



## Consumer Awareness and Perceptions of Green Marketing: A Comprehensive Review

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### **Abstract:**

Green marketing, also known as sustainable marketing or environmental marketing, has gained significant attention in recent years as individuals and organizations increasingly prioritize environmental concerns. This abstract aims to provide an overview of consumer awareness regarding green marketing and its impact on consumer behavior and decision-making processes. The rise of environmental consciousness has led to a growing demand for eco-friendly products and services. As a result, companies have embraced green marketing strategies to align their offerings with consumer expectations and enhance their brand image. However, the effectiveness of these strategies hinges on consumers' understanding and awareness of green marketing claims. It examines the factors influencing consumer awareness of green marketing and the subsequent implications for consumer behavior. It explores various aspects, such as the influence of demographic characteristics, personal values, and environmental knowledge on consumer perceptions of green marketing practices. Consumer awareness of green marketing has increased over time; there remains a gap between consumers' expectations and companies' actual environmental performance.

### **Keywords:**

Green marketing, Sustainable marketing, Environmental marketing, Consumer awareness, Consumer perceptions

### **Introduction:**

Consumer awareness and perceptions of green marketing have become increasingly significant in today's environmentally conscious world [1]. As sustainability concerns rise, individuals and organizations alike are placing greater emphasis on environmentally friendly products and services. To meet these evolving consumer demands, companies are adopting green marketing strategies to align their offerings with environmental values and enhance their brand image. However, the success of these strategies hinges on consumer awareness and understanding of green marketing claims. It highlights the growing demand for eco-friendly products, the role of green marketing in meeting consumer expectations, and the need for consumer scrutiny and discernment in evaluating green marketing claims. The escalating global awareness of environmental issues, such as climate change, pollution, and resource depletion, has fueled a desire among consumers to make sustainable choices. Consequently, there has been a shift in consumer preferences towards products and services that demonstrate a commitment to environmental responsibility. In response, companies have recognized the significance of integrating environmental considerations into their marketing strategies to capture this growing market segment [2]. Green marketing encompasses a range of practices, including promoting eco-friendly features, highlighting sustainable production methods, and emphasizing corporate social responsibility initiatives. However, for these efforts to be successful, consumer awareness and perceptions of green marketing play a crucial role. Consumers need to understand the environmental benefits associated with products or services and trust that companies' claims are



## How to Use Motivation to Improve Workers Productivity and Efficiency

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### **Abstract:**

Most workers want motivation to feel good about their work and perform at their best. While some workers are driven by money, others are personally motivated by praise and awards. Employee productivity directly correlates with motivation levels at work. Motivated personnel are those who are consistent with their work, they perform their duties to the best of their abilities, which leads to a rise in production. For managers and leaders, employee motivation has always been a major challenge. Employees that lack motivation are more likely to put little to no effort into their work, stay away from the office as much as possible, leave the company if given the chance, and produce subpar work. Employees who feel inspired to work, however, are more likely to be persistent, creative and persistent. Employers must get to know their employees well in order to encourage them individually based on their unique wants and needs. In order to improve employee performance and productivity, we would like to emphasise the significance of motivation in the workplace in this Article.

### **Keywords:**

Employee Motivation, Importance, Performance.

### **Introduction:**

Employee motivation is the level of dedication, innovation, and vigour that employees in a firm bring to their work. Designing ways to motivate staff should be a top priority for managers whether the business is flourishing or failing. Small businesses and enterprises often struggle with employee motivation because their founders are constantly thinking about the many years they spent building those organizations, and as a result, they have trouble giving others meaningful tasks to complete. However, business owners need to be aware of the dangers of under motivated staff in smaller organizations. For years, it was believed that motivation comes only from the outside, but recent research has shown that the most powerful motivating forces come from within each employee. This is because each person carries a unique set of forces within them that, when identified and activated, cause them to become motivated businesses [3].

The degree of a need or desire, the value of the goal's incentive or reward, and the individual's and his or her peers' expectations are just a few of the conscious and unconscious factors that interact to determine motivation. These elements serve as the justifications for one's behaviour. A person's internal and external motivations for their desire and energy to regularly be interested in and committed to a career, role, or subject, or to make an effort to achieve a goal [1].



## Ethical Hacking and Its Role in Cybersecurity: Safeguarding Digital Assets

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### Abstract:

Ethical hacking, also known as penetration testing or white-hat hacking, has emerged as a vital component in the field of cybersecurity. Its role in safeguarding digital assets cannot be overstated, as organizations and individuals face increasingly sophisticated cyber threats. Ethical hacking involves authorized individuals, known as ethical hackers, employing hacking techniques to identify vulnerabilities within computer systems, networks, and applications. By adopting the mindset of a malicious hacker, ethical hackers proactively seek out weaknesses and potential entry points that could be exploited by cybercriminals. They perform comprehensive assessments, using a range of tools and methodologies, to expose vulnerabilities before they can be maliciously exploited. The key objective of ethical hacking is to help organizations strengthen their cybersecurity defenses. Ethical hacking encompasses various domains, including network security, web application security, wireless network security, and social engineering. It involves conducting thorough vulnerability assessments and penetration testing to identify weaknesses in infrastructure, applications, and human interactions.

### Keywords:

Ethical hacking, cybersecurity, digital assets, penetration testing, white-hat hacking, wireless network security

### Introduction:

In an increasingly interconnected and digital world, the security of our valuable digital assets has become paramount. Cyber threats, ranging from data breaches to unauthorized access, pose significant risks to individuals and organizations alike. To counter these risks and protect digital assets, the practice of ethical hacking has emerged as a critical component of cybersecurity. Ethical hacking, also known as penetration tests or white-hat hacking, involves authorized individuals utilizing hacking techniques to identify vulnerabilities within computer systems, networks, and applications. Unlike malicious hackers who exploit these vulnerabilities for personal gain, ethical hackers employ their skills and knowledge for the purpose of safeguarding digital assets. The role of ethