children from working in an hazardous environment.
- Article 21, 45 says that all children below the age of 14 years have the right to education.
- Article 39 says that the State has to provide the children with accessible comforts to develop healthily.
- Due to the increased cases of child abuse and sexual abuse government has strictly banned child labour in domestic work especially for girls.
- The government has a particular cell to help children in exploitive circumstances. These cells are comprised of social inspectors and other administrative personnel explicitly employed to deal with child labour issues.
- There are many organizations that aim to stop child labour globally, such as CRY, UNICEF, ILO, etc.
- Government alone cannot stop the child labour, its the responsibility of whole nation as children's are strength of a nation.

Causes of Child Labour

- Lack of elementary education for children at the primary level
- Ignorance attitude of parents towards child
- Child labour laws are not much effective

- Non-availability of schools in rural areas
- Unpractical school curriculum
- Lack of proper guidance
- Poverty
- Excessive population
- Illiterate and ignorant parents
- Adult unemployment
- Urbanization
- Availability of child labour at cheap rates
- Adult exploitation of children
- Industrial revolution
- Multinationals preference to employ child workers

Programmes and acts for Child Labour The Child Labour Act, 1986:

The Government of India in 1986 passed the Child Labour (Prohibition and Regulation) Act to protect children. It covers where and how children can work and where they cannot. This act considers anyone less than fourteenth years of age as a child. This act is divided into three parts. Part 2 of the Act discusses the work prohibited for children, and these are divided into Part A and Part B. Part A includes work like Catering at the railway station, and part B includes work like the beedi making process. On the other hand, these rules are not applied at the workplace where a worker is working to help his close ones or in any government or aided school.

Part 3 of the Act discusses how children can work in occupations/ processes not mentioned above. At this workplace, children are not allowed to work more than 3 hours, and a break of 1 hour is also provided to them after 3 hours of work. This section also does not allow them to work in the 7 to 8 pm timeline. Overtime cannot be imposed on children in a day, and they must receive a holiday per week.

The owner or employer must inform the inspector about a child working there and keep a record of children working there not to get involved in age dispute matters. The involved inspector can submit the child for medical examination if he finds any dispute. There is a need to advertise notice about the prohibition of child labour at every workplace.

The wellbeing conditions of work being attempted by children should be set for each specific kind of foundation of the class by the suitable government. The rules may cover points such as cleanliness, light, transfer of squander and effluents, drinking water, washrooms, assurance of eyes, support and security of buildings, etc. Section IV of the act traces different remaining angles child to work in occupations/ forms laid out, such as Punishments. The punishment of permitting a denied schedule could be a least of 3 months jail time and a least of Rs. 10,000 in fines. Moment time offenders are subject to imprisonment time of at least six months. Disappointment to inform an inspector, keep a enrol, post a sign or any other necessity is culpable by basic detainment and a fine up to Rs. 10,000.

Wrongdoers can, as it were, be attempted in courts higher than an officer or metropolitan judge of the first class. Courts have the specialist designate individuals to be inspectors beneath this act.

National Child Labour Project

In order to tackle the problem of child labour in India, the Ministry of Labour and Employment took a three-prong approach. To reduce child labour in hazardous industries by 2010 National Child Labour project was launched. The complete elimination of labour is a gradual aim of the project.

Under this project, the target group is all children below 14 years of age working in occupations and processes mentioned in the Child Labour Act of 1986 that are harmful in regard to health.

- NCLP included the following activities as per the 10th Plan
- Ensuring the enforcement of child labour laws

- Formal and Non- formal education initiatives like Special Schools (Child Labour Rehabilitation-cum-Welfare Centres). These schools should offer stipends, nutritional services, health services to children and proper training for teachers. The purpose of the school is to prevent children from working in hazardous industries and mainstreaming them into the formal education system.
- Provision of Vocational Training
- Creating awareness about the harmful effects of child labour on the development of a child
- Income and employment generation activities for families
- Direct rehabilitation of child labour
- Raising public awareness
- Survey and evaluation

During the 10th Plan, strategies included to ensure the expansion and implementation of the NCLPs:

- Expansion of the NCLPs to additional 150 districts during the Plan.
- They are linking child labour with Sarva Shiksha Abhiyan to provide the right to education to every child.
- To reduce school dropout, there is a need to strengthen the quality and quantity of the formal school system and increase the school numbers.
- Making a more successful observing strategy of child labourers
- Coordinating between divisions and services to guarantee that no child is permitted to slip through the system
- Assistance of deliberate association in running NCLP schools.

LAW AND CHILD LABOUR

The policy prohibiting child labour exists but lack of enforcement of labour restrictions is responsible for child labour. This is present due to the variation in minimum age criteria among various types of occupation/service. The International Labour Office reports that children who works for long time are paid less in every employment. In India, the Child Labour Act of 1986 states that no child should be allowed to be employed in any of the occupations mentioned in Part A of the Schedule or at any workplace where any of the processes such beedi making mentioned in Part B of the Schedule is performed.

OBJECTIVES

The objective of displayed paper is to get it the circumstance of children working at distinctive work place in Delhi.

METHODOLOGY

The present study is structured with descriptive and quantitative research approach. 37 children working in different area of Delhi were included in the study. There samples were included by using purposive technique of sampling. Samples were interviewed based on designed questionnaire, then data was coded using Microsoft-Excel in a tabular form and result analysed by calculating frequency and percentage. The obtained result was presented using Pie-chart, bar graph. methodology adopted for the study is discussed under the following heads:

RESULTS AND DISCUSSIONS

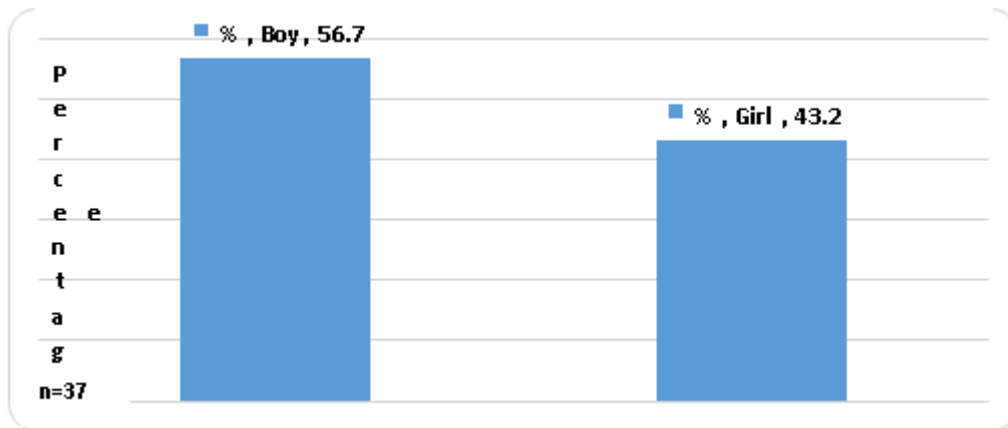
Findings of this chapter have been discussed under the following heads.

1. Background Information of Child Labourers

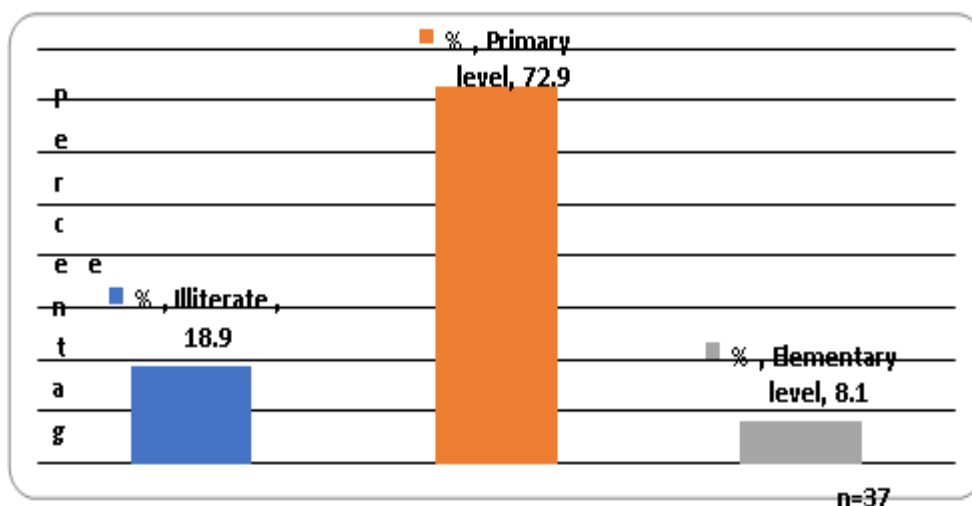
2. Profile of Work Place

BACKGROUND INFORMATION OF CHILD LABOURERS

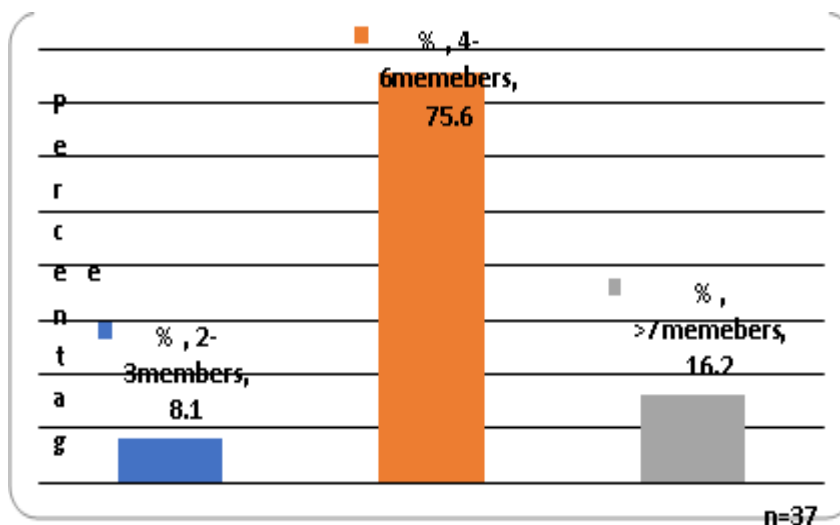
Gender- As we can see from the figure, greater percentage, i.e., 56.7% of child labours who were interviewed were boys. As observed from the data girl comprised of only 43.2% of the total. Reason for more boys in the sample was due to the fact it has been seen that owners at the work place prefer to hire more of boys as compared to girls so that they can get good amount of work in cheaper rates and also in terms of physical attributes. Girls were seen more in domestic help.



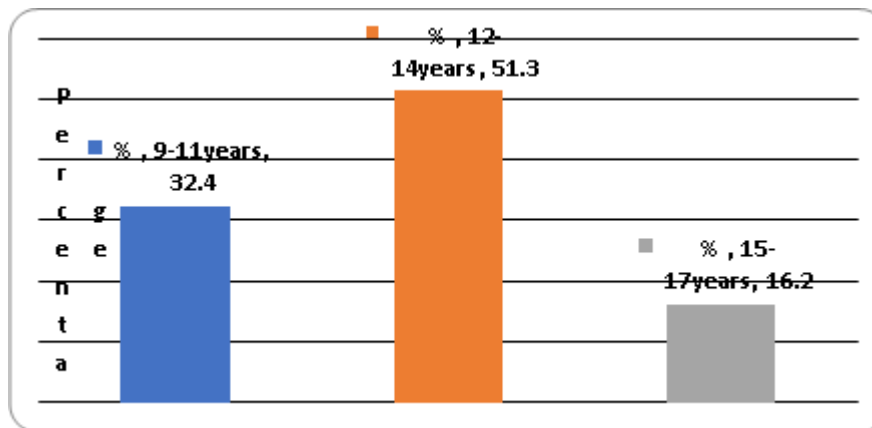
Education- Observation table revealed that majority of the child labours (72.9%) were educated up to primary level, i.e., up to 5th class, however there were some children who educated up to elementary level which includes the classes from 6th to 8th (8.1%). There were some section of children (18.9%) who were illiterate and never gone to school.



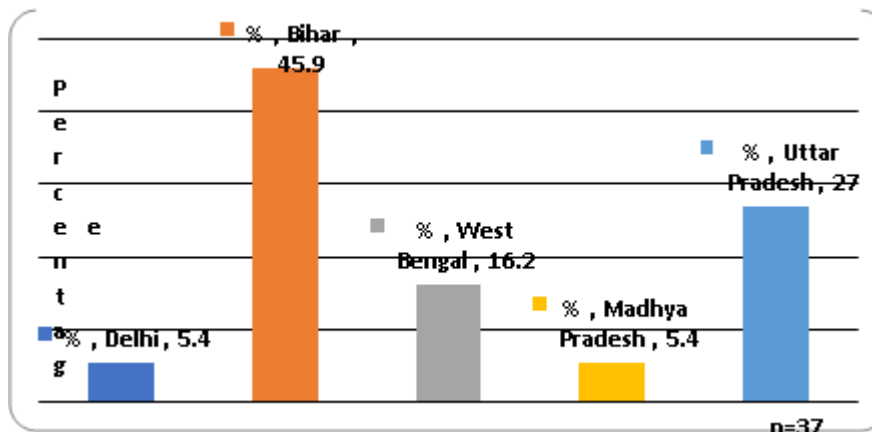
Members in the family- Majority (75.6%) of child labours had 4-6 members in their families. Some (16.2%) had even larger families, i.e., more than seven members. Such was the case with the families those who were living in the joint family. Very few (8.1%) children families were small and comprised of only 1-3 members (which included couple of families that were single member families as well).



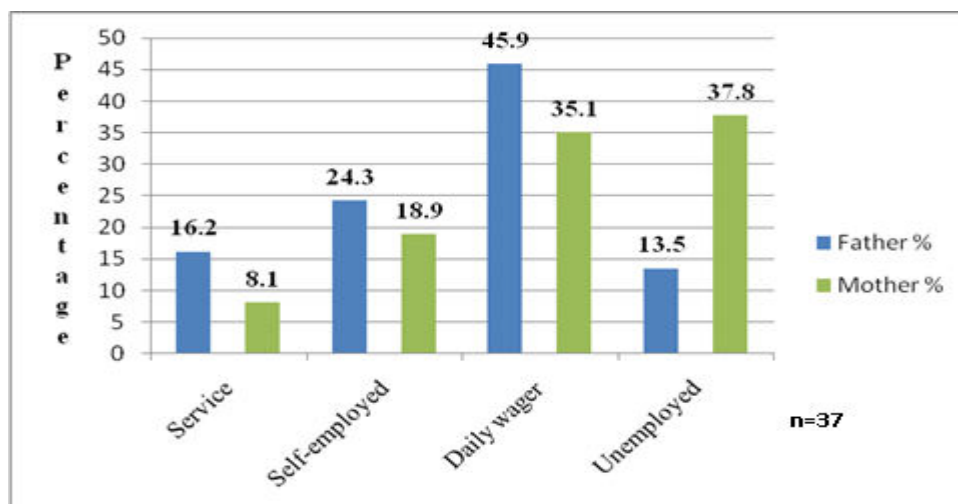
Age- Data is showing that majority (51.3%) of respondents were in the age range of 12-14 years while a substantial percent (32.4%) were 9-11 years. Only 16.2% were in the age range of 15-17 years. It revealed that most of the child labours were in their adolescent years.



Place of Domicile- Data represents that majority (45.9%) of child labours were the residents of Bihar, they came Delhi in the search of work so that they can earn their livelihood and able to meet their needs and 27% were from Uttar Pradesh while 16.2% were from West Bengal and very few children (5.4%) were from Delhi as well as Madhya Pradesh. Findings revealed that majority of the child labours were the residents of different states like Bihar, Uttar Pradesh, and West Bengal who had come to Delhi in search of an employment.



Occupation of Parents- Observation table revealed that (45.9%) father and (35.1%) mother were daily wagers, in which father were involved in more of daily wage labour, mason, contractors, carpenter, painter, white-washer, kabbadiwala, etc. and mother in daily wage labour at the construction sites whereas (24.3%) father and (18.9%) mother were self employed (such as shopkeepers, fruit and vegetable vendors, maids). Only 16.2% father and 8.1% mother were engaged in service, either private or government. It has been found that 13.5% father and 37.8% of mother were unemployed. The reason of higher percentage of unemployment may be due to the fact of health issues and percentage of unemployment in case of mother is higher as she has to perform the household duties as well and the fact that parents of the child labours are poor and not very educated in most of the cases therefore majority of them belonged to the occupations bearing a low profile.

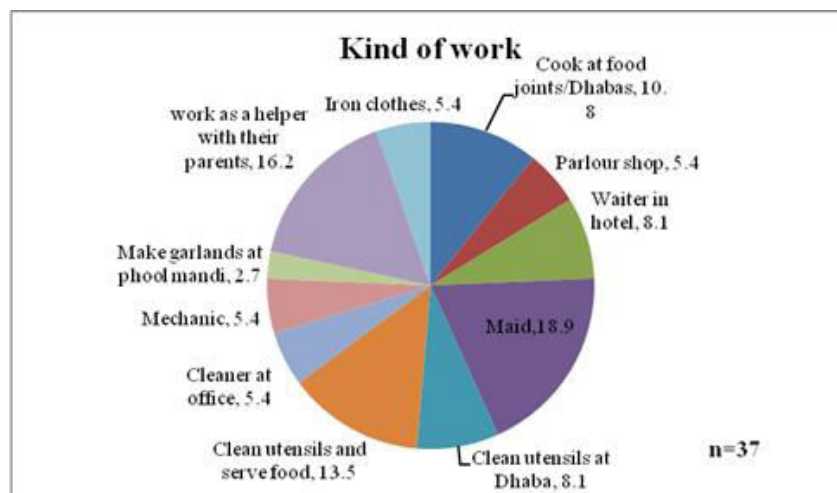


Helping siblings in their studies - Most of the siblings of the child labours (75.6%) are studying and enrolled in school while 24.3% of their siblings are not studying. It has been revealed that 64.2% of children help their younger siblings in their studies whenever they get time from their busy work schedule while 21.4% of children help sometimes whereas 7.14% of them never help their siblings in studying and the reason for that are they don't get time from their work schedule and some are not educated, never gone to school.

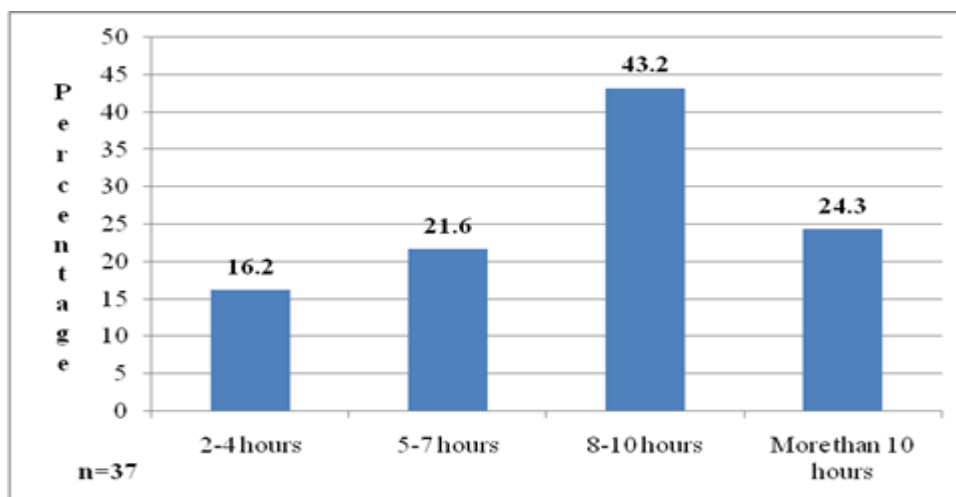
PROFILE OF WORK PLACE

Kind of work- Figure indicates that child labours were engaged in different kind of work. Depending on the amount of salary and location, the children chose their work. The pie-chart clearly indicates that majority of children (18.9) were working as maid which included girl child. Some (16.2%) respondents were working as a helper with their parents so that they can work to help their parents at their work place.

Findings revealed that 13.5% of respondents were working at food joints or *dhabas* as they were engaged in cleaning utensils and serving food and only 8.1% of respondents were only cleaning the utensils at the food joints. Whereas 10.8% of children were indulged in cooking food. Some section of respondents were also working as a waiter in small hotel. Quite substantial percent of children were indulged in the work like mechanic, working as a cleaner in the office, Parlour shop and ironing clothes. Only 2.7% of respondents were engaged in making garlands at the *phool mandi* (flower market).

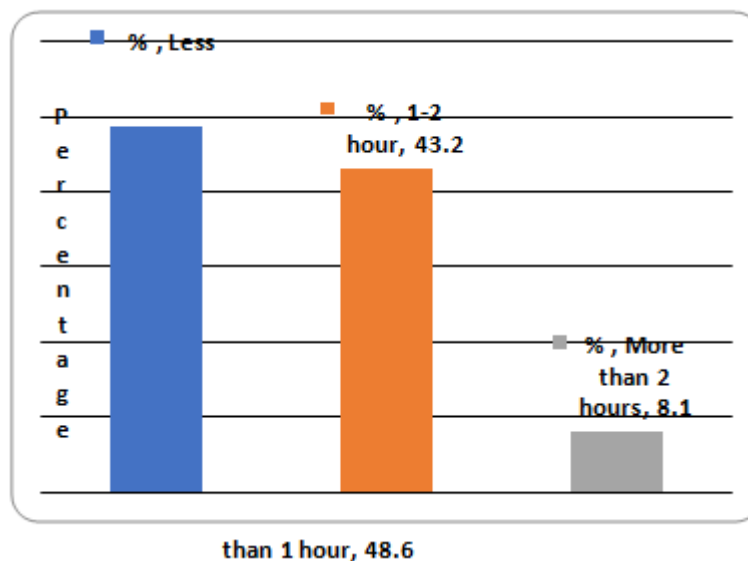


Hours of Working- Data shows that most of the children (43.2%) work about 8-10 hours a day. It has been seen in the cases where children work at the places like Dhabas/ food joints, where they have to cook, clean the utensils, serve the food, where the crowd is more and they have to work according to that while 21.6% of children work for 5-7 hours a day like those who are working at office, involved in the work like mechanic, parlour shop, maid. Some section of children 21.6% work for 2-4 hours a day those who are engaged with their parents for some hours like at the construction site, shop, in ironing clothes. Some section, i.e., 24.3% of children are also working more than 10 hours in a day in the cases where children hardly get time to rest because of the work like in making garlands at the *phool mandi*, working at waiter in hotel and also at the food joints where they have to work till late in the night, especially on the weekend days.

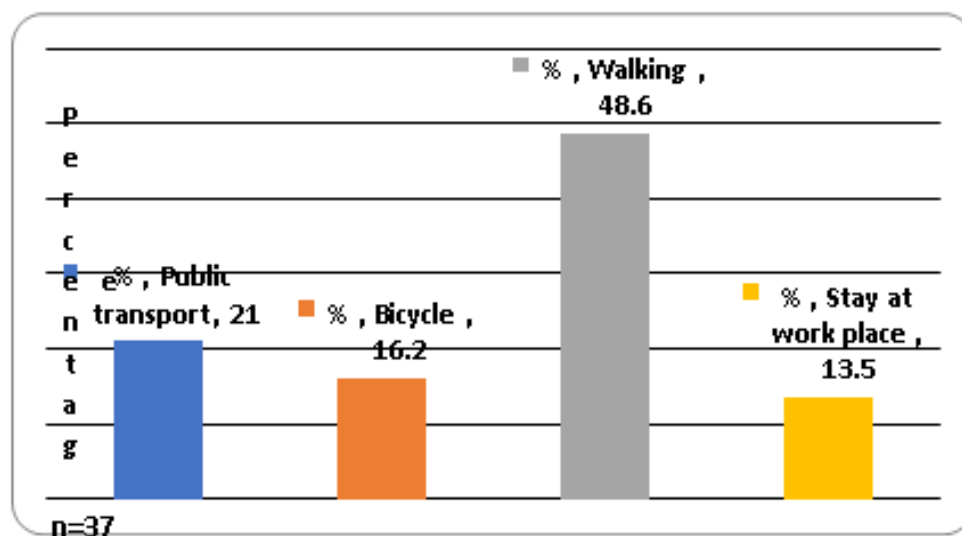


Rest periods- Data represents that majority (48.6%) of respondents get less than one hour to rest while working. They generally get break of 15-30 minutes and sometime also of half an hour depending on the amount of work. These break timings were generally followed at the food joints where there is more crowd as respondents informed that break timings depend on the crowd and the number of customers. There were also some days when they hardly get any time to rest. In the office, the work schedule followed includes the break timing of generally half an hour.

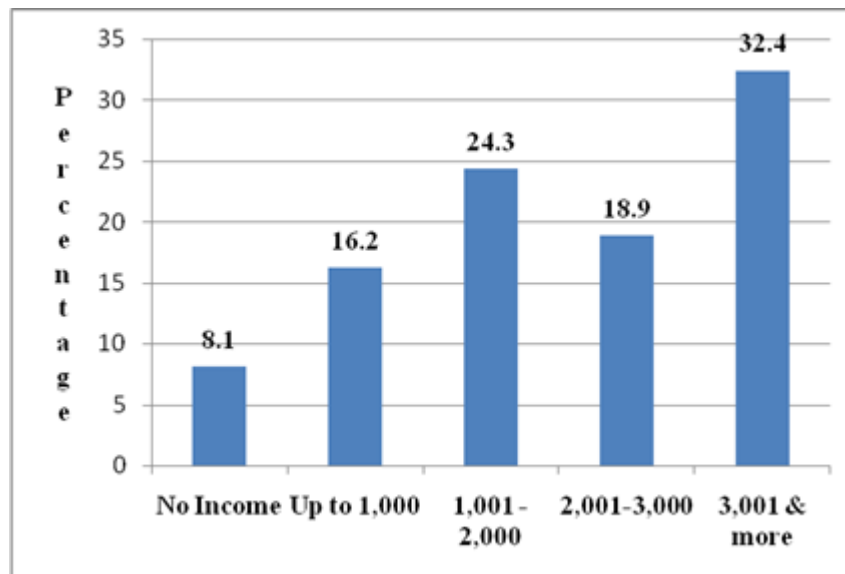
While 43.2% of children get 1-2 hours to rest. These were the respondents who were engaged in parlour shop, ironing clothes, making garlands and also some respondents who were working as maid. Very few respondents agreed that they get ample time to rest while working as these were the respondents who were working as a helper with their parents at their work place. They informed that as they were working only as a helping hand so most of the work was managed by their parents only so they get much time to rest.



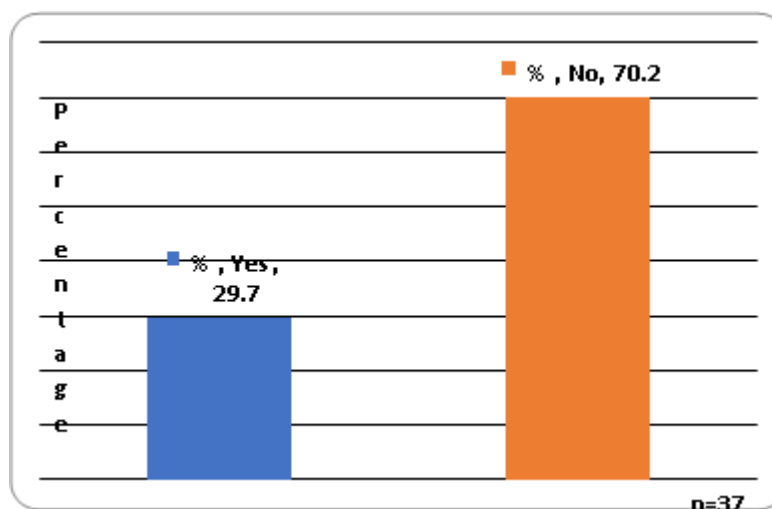
Mode of commuting- Data represents that majority (48.6%) of children live nearby their work place as they usually come to work on foot. So they don't need to spend any single penny on commuting. Some section (21%) of respondents use public transport, i.e., bus, minibuss, auto, etc. to reach at their work place and cost spend on commuting from public transport is between Rs. 5 to Rs. 25 whereas (16.2%) came down by bicycle, those who lives up to 3-4 kms and quite substantial percent of respondents (13.5%) stays only at work place. They live at their work place as these facilities were given by the owner.



Salary- Table indicates that 16.2% of child labours earned up to Rs. 1,000 and a substantial percent (24.3%) earned between Rs. 1,001-2,000 per month. Some section (18.9%) of children earned between Rs. 2,000-3,000 whereas 32.4% were earning between Rs. 3,001 & more while 8.1% were not earning anything at all as they were working as a helper with their parents due to which they were not getting any income for that.



Already worked somewhere else- Data represents that majority (70.2%) were not engaged in any other work before, therefore it can be concluded that they had started their work first time and 29.7% of children were already worked before they are actually doing. They had some experienced of working as they have worked at the places like Garment shop, construction site, sold flowers at the roadside, worked at Dhaba, domestic worker and also hauled bricks.



CONCLUSION

Child labour has been proved to be a major obstacle in development of a country like India. Children of 12 to 14 of years of age living in slum areas or of lower socio-economic class are deprived of primary education and has lost their mental and physical health as well. Government alone cannot stop the child labpur, its the responsibilty of whole nation as children's are strength of a nation.

Government of India ha enacted many child labour prohibition act and laws along with projects in every state but still needs more focus to make parents as well as child understand their rights and stop child labour.

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GREEN SYNTHESIS OF COBALT NANOPARTICLES USING NATURAL SUPPORT BY MENTHA PIPERITA: ENHANCED TOPICAL DELIVERY FOR DERMAL DISEASES**Devsuni* and Prof. Suman Pant****

*Research Scholar, Department of Home Science, Banasthali Vidhyapith, Raj., India

**Dean, Department of Home Science, Banasthali Vidhyapith, Raj., India

ABSTRACT

This study was intended to perform the anti-fungal activity of the cobalt nano-coated fabric through the determination of enhanced medicated textile material for dermal infection. By synthesis process, we have produced cost-effective, simple, sustainable and ecofriendly CoNPs by means of the ethanolic extract of *Mentha piperita* (Mint). At this point, Mint acts as a noble reducing agent that produces steady cobalt nanoparticles with particle size 16.2 ± 1.16 nm, PDI 0.483 ± 0.11 and Zeta potential -27.7 ± 1.5 mV. The consequence of plant concentration, temperature & rounds per minute (rpm) used were considered for optimization by (DOE) Design of Experiment, (RSM) Response Surface Methodology and ANOVA of synthetic procedure. The nanoparticles were considered for characterization through the study of morphology, size using SEM and TEM and zeta-potential. The functional groups detection was studied by using ATR-FTIR. An IC₅₀ value and zone of inhibition was studied which demonstrate that the cobalt nano-coated fabric has an outstanding antifungal property against *Candida albicans* (MTCC 227) and *Aspergillus niger* (MTCC 8652). Further nano-coated cloth material was washed (with purpose of time 0, 10, 25, and 50 laundry cycles) and still reserved their anti-fungal activity to both strain. Primarily there was 51 µg/ml of cobalt nanoparticles on the cloth but later 50 laundry cycle in 500 ml of purified water the cloth showed more efficiency contrary to *Aspergillus niger* than towards *Candida albicans*.

Keywords: *Mentha*, greenly synthesized CoNP@M, nano-coated cotton fabric, antifungal activity, laundry durability

1. INTRODUCTION

Skin is the largest organ of the human body and serving as the first line of defense against fungal infections. Generally, conventional treatment is less success in the cure of dermal fungal infections. Nanotechnology has shown significant improved therapeutic efficiency in the treatment of fungal infections. Nanotechnology has enhanced the efficacy and targets the specific site with low bioavailability. Cobalt nanoparticles are non-toxic, could be effectual nanoparticles as they own high performance permanent magnetic properties and good catalytic and also possess cytotoxic and biomedical activity. Cobalt nanoparticles synthesized with plant extract *Mentha piperita* contain ecofriendly polyphenolic and flavonoid compounds which acts as an effective reducing and capping agent. *Mentha piperita* is a plant belongs to Lamiaceae family contain several pharmacological characteristics such as antiviral, antibacterial, antifungal activity and its oil has been used in medicine to alleviate digestive disorders, eliminate headache, lessen muscle aches, rheumatism, irritated skin, fight bad breath, to expel gases from the gastrointestinal tract, reduce stoma inflammation, fight fungi and several viruses. Hence, in view of its medicinal importance we have selected *Mentha piperita* extract for the biosynthesis of Cobalt nanoparticles in this current study for its biomedical application in textile industry by impregnating it to a white cotton fabric.

2. MATERIALS AND METHODS

Cobalt nitrate hexahydrate $\text{Co}(\text{NO}_3)_2$ was purchased from Sigma Aldrich, USA. Leaves of plant *Mentha piperita* also known as Peppermint, family Lamiaceae was taken from local market. Plain weaved 100% white color cotton fabric was used for the nano-incorporation of the greenly synthesized cobalt nanoparticles. The standard strains of *Candida albicans* (MTCC 227) and *Aspergillus niger* (MTCC 8652) were purchased from MTCC Chandigarh. All the other chemical compounds and reagents were used of high purity and grade.

2.1. Ethanolic extraction of *Mentha piperita* (mint) leaves

The ethanolic extract of mentha leaves was used as reducing and capping agent for the synthesis of cobalt nanoparticles. For the plant extract mentha leaves was dried in a dark room and then 50g of crushed mentha leaves were mixed with 250ml of ethanol for 48 h on a rotary shaker. The duration of 48 h was considered to ensure the maximum extraction of the bioactive compounds from the mentha leaves. After the completion of 48 h, the extract was filtered through Whatman no. 1 filter paper. The resulted ethanolic extract of mentha leaves was collected in an air tight container and stored at 4°C in refrigerator for the further uses.

2.2. Mercerization process of the cotton fabric

Mercerization is a finishing treatment or process for cotton fabric or yarns was treated with strong solution of alkali as sodium hydroxide, potassium hydroxide, caustic soda and lithium hydroxide etc., in order to enhanced luster, improve the ability of dye uptake, or dyes like material, strengthens the cotton fabric, reduces the fabric shrinkage, and enhanced smoothness. The extreme alkali treatment leads to the change in fiber structure & their properties. In the present study, the process of mercerization was done by means of 23.5% sodium hydroxide and 1gdm^{-3} Subitol MEZ-N as a wetting agent at 18°C in warm water additionally rinsed with hot water (80°C). Further the mercerized cotton fabric was centrifuged at 6000 rpm to eliminate any surrounded remainder and keep on drying at room temperature (25°C). This pretreated cotton fabric was used in the processing of cobalt nanoparticle impregnation.

2.3. Green synthesis of cobalt nanoparticle capped with mentha extract and impregnation into cotton fabric

Greenly synthesized cobalt nanoparticles were impregnated on pretreated white cotton fabric. To synthesize this one-step process, 15ml filtered green ethanolic extract, was added to a 6.0 g of $\text{Co}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$ solution of pH of 3.8. At a suitable temperature, while whirling, the Co salt was experiential to dissolves completely in the ethanolic extract under 20-25 mins. The colour of the solution changes from red wine to reddish blackish colour solution, thereby confirming the formation of cobalt nanoparticles. The resultant solution was allowed to settle over a period of 24 h, afterwards precipitates were observed without any heating. The precipitates were then detached from the ethanolic extract, first by decanting then by centrifuging at 1000 rpm 3 times for 10 min each over successive additions of ethanol to wash the precipitate of any residual ethanolic extract. Simultaneously the impregnation to the cotton fabric takes place by dropping the cotton fabric in the cobalt nanoparticle solution for an interval of time (approx for 24h). Further the dipped cotton fabric was took out and wash away with distilled water to totally remove the residuals from the impregnated cloth, then, it was kept on drying and ironed for the additional characterizations.

The quantity of cobalt nanoparticle found was 1.55 mg/ml in 10 ml of solution. Cobalt nanoparticle's precipitates were collected after centrifugation, and were dried in oven at suitable temperatures. After the complete drying, the cobalt nanoparticles were achieved.

3. Characterization of greenly synthesized cobalt nanoparticle capped with *Mentha piperita* (mint)

3.1. UV/Visible spectroscopy and particle size, polydispersity index (PDI), zeta potential

Development of greenly synthesized cobalt nanoparticles capped with Mentha extract (CoNP@M) was confirmed using UV/Visible Spectroscopy comprising Uv-Win software. Pictorial examination of synthesized nanoparticles was determined by scanning the sample in the range of 390–800nm. The distribution of particle size, zeta potential and mean diameter was resolved with Zetasizer Nano ZS (Malvern Instrument, UK) instrument using the principle of DLS (dynamic light scattering). All the experiments of particle size, zeta potential and PDI was carried out in triplicate and the resultants were expressed in mean $\pm$ SD.

3.2. Scanning electron microscopy (SEM) and energy dispersive x-ray spectroscopy (EDX)

The surface morphological behavior of the prepared cobalt nanoparticles coated cotton fabric, and pretreated cotton fabric was determined with SEM (Scanning electron microscopy), using the lyophilized sample, mounted on carbon tape coated with gold and imaged using SEM (MNIT Jaipur, India) operated at a power of 20 kV at a magnification of 3300X, 19000X.

Energy Dispersive X-ray spectroscopy (EDX) was performed to confirm the presence of cobalt and other basic element such as carbon and oxygen in the sample. Peaks of carbon, and oxygen were also recorded for capping of nanoparticles with Mentha.

3.3. Transmission electron microscopy (TEM)

TEM gives a clear visual morphology of the synthesized cobalt nanoparticles. The particles seemed as black in color in contradiction of white background which makes the image extra feasible for the morphological identification. For this analysis a drop of greenly synthesized cobalt nanoparticle about volume ($2\text{ }\mu\text{l}$) was cited on a cobalt grid i.e., a conductive grid with 2% w/v (phosphotungstic acid) for 30 sec used for the surface analysis by TEM, and then dried the sample and examined by instrument TEM, (MNIT Jaipur, India) at a bias voltage of 200 kV with a magnification of 9900X.

3.4. Attenuated total reflection fourier transform infrared spectroscopy (ATR-FTIR)

Spectrum were scanned through ATR-FTIR spectrophotometer (Bruker EQUINOX 55 FTIR spectrophotometer) containing liquid nitrogen cooled mercury telluride (MCT) operated at the temperature of

25°C with 2 cm⁻¹ resolution. For the internal reflection element diamond was used, positioned at an angle of 45° which allow scanning at 32 times and provides a reflection that is equivalent to 21 resolutions. ATR correction was applied for every spectrum and peak fitting was carried out using Opus software. A scanning region selected was in a range of 4000–400 cm⁻¹ and fitting of peak was completed by using Opus software.

4. Determination of antifungal activity of greenly synthesized cobalt nanoparticles

Pure culture of *Candida parapsilosis* (MTCC 2512) and *Aspergillus niger* (MTCC 8652) was obtained from Microbial Type Culture Collection, Chandigarh (India). *C. parapsilosis* cultures were grown on yeast malt agar (YMA) medium plates and *A. niger* were grown on potato dextrose agar (PDA) medium plates and maintained in the agar slants at 4°C. Overnight culture in the broth was used in the research work. Half inhibitory concentration (IC₅₀) of NPs were estimated using tube dilution assay and compared with standard ketoconazole (Hi-media laboratories Pvt. Ltd, India) used as a reference agent.

5. Determination of antifungal activity of greenly synthesized cobalt nano-coated cotton fabric

Zone of inhibition of Cotton fabric coated with CoNP@M was determined using disc diffusion method (Bhalodia *et al.* 2012). Freshly overnight incubated fungal culture was used. Fungal culture (approximately 10⁸ CFU/mL) was spread onto sterilized YEPDA (*C. albicans*) and PDA (*A. niger*) medium plates. Cotton fabrics (1×1 cm) was placed on medium and pour few drops of methylene blue dye on cotton fabric used as an indicator and then, plates were incubated at 25°C for 24–48 h for the development of zone of inhibition.

5.1. Laundry durability test of cobalt nano-coated cotton fabric

This test was done according to the American Association of Textile Chemist and Colorists (AATCC) guidelines with Test method 61-2006, and the testing condition was upheld using (WOB) Without Optical Brightener detergent (0.15% w/w) & 50 balls made of stainless steel in warm water (80 °C). The laundering cycle which was accelerated, used to achieve the experiment in which 1 laundry cycle was theoretical to be equivalent of 5 laundering cycles. Meanwhile, we have taken 0... 2... 5... & 10 numbers of laundry cycles that in result of quicker stress testing measures 0...10...25... & 50 numbers of laundry cycles. The resistances of greenly synthesized CoNP@M were measured for each cycle & reported the results.

6. RESULTS

6.1. UV/Visible spectroscopy and particle size, polydispersity index (PDI), zeta potential

For the confirmation of the synthesis of the cobalt nanoparticles UV/visible analysis were performed and throughout the synthesis, recurrent sampling was done till whole color change from red wine to reddish black. The spectrum of absorption of greenly synthesized CoNP@M showed a fine surface Plasmon's resonance band centered at 510 nm, which confirmed the synthesis of cobalt nanoparticle. The mean particle size diameter of the CoNP@M ranged from 16.2±1.16 nm to 31.58 ± 1.29 nm & PDI value of 0.285±0.18 to 0.516±0.20. The optimized cobalt nanoparticle showed particle size diameter 16.2±1.16 nm and PDI value 0.483±0.11. The zeta potential values of the all particles were ranging from -21.6±1.4 mV to -27.7±1.5 mV. The average Zeta potential value of the optimized CoNP@N was found to be -27.7±1.5 mV, as shown in Table no.1

TABLE 1 Cobalt Nanoparticles formulation using Pudina Extract (CoNP@M)

FORMULATIONS	PARTICLE SIZE (nm)	PDI	ZETA POTENTIAL (mV)
F1	31.58±1.29	0.285±0.18	-23.6±1.8
F2	16.2±1.16	0.483±0.11	-27.7±1.5
F3	30.26±2.36	0.388±0.12	-21.6±1.4
F4	16.40±1.22	0.516±0.20	-27.7±1.2

6.1.1 Experimental design for the optimization of CoNP@M with respect to particle size and zeta potential

A three-factor, 2-level design of experiment (2³) and response surface methodology using Minitab-16 software was applied to optimize the cobalt nanoparticles capped with mentha extract. The independent variables chosen were Plant concentration in ml (X₁), Temperature in °C (X₂) and (X₃) rpm for CoNP@M. The independent variables and their levels were selected on the basis of the extensive literature search and preliminary trails and the dependent variables chosen are particle size in nm (Y₁) and Zeta potential in mV (Y₂). To evaluate the effect of independent variables on each response, the obtained responses were subjected to design of experiment analysis to generate polynomial equation including interaction and quadratic terms. The general form of the polynomial equation is represented as follows.

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_{12} X_1 X_2 + \beta_{11} X_{12} + \beta_{20} X_{20} \dots \dots \dots (1)$$

Where, Y is the dependent variable, β_0 arithmetic average response of the twenty runs, β_1 and β_2 are linear coefficients, β_{12} interaction coefficients between two factors, β_{11} and β_{22} are quadratic coefficients, X_1 , X_2 and X_3 are coded levels of independent variables, X_1 , X_2 , X_3 and X_{i3} (i = 1-3) denotes interaction and quadratic terms respectively. ANOVA was used to ascertain the significance of the model and model terms. Using 5% significance level, the model and model terms were regarded as significant, if the p-value (significant probability value) is less than 0.05. The 2D-contour plots (explains independent and dependent relationship) and 3D-response surface plots (effect on independent variable) were generated for each response variable with the help of Minitab-16 software.

6.1.2 Effect of independent variables on particle size (Y1) of CoNP@M capped with mentha extract

The particle sizes of the CoNP@M formulations are shown in Table. The smallest particle size was observed for CoNP@M 2 (16.2nm) while the highest particle size was obtained for CoNP@M 4 (60nm). The effect of independent variables on the particle size can be described by the following quadratic equation.

$$Y_1 = -74.5359 + 0.4382X_1 + 1.1285X_2 + 0.1122X_3 - 0.0025X_1^2 - 0.0040X_2^2 + 0.000X_3^2 + 0.0098X_1X_2 - 0.0008X_1X_3 - 0.0012X_2X_3 \dots \dots \dots (2)$$

For the desired optimization of cobalt nanoparticles, the parameters that should be taken into account are displayed by the software. It describes that for the target of particle size value as 30nm, the plant concentration should be taken as 60ml, temperature at 100°C and at 1200 rpm. The formulation prepared by the optimized parameters considered to be as 98% optimized as predicted by the Design of experiment's graphs and response surface methodology.

Exp. Run	Plant conc. (X_1)	Temp. (X_2)	S.T. (X_3)	P.S. (Y_1)
CoNPs@P-1	10	80	4.0	16.4
CoNPs@P-2	20	90	3.0	16.2
CoNPs@P-3	30	100	5.0	35.0
CoNPs@P-4	40	70	6.0	60.0
CoNPs@P-5	50	60	3.5	30.0
CoNPs@P-6	25	85	3.0	21.0
CoNPs@P-7	35	95	4.0	34.0
CoNPs@P-8	45	92	5.5	25.0
CoNPs@P-9	50	110	6.5	30.0
CoNPs@P-10	22	81	4.0	31.0
CoNPs@P-11	35	88	3.0	26.0
CoNPs@P-12	41	80	6.0	39.0
CoNPs@P-13	43	77	5.0	35.0
CoNPs@P-14	49	60	4.5	45.0
CoNPs@P-15	36	83	6.0	42.0
CoNPs@P-16	47	92	3.5	24.0
CoNPs@P-17	42	100	3.0	40.0
CoNPs@P-18	27	82	5.0	41.0
CoNPs@P-19	29	105	5.5	37.0
CoNPs@P-20	31	90	3.5	29.8

TABLE 2 Independent variables = (X_1 = Conc. of plant extract (ml) i.e., 10, 30 & 50ml, (X_2 = Temperature, i.e., 60, 80 & 100°C) and X_3 = Stirring time, i.e., 3, 4 & 6 hours)

Dependent variables = (Y_1 = Particle size (nm))

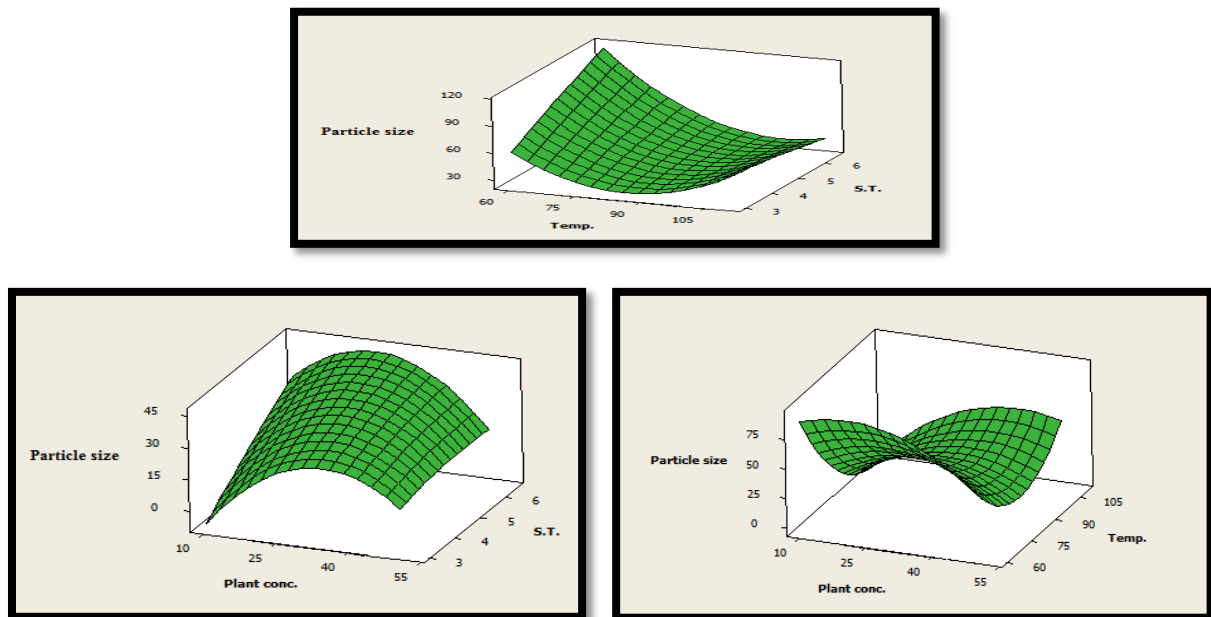


Figure 6.1 Response surface methodology for optimization of particle size (nm)

6.2 Scanning electron microscopy (SEM) and energy dispersive x-ray (EDX)

Surface morphology & impregnation into the cotton fabric of the CoNP@M was established by using scanning electron microscopy (SEM). The pretreated cotton & cobalt nano-coated cloth was made to conductive by gold coating and operated at 3 kV & 5 kV at 1.18kx & 3kx magnification correspondingly. The SEM image of the CoNP@M clearly shows & revealed that nucleation instigates throughout the impregnation afterwards aggregation, saturation, of greenly synthesized CoNP@M into the cotton fabric takes place. Surface morphology of the CoNP@M is portrayed in Figure (A). Additionally, an Energy dispersive X-rays was used to confirm the attendance of the cobalt nano-coating into the cotton fabric. In Figure (B), the quantitative & qualitative graph has been exposed, which provides enough info to approve the greenly synthesized cobalt nano-coating into the cotton fabric.

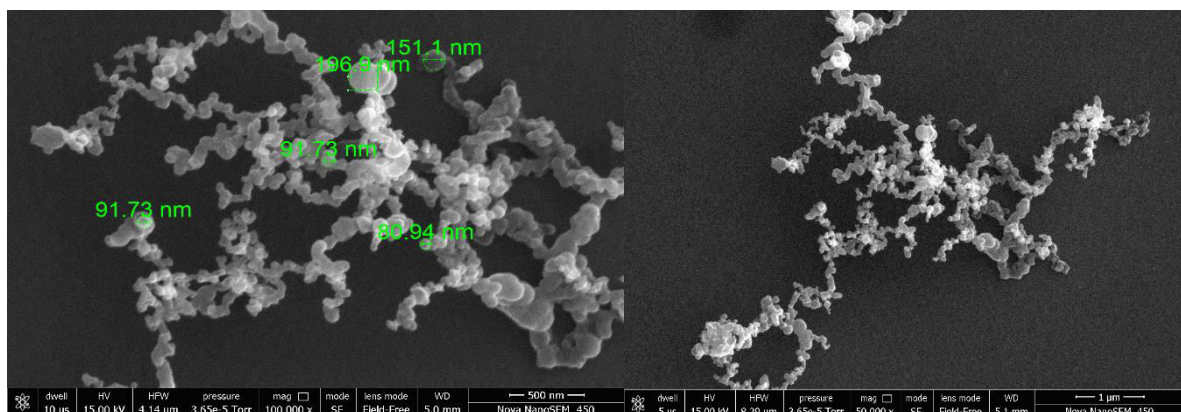


Figure 6.2 A SEM images of CoNP@M

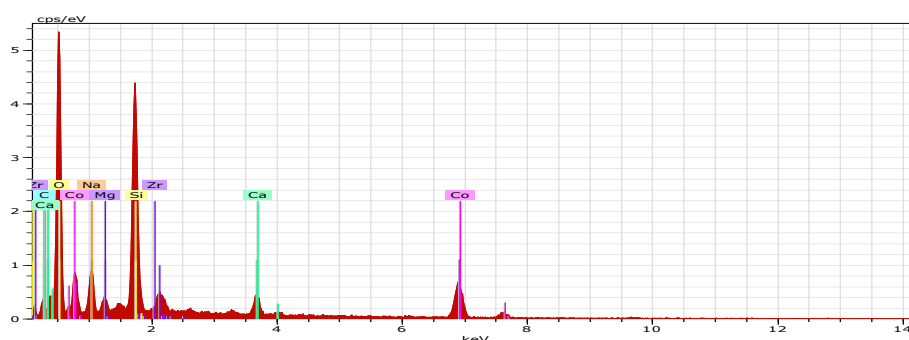


Figure 6.2 B EDX images of CoNP@M

6.3. Transmission electron microscopy (TEM)

TEM was used to demonstrate the shape & size of the synthesized CoNP@M. The TEM microscopical image of the optimized greenly synthesized cobalt nanoparticle has been showed in figure. The outcome undoubtedly discloses that most of the cobalt nanoparticles are spherical in shape with a smaller diameter.

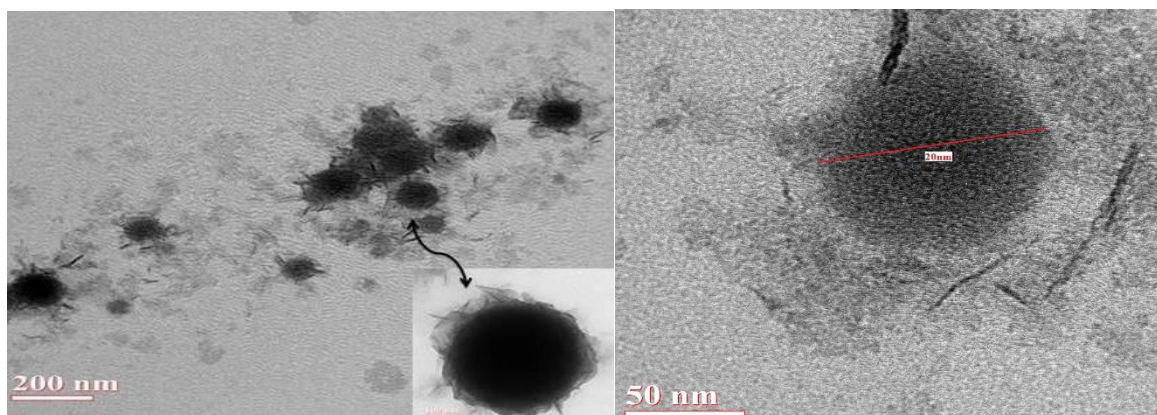


Figure 6.3 TEM images of CoNP@M

6.4. Attenuated total reflection- fourier transform infrared spectroscopy (ATR-FTIR)

The IR spectra of the cobalt nitrate hexahydrate (A), ethanolic extract of *Mentha piperita* (B), Physical mixture (C) and greenly synthesized cobalt nanoparticles (D) were analyzed for conceivable bio-molecules accountable for the development of protective layer that is a covering over the surface of CoNPs by using an ATR-FTIR spectroscopy. All the individual peaks are depicted in the figure. The occurrence of these protruding bands recommends that the extract comprises of amine and carbonyl groups that are adsorbed on the superficial of the CoNP@M. The spectroscopy result discloses that the overhead functional groups are needed for the stabilization & synthesis of CoNP@M.

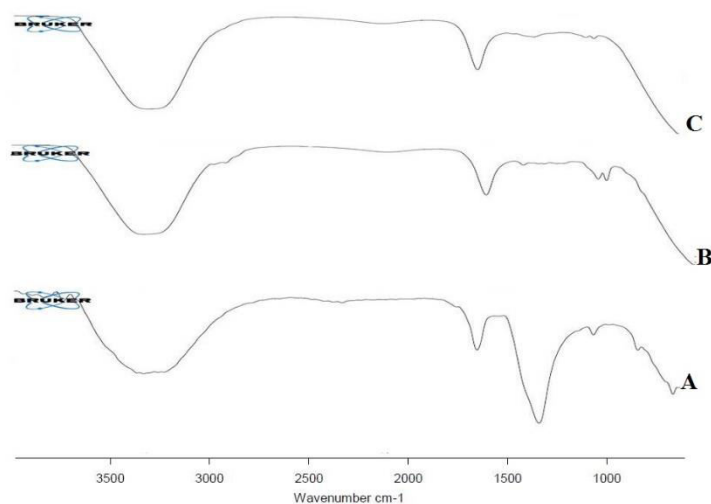
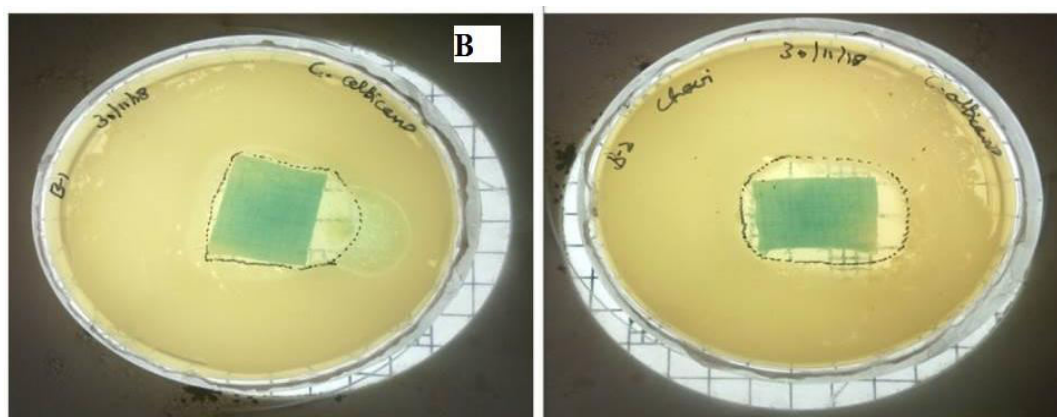


Figure 6.4 FT-IR images of CoNP@M

6.6. Determination of antifungal activity of greenly synthesized cobalt nanoparticles and nano-coated fabric

In-vitro antifungal activity of nanoparticles studies revealed that nanoparticles was active and potent against pathogenic *C. parapsilosis* than *A. niger* strain when compared with antibiotic standard. The effects of nanoparticles were obtained after overnight incubation. The IC₅₀ of cobalt nanoparticles results was revealed that found 30 µg/mL and 40 µg/mL against *C. parapsilosis* strain, and 80 µg/mL and 60 µg/mL against *A. niger* respectively. The obtained data of nanoparticles was compared with standard ketoconazole in order to analyze IC₅₀ values. Nano-coated cotton fabric was originated to be effective against both the fungus. In-vitro antifungal activity of cotton fabric studies revealed that fabric was more active and potent against *C. albicans* than *A. niger* strain with zone of inhibition at 32 ± 3.6 mm against *C. albicans* and at 24 ± 4.0 mm against *A. niger*. The effects of cotton fabric were obtained after overnight incubation.



Test compound	Zone of inhibition (mm)	
	C. albicans	A. niger
CoNP@P	32 ± 3.6	24 ± 4.0

Figure 6.6. ZOI study of the (B) CoNPs@M on *Candida albicans* and *Aspergillus niger*

7. LAUNDRY DURABILITY TEST OF COBALT NANO-COATED COTTON FABRIC

These tests were achieved conferring to the method 61-2006 of AATCC Test. The laundering cycle's effect on the soaked cobalt cotton fabric. After 10...25....50 laundry cycles, there was leakage of nanoparticles from the cloth. Later 50 laundry cycles in 500 mL of d.w., there was elimination of cobalt nano-coating this is articulated as decrement in entrapment. The outcomes of laundry cycles evidently recommended that the soaked cobalt cotton fabric was effective after numerous experience of accelerated laundering and it was shown that this impregnated cobalt cotton fabric was 93.3% efficacious against *C. albicans* and 95.7% efficacious against *A. niger*.

8. CONCLUSION

Current study reveals that, the cobalt nanoparticles were synthesized through the green synthesis method therefore, the present synthesis procedure meets the safety condition of environment. The cobalt nanoparticle is identified by the design for its numerous activities & acknowledged for the antifungal property. The authorization of several properties of the synthesized CoNPs were done by the characterization processes such as UV, Zeta potential, Particle size, SEM-EDX, TEM, XRD, etc. The existing study proposed that the CoNP@M were well-defined nanoparticles which will stop and prevent various hazards related to environment in an ecological way.

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DISTILLATION COLUMN SEQUENCING FOR THE SEPARATION OF 2-ETHYL HEXYL ACRYLATE FROM ITS REACTION MIXTURE

Reshma R. Devale¹, Vivek D. Talnikar² and Yogesh S. Mahajan^{1*}

¹Chemical Engineering Department, Dr. Babasaheb Ambedkar Technological University, Lonere, Raigad, Maharashtra, 402 103, India

²Chemical Engineering Department, Gharda Institute of Technology, Lavel, Ratnagiri, M.S.

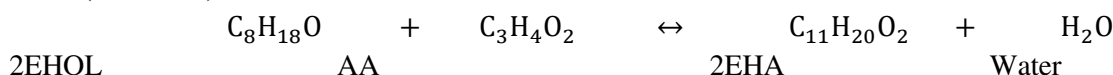
ABSTRACT

This work explored separation of 2 Ethyl hexyl acrylate (2EHA) from its reaction mixture in high purity. Vapor liquid equilibrium (VLE) study was conducted. VLE data for acrylic acid (AA) water system was experimentally generated in the modified Othmer still. Several models were tested using ASPEN PLUS® for their ability to correctly predict azeotrope, out of which Soave-Redlich-Kwong (SRK) and PENG-ROBINSON (PR) were observed to predict the azeotrope. Simulation and column sequencing was done to isolate 2EHA with high purity. Residue Curve Maps were used to predict feasibility of separation. In first column 2-Ethyl hexanol (2EHOL) is obtained at bottom of column with very high purity. In second column, 2EHA separates out at bottom with high purity. In third column, AA separates out at bottom of distillation column whereas in column four, water separates out at bottom. Almost complete separation can be achieved.

Key words: 2-Ethyl Hexyl Acrylate, Vapor Liquid Equilibrium (VLE), Distillation, Residue Curve Map (RCM), Column Sequencing.

1. INTRODUCTION

This work deals with vapor and liquid equilibrium (VLE) study of an important industrial separation. VLE indicates a condition in which a liquid and its vapor (gas phase) are in equilibrium with each other so that the rate of evaporation equals the rate of condensation [1]. VLE diagrams relate bubble-point and dew-point of a binary mixture at constant pressure or constant temperature. Two types of VLE diagrams are often used to represent data for binary systems: a) constant pressure VLE diagram (T-x-y) and b) constant temperature diagram (P-x y) [1, 2, 3]. In this work, VLE data of binary mixtures is considered. The most complicated VLE plots are generated by azeotropic systems since at the azeotrope, the bubble point and dew point curves intersect with each other, at the diagonal (x = y). Distillation plays a vital role in chemical industries. A good understanding of VLE is essential for the analysis, design, and even control of distillation columns. In this article, the system chosen for investigation is the esterification reaction of 2EHOL and AA to form 2EHA and water (Scheme 1).



Scheme 1: Reaction of 2EHOL with AA to form 2EHA and water

For production of 2EHA, acid catalyst is used [4]. Typically, in batch runs 30-40 % conversion of the limiting reactant (AA) is achieved [15]. Catalyst is readily separated since it is heterogeneous in nature. In a typical esterification system one or many binary and / or ternary azeotropes may exist. This may complicate the separation of the product from the reaction mass by distillation. Depending upon the nature of the azeotropes, azeotropic distillation can be employed. Usually for N components to be separated in a normal distillation, N - 1 columns are needed [5]. Distillation column sequencing is thus an important aspect in distillation design. Knowledge of Residue Curve Maps (RCM) and VLE is essential for this [6]. In this work, we have attempted to separate 2EHA from reaction mass assuming 40 % conversion of the limiting reactant, AA.

2. POSSIBLE BINARIES

For the chosen system, total binaries are 6 (Fig. 1). Out of these, 2 are reactive and remaining 4 are non-reactive binaries (Table 1).

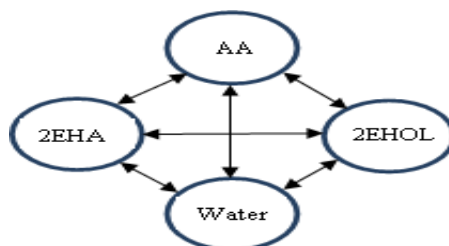


Fig. 1. Diagrammatic representation of all possible binaries in the system.

Table 1: Reactive and non-reactive binaries

Reactive Binaries	Non-reactive Binaries
2EHOL- AA	2EHOL - 2EHA
2EHA - Water	2EHOL - Water
	AA - 2EHA
	AA - Water

Detailed literature survey was done and the following binary VLE data was obtained. This data is plotted below for reference (Figure 2).

1. AA - water (at 760 mm Hg) where X_1 and Y_1 are mole fraction of water in liquid and vapor phase respectively (Figure 2 (a)) [7].
2. AA - 2EHOL (at 100 mmHg), where X_1 and Y_1 are the mole fraction of AA in liquid and vapor phase (Figure 2 (b)) [7].

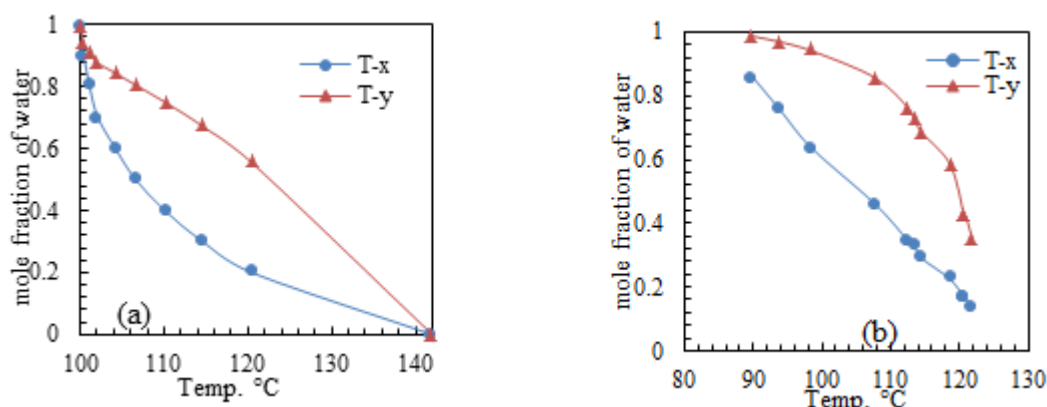


Figure 2: VLE for system (a) AA - water, (b) AA - 2EHOL

3. Thermodynamic models

Modelling and simulation of distillation requires VLE data, which is generally estimated using thermodynamic models based on the fundamental phase equilibrium criterion of equality of chemical potential in both phases [8]. This process is based on the gamma (γ) – phi (ϕ) calculation method. This requires knowledge of activity coefficient in the liquid (γ) and vapor (ϕ) phases for all the components. Several activity-coefficient models and EOS like NRTL, UNIFAC, UNIQUAC, SRK, and PR are in use to evaluate VLE data. From literature survey we found that azeotrope exists between AA and water at 99.8°C and 84.21 mole %. Thus, AA cannot be separated from water by normal distillation [6, 9]. So we checked several models in ASPEN PLUS® out of which SRK and PR were able to predict the azeotrope. Hence for the further work we have used these two models. These are briefly discussed below:

a. Soave-Redlich-Kwong (SRK): The SRK model is based on a combination of the SRK equation of state with a mixing rule whose parameters are determined by the UNIFAC method. The equation of state of Soave is given below [10]:

$$P = \frac{RT}{v-b} - \frac{a \alpha(T)}{v(v+b)} \quad (2)$$

$$\sqrt{\alpha(T_r)} = 1 + c_1(1 - \sqrt{T_r}) + c_2(1 - \sqrt{T_r})^2 + c_3(1 - \sqrt{T_r})^3 \quad (3)$$

Here c_1 and c_2 are zero and c_1 is calculated by following equation.

$$c_1 = 0.48 + 1.574\omega - 0.176\omega^2 \quad (4)$$

Where ω – Acentric factor

b. Peng-Robinson (PR)

The Peng-Robinson EoS is given as [10]:

$$P = \frac{RT}{v-b} - \frac{a}{v(v+b) + b(v-b)} \quad (5)$$

Where the temperature dependent parameter 'a' can be defined by

$$a = 0.45724 \frac{R^2 T_c^2}{p_c} \left[1 + (0.37464 + 1.54226 w - 0.26992 w^2) \left(1 - \sqrt{\frac{T}{T_c}} \right) \right]^2 \quad (6)$$

The constant parameter 'b' is given by

$$b = 0.07780 \frac{RT_c}{p_c} \quad (7)$$

4. Experimental Work

We estimated VLE data for AA - water system by using modified Othmer vapour liquid equilibrium still [11]. In order to find VLE data we made solutions of AA - Water system in which concentration of acrylic acid was varied from 5% - 95% by mole. Figure 3 shows the schematic of othmer VLE still.

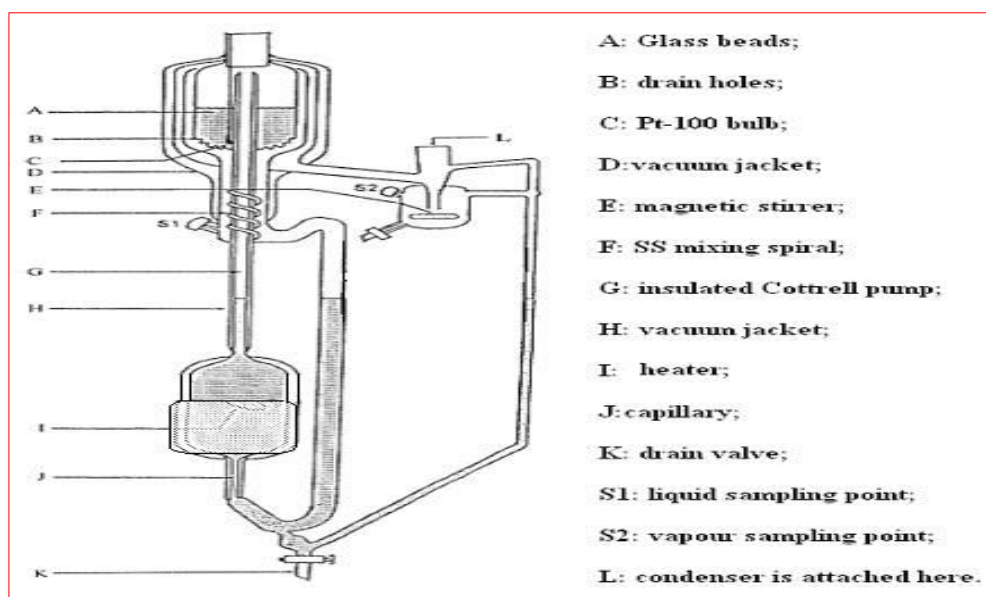


Fig. 3. Experimental Setup (Modified Othmer Still) [12].

With the help of this modified Othmer VLE still we have carried out experimental runs to find the mole fraction of water in liquid phase and vapour and plotted against each other (Fig. 4). The available VLE data for AA-water system is also plotted in the same (Fig. 4) [6].

None of the above experimental data predict azeotrope but literature suggests that there is azeotrope at 84.21 mole % concentration of water at 99.8°C temperature [9]. Therefore we started predicting x-y and T-x-y data for AA-water system using 14 different models: Non-Random Two-Liquid model (NRTL), NRTL-HOC, PR, SRK, SYSOPO, Universal QUAsi Chemical (UNIQUAC), UNIQUAC Functional-group Activity Coefficients (UNIFAC), UNIF-Hoc, UNIQ HOC, Vanlaar-Hoc, Vanlaar, Wilson-Hoc, Wilson. Out of these 13 models only SRK and PR model predicted azeotrope. The x-y diagrams for these two models are as shown (Fig. 5a and b).

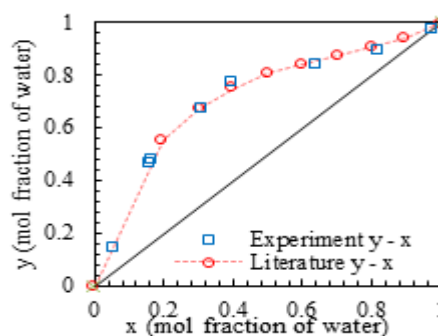


Fig. 4. Experimental and Literature data for the Water-AA system [6].

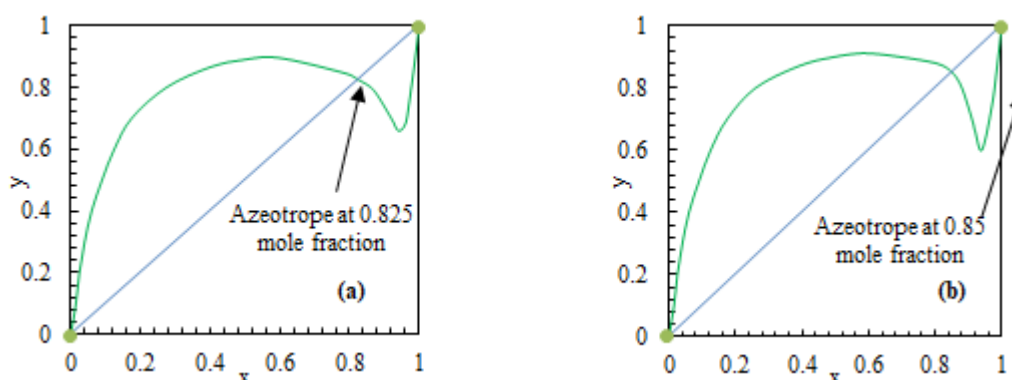


Fig. 5: Prediction of AA-Water VLE by (a) SRK Model, (b) PR model where x and y are mole fractions of water in liquid and vapor phase respectively, data predicted by Aspen plus.

We also have experimental data available for AA - 2EHOL system at 100 mm Hg pressure conditions where x and y are the mole fraction of AA in liquid and vapour phase respectively figure 6 [7].

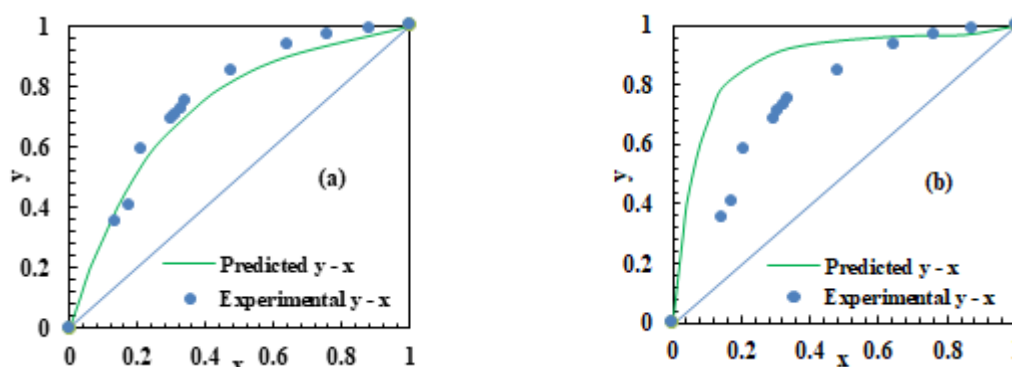


Fig. 6. Prediction of x - y curve by (a) PR Model and (b) SRK model for AA-2EHOL.

Out of the above two models, the data obtained by using SRK model is found to be more promising than that of the PR model. Hence we select SRK for further work. Since distillation is carried out at 1 atmospheric pressure, all the 6 binaries are predicted by use of SRK in ASPEN PLUS® (Figure 7, 8, 9).

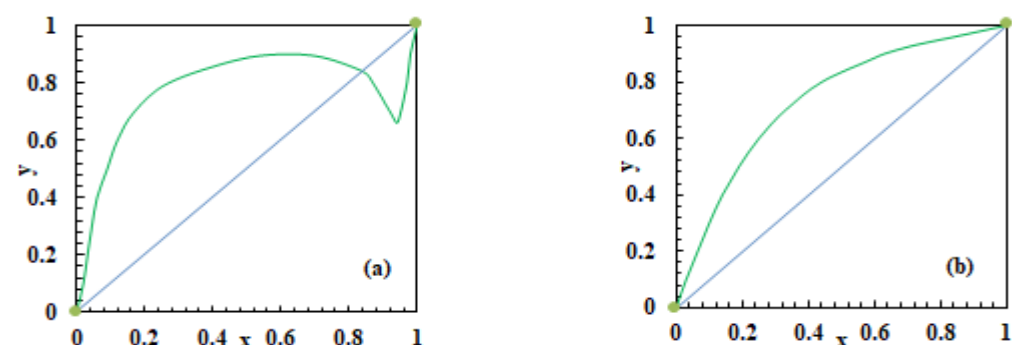


Fig. 7. Prediction of x - y curve for (a) AA-water and (b) AA-2EHOL respectively by SRK model.

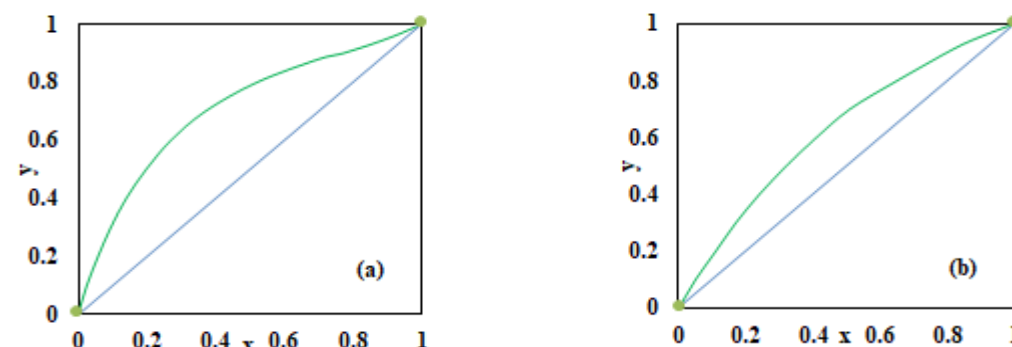


Fig. 8. Prediction of x - y curve for (a) AA-2EHA and (b) 2EHA-2EHOL system respectively by SRK model.

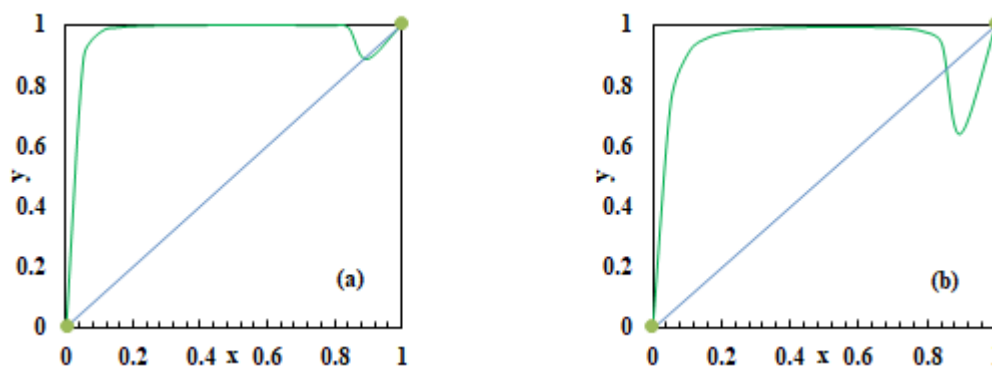


Fig. 9. Prediction of x-y curve for (a) 2EHOL- water and (b) 2EHA-water system respectively by SRK model.

5. RESIDUE CURVES MAP (RCM)

Residue curves are generally used to describe the change of liquid phase concentration of chemical mixture during continuous evaporation under the condition of VLE [6, 13]. The multiple residue curves for a single system are known as residue curve map (RCM). RCM is a valuable tool for designing distillation process as it allows the feasibility of a separation of a mixture. As previously stated, batch reactions were carried out using Amberlyst-15 as catalyst. The maximum conversion achieved in batch reaction is 40%. Then we carried out reactive distillation (Batch mode, BRD), the maximum conversion achieved is 75%. So if continuous reactive distillation runs are carried out, about complete conversion (100%) can be achieved. Hence the product mixture that would come out would be of 2EHA, 2EHOL and water. In this case the RCM comprising of these 3 is shown (Fig. 10). Here the operating line joining feed point to the desired product is also shown. Since the operating line does not cross any distillation boundary so the separation of components should be feasible. In order to validate this inference we have performed column sequencing using ASPEN PLUS[®] which is discussed next. For this we have used 1:2 mole ratio of the reactants and further assumed 40 % conversion.

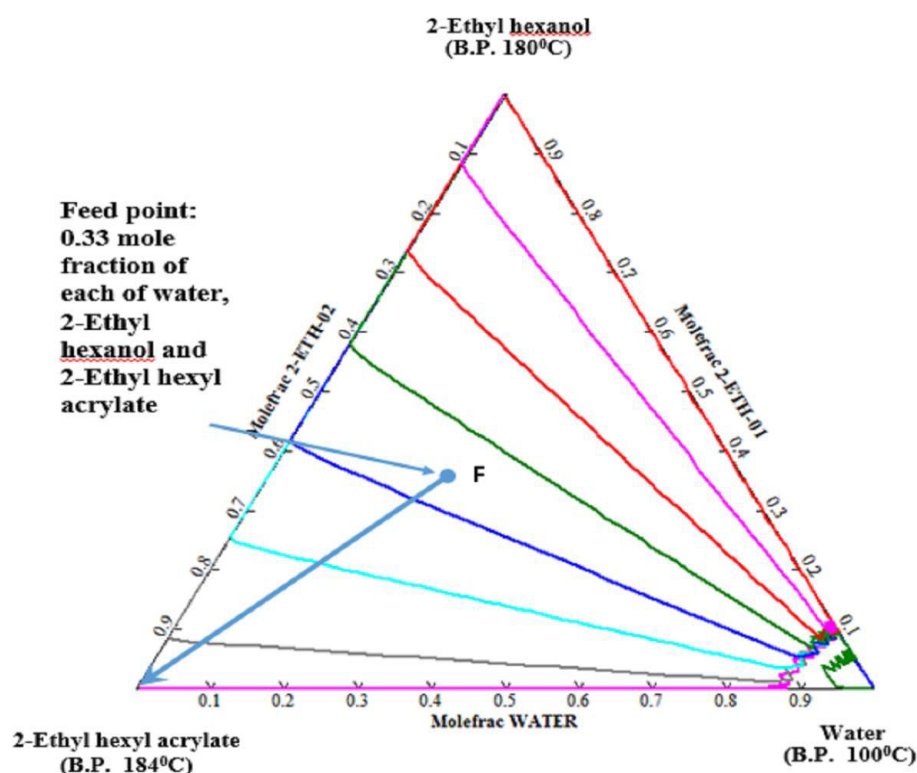


Fig. 10. RCM for Water - 2-Ethyl hexanol- 2-Ethyl hexyl acrylate by SRK model.

7. COLUMN SEQUENCING

Multicomponent mixtures are often separated into extra pure products. Most commonly, sequence of two product separator is used. Hence we have done simulation on column sequencing by using ASPEN PLUS[®]. Figure 11 shows the final outcome of the column sequencing. The RADFRAC module (used for rigorous 2- or 3- phase fractionation) was utilized for all the columns. The main aim of doing the column sequencing is to

isolate the product 2EHA with high purity. This is achieved by using distillation column in series. Total four distillation columns are required to separate all components. In the first column, the alcohol (2-EHOL, 2-ETH-01) is separated. In the second column the product (2-EHA, 2-ETH-02) is obtained with very high purity 99.28 percent by mass. In the third column we have used cyclohexane as the entrainer with feed rate 0.024 Kg/hr (2 kmol/hr). In this column, we have obtained AA in pure form for use as a recycle. In the last column, we get cyclohexane as the distillate where aqueous waste is obtained as the bottom stream.

Table 2. Composition of feed (10 kmol/hr)

Component	AA	2EHOL	2EHA	Water
Mole fraction	0.24	0.46	0.15	0.15
Mass fraction	0.161	0.557	0.257	0.025

Table 2 shows the composition of feed given to the column 1. As stated earlier we have considered 40% conversion and mole ratio of AA to 2EHOL 1:2. From this assumption mole fraction of each component is drawn. Since we are using batch reaction, 40% conversion is assumed. We have used Amberlyst-15, filtration is the only unit operation required for separation of catalyst from reaction mass. So with this as a feed to the first distillation column and with SRK as the base property method separation of all the components involved in the system was performed.

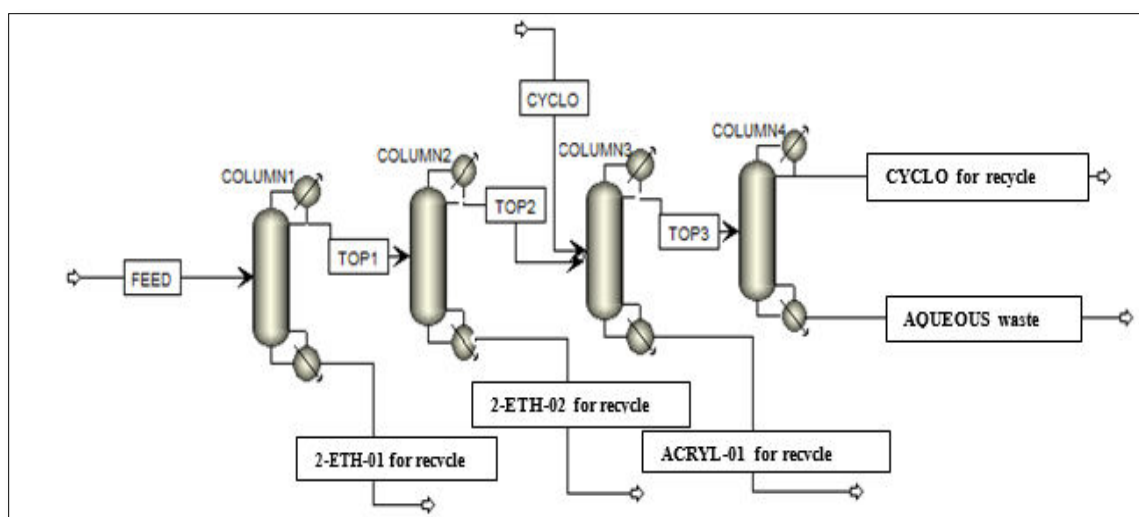


Fig. 11. Overview of complete flow sheet. Key: 2 ETH-01 → 2-Ethyl hexanol, 2 ETH-02 → 2-Ethyl hexyl acrylate, ACRYL → Acrylic acid, CYCLO → Cyclohexane.

The details about each of the column like number of stages, feed stage, reflux ratio, heat duty is shown in the following Table 3. In order to achieve high degree of separation, we have fixed certain parameters for each column. Some parameters are same for all four columns such as property set method SRK, convergence method (BROYDEN) and standard algorithm. Other parameters which are specific for that particular column are listed below (Table 3).

Table 3. Specifications for each column

Sr. No.	Specifications	Column 1	Column 2	Column 3	Column 4
1	Number of stages	20	18	16	18
2	Feed stage	11	11	13	10
3	Molar reflux ratio	2.00	3.05	7.00	2.90
4	Molar distillate rate Kmole/hr	5.40	3.906	3.50	2.01
5	Condenser duty, KJ/sec	-240.35	-207.42	-283.39	-46.29
6	Reboiler duty, KJ/sec	358.44	219.71	290.27	49.42
7	Molar flow rate of bottom, Kmole/hr	4.60	1.49	2.41	1.49
8	Mass flow rate of bottom, Kg/min	2.1	0.48	1.926	4.8
9	Purity of product stream % by mass	99.88 (2-ETH-01)	99.28 (2-ETH-02)	99.53 (ACRYL-01)	100 (CYCLO)

Column 1: When feed is given to first column at atmospheric temperature and pressure conditions, 2EHOL is obtained at bottom of column 1 (20th stage) with 99.88% by mass. The top stream from column 1 consists of AA, water, 2EHA. This top stream is given to the column 2 as a feed. Column 1 consists of 20 stages and feed is given on 11th stage. Figure 12 shows temperature and composition profile of column one.

Column 2: The feed to the column 2 consists of AA, 2EHA, water and only traces of 2EHOL. Column 2 consists of 18 stages and feed is given on 11th stage. In 2nd column, 2EHA separates out at bottom (18th stage) with 99.48% by mass. The top stream coming out of distillation column consists mainly of AA, water and traces of 2EHOL and 2EHA are present. Top stream is given as a feed to the column 3. Temperature and composition profile of column 2 is as shown (Fig. 13).

Column 3: The feed to the column 3 consists of AA and water. Column 3 consists of 16 stages here we have to separate AA from water but due to minimum boiling azeotrope we cannot separate AA completely from water [9]. According to literature [14] organic solvent having boiling point from 353.15 K to 403.15 K can be used as an entrainer for separation of AA from water. So in order to separate acrylic acid from water we have used cyclohexane as an entrainer. Cyclohexane is fed to column 3 at 2 kmol/hr (0.024 kg/hr). The overhead product contain the entrainer and water while AA separates out at bottom of distillation column. The temperature and composition profile of column 3 is as shown as below (Fig. 14).

Column 4: The feed to the column 4 consists of cyclohexane and water with negligible quantity of 2EHOL, AA and 2EHA. Column 4 consists of 18 stages and feed is given at 10th stage here we have to separate cyclohexane from water. In column 4, water separates out at bottom (18th stage) with 1.00 mass fraction. The top stream coming out of distillation column contain cyclohexane. This top stream can be given as a recycle to the column 3. The temperature and composition profile of column 4 is as shown (Fig. 15)

It can be clearly seen from these figures and discussion thereof, almost complete separation of all components is possible. Because of azeotrope between AA and water an entrainer is fed in 3rd column which is completely recovered in 4th column. Thus in this work we have conceptually designed and analysed the distillation column train for the separation of 2EHA resulting from the reaction of AA and 2EHOL.

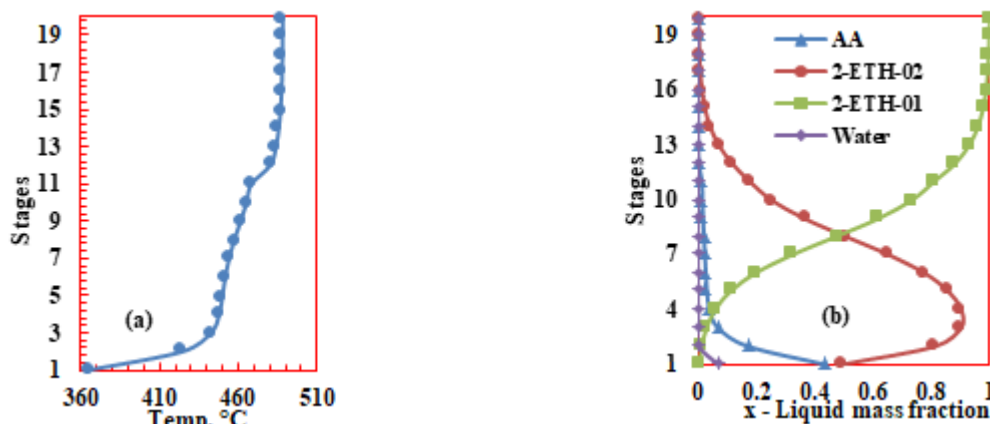


Fig. 12. Temperature and composition profile of column 1.

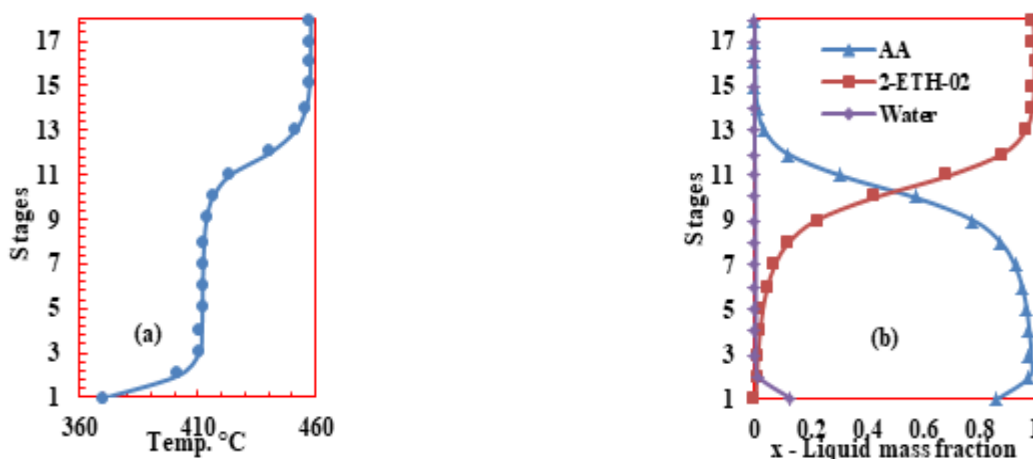


Fig. 13. Temperature and composition profile of column 2.

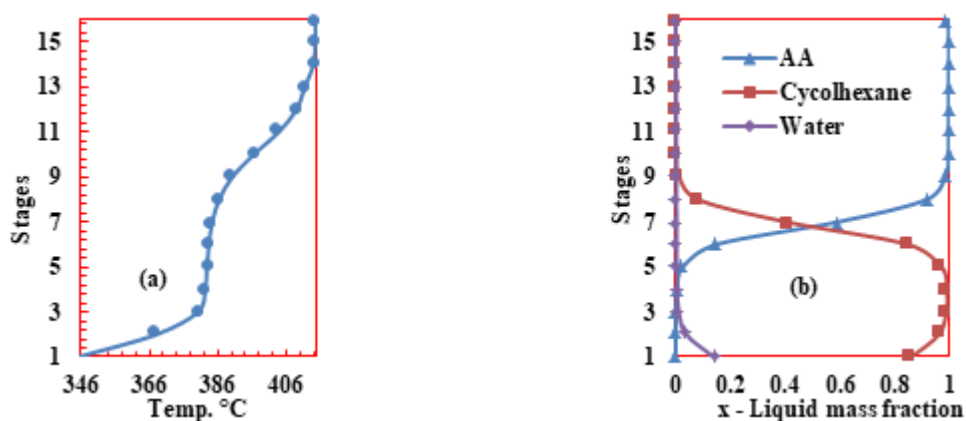


Fig. 14. Temperature and composition profile of column 3.

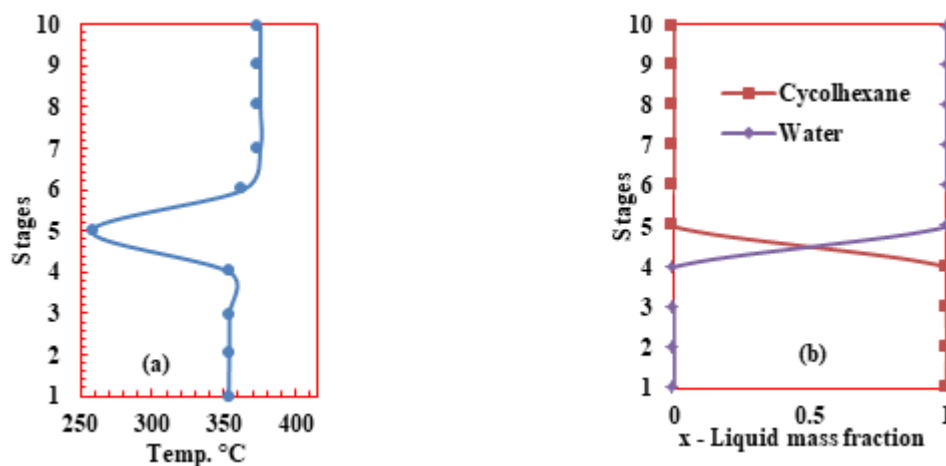


Fig. 15. Temperature and composition profile of column 4.

CONCLUSION

In this work separation of 2EHA from its reaction mixture is achieved by designing the distillation column sequence. Initially VLE studies were conducted. In order to assess the feasibility of separation, RCM technique was employed. It has been shown that all the components can be effectively separated using carefully designed distillation sequence.

NOTATION

V	-	Vapour phase
L	-	Liquid phase
P	-	Pressure (atm)
P_c	-	Critical Pressure
T	-	Temperature (°C)
T_c	-	Critical Temperature
R	-	Gas Constant
ϕ	-	Fugacity coefficient
γ_i	-	Activity coefficient of component i
AA	-	Acrylic acid
ACRYL	-	Acrylic acid
2EHOL	-	2-Ethyl hexanol
2 ETH-01	-	2-Ethyl hexanol
2EHA	-	2-Ethyl hexyl acrylate

2 ETH-02	-	2-Ethyl hexyl acrylate
CYCLO	-	Cyclohexane
VLE	-	Vapor liquid equilibrium
RCM	-	Residue Curve Map
SRK	-	Soave-Redlich-Kwong
PR	-	PENG-ROBINSON
NRTL	-	Non-Random Two-Liquid model
UNIQUAC	-	Universal QUAsi Chemical
UNIFAC	-	UNIQUAC Functional-group Activity Coefficients
x_i	-	Mole fraction of component i in liquid phase
y_i	-	Mole fraction of component i in vapor phase

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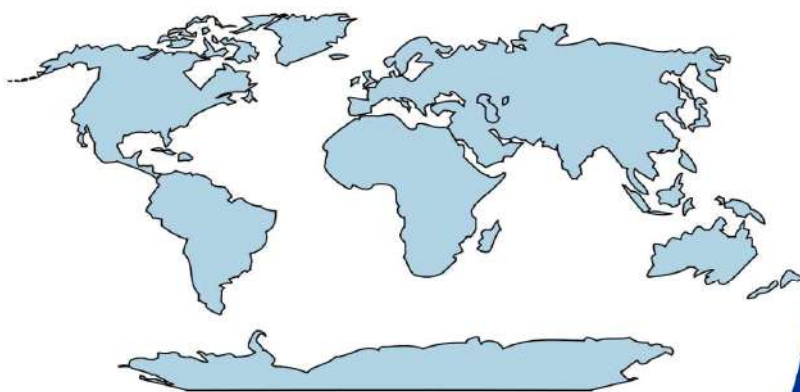
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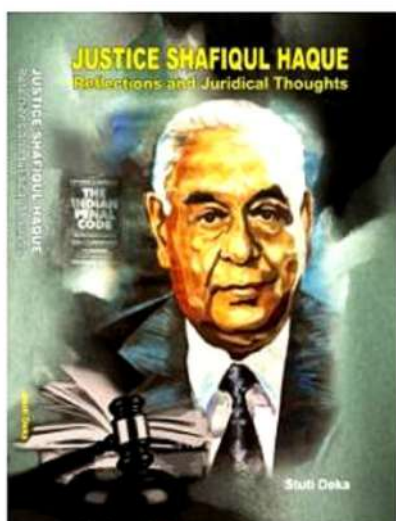


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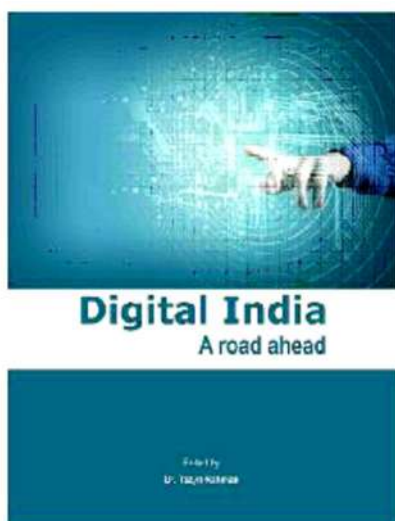
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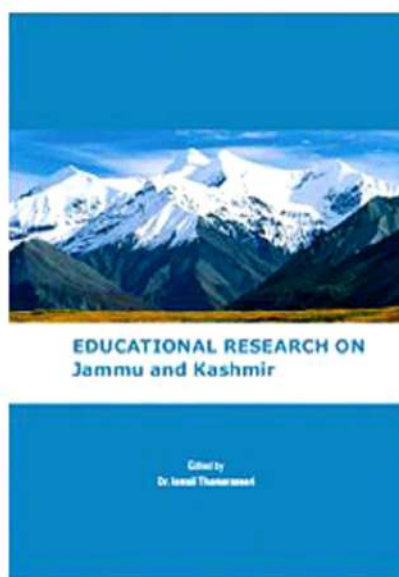
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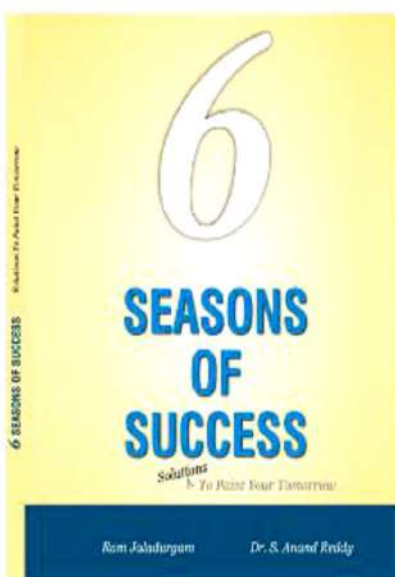
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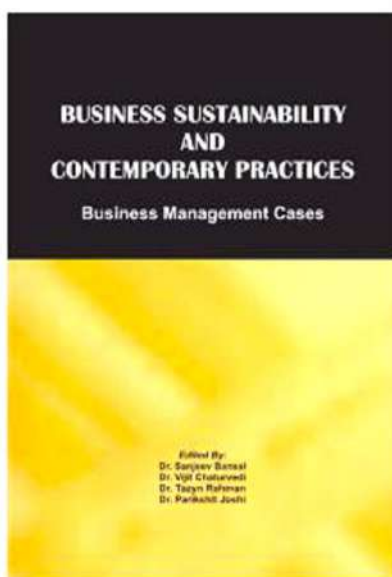
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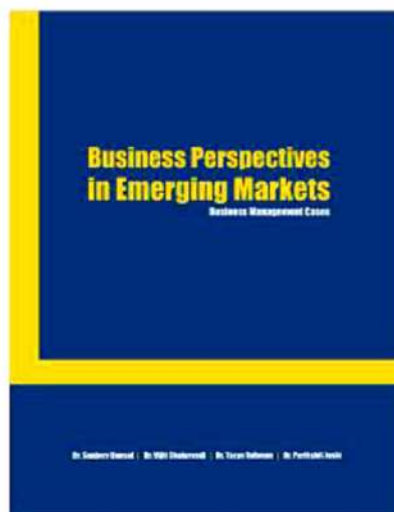
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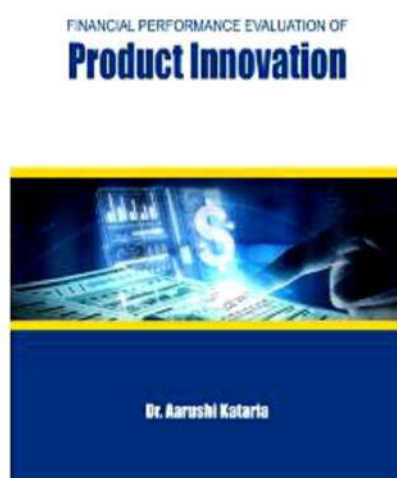
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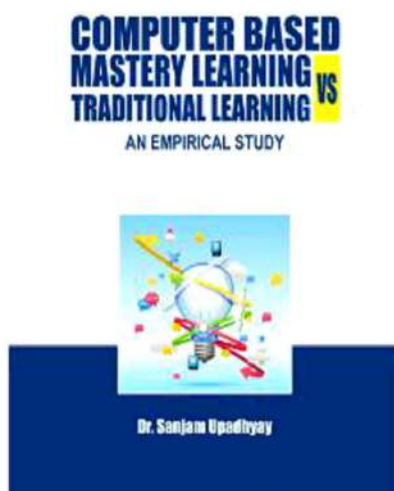
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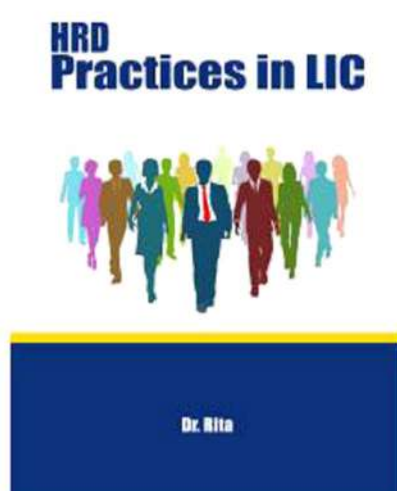
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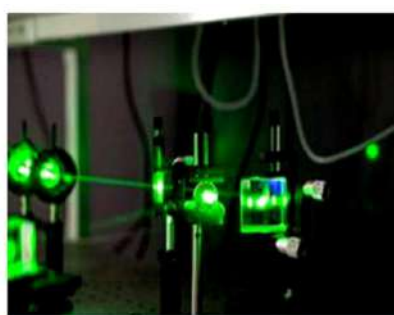


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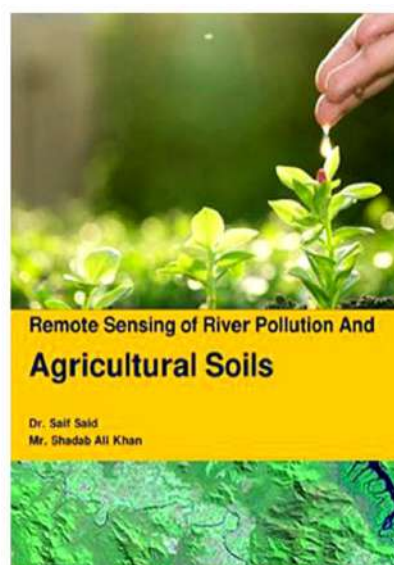
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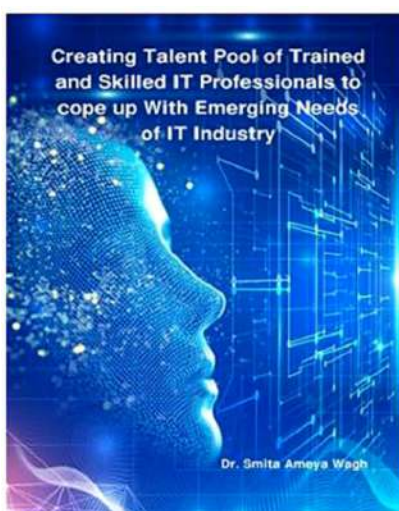
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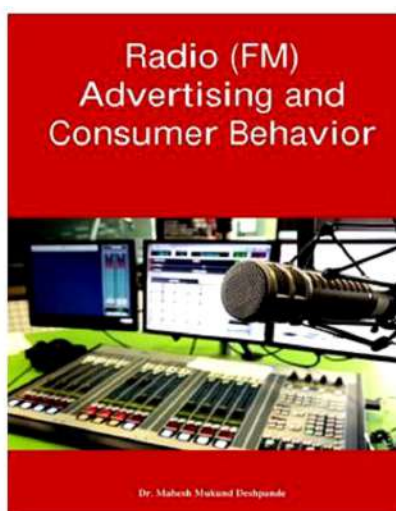
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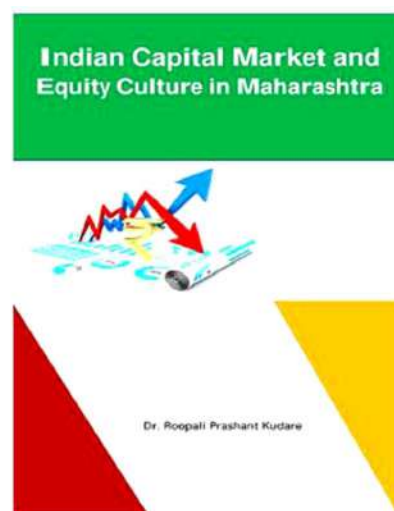
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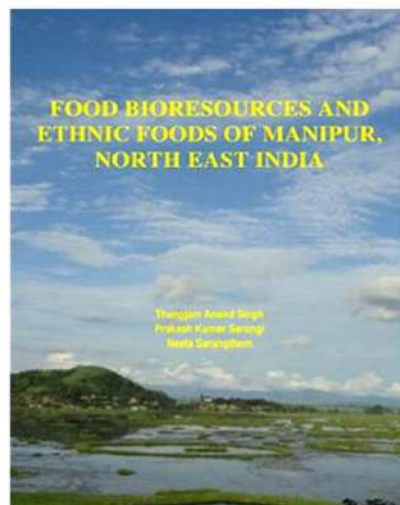
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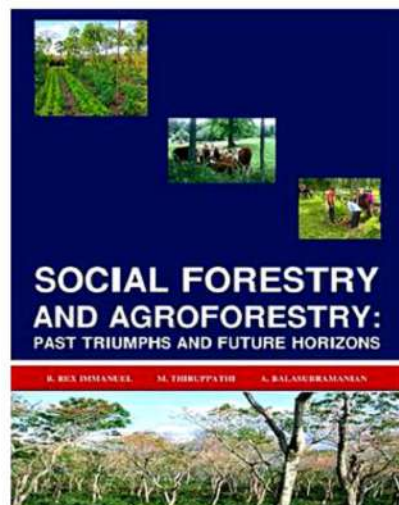
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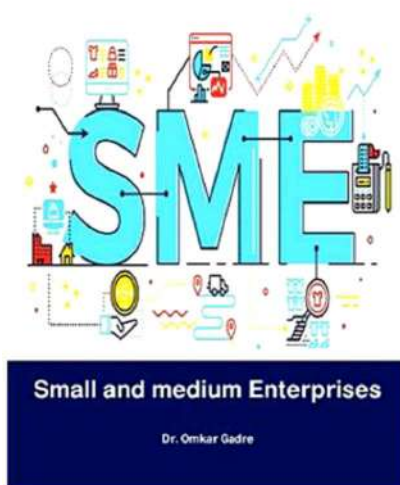
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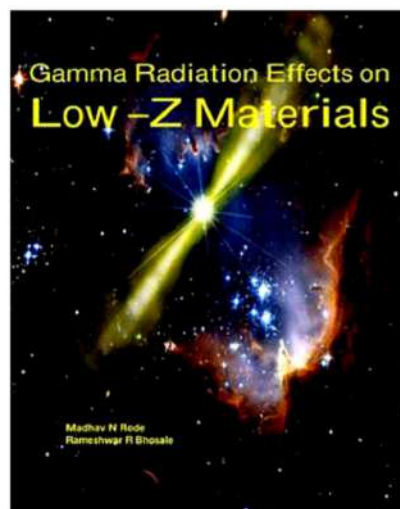
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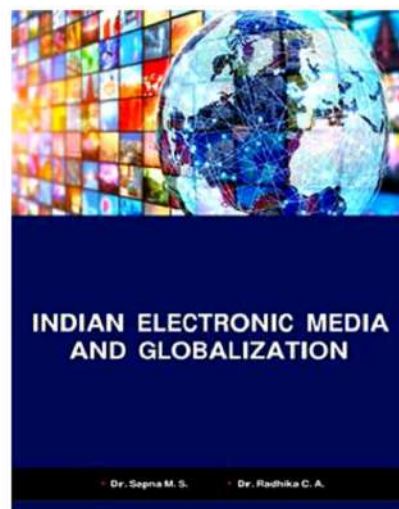
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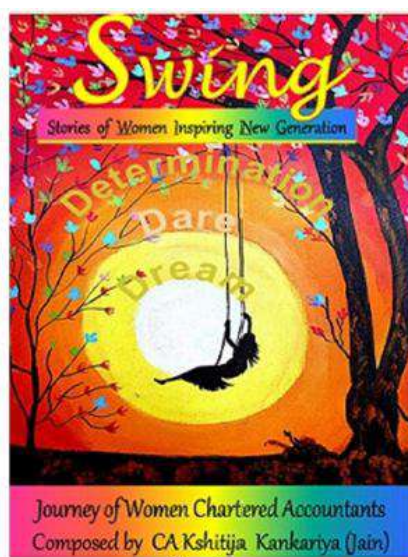
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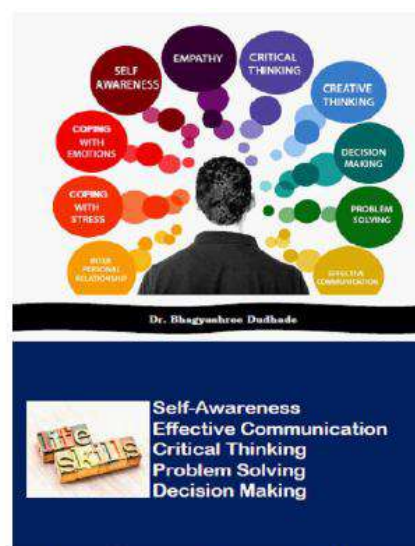
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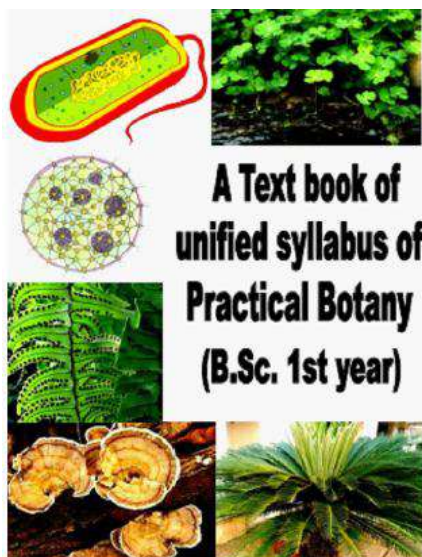
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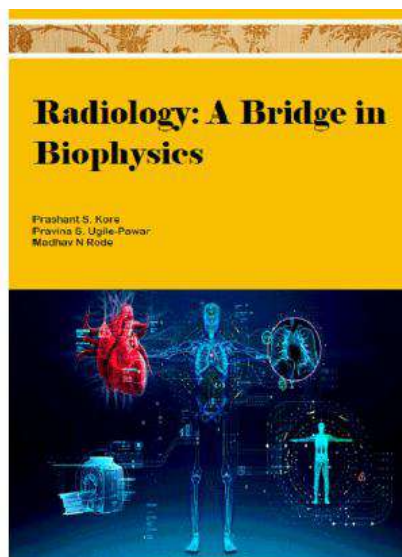
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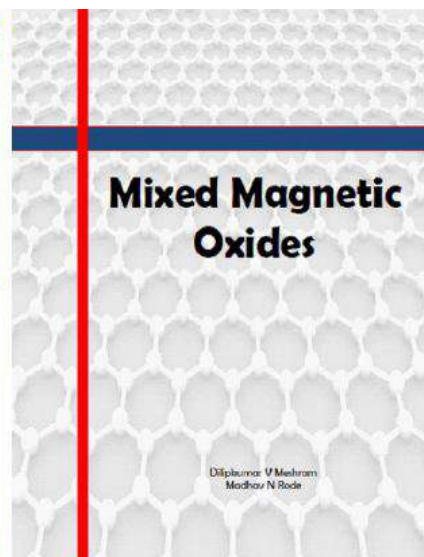
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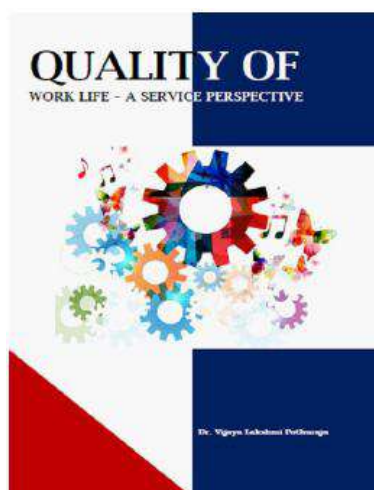


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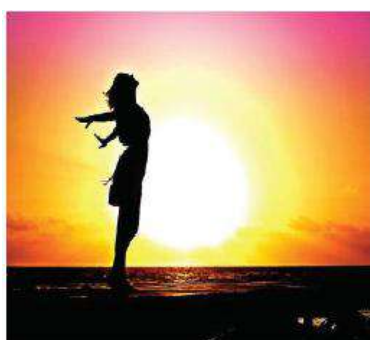
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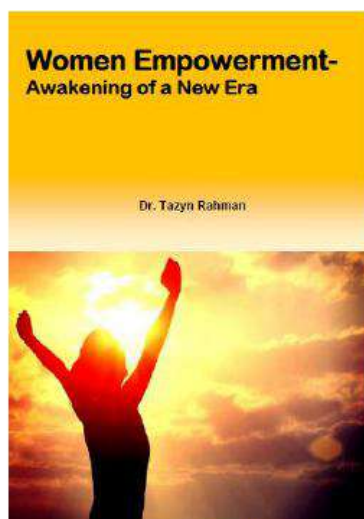


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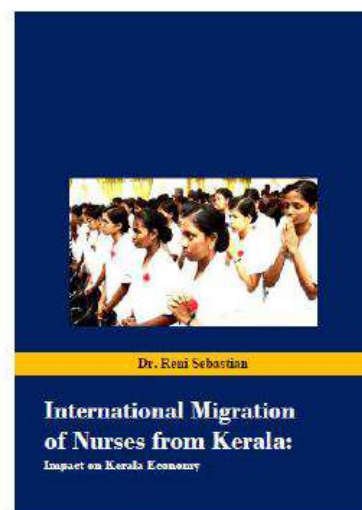


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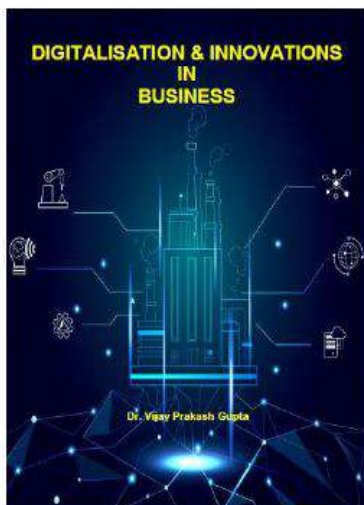


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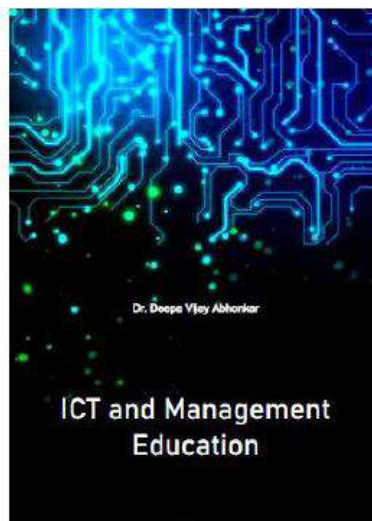
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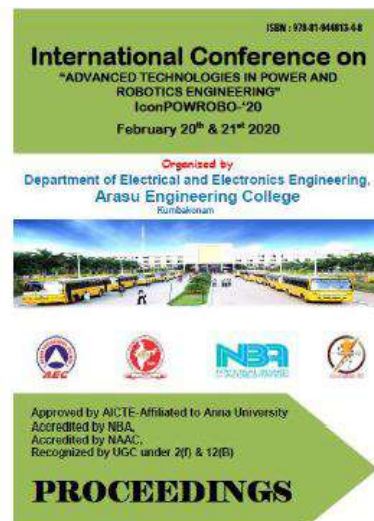
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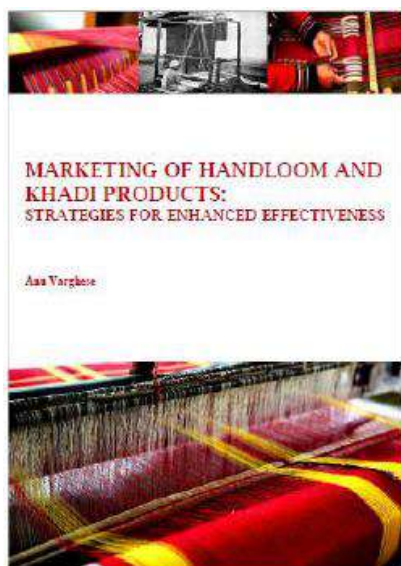
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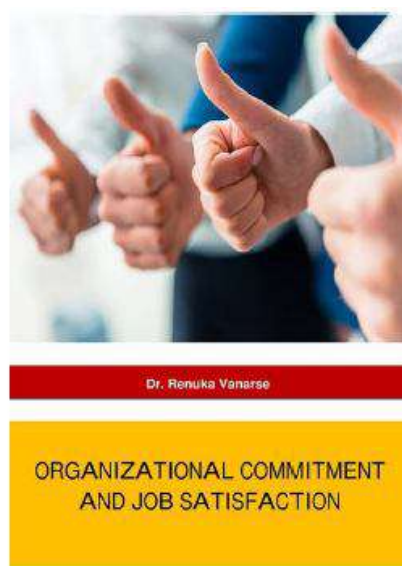
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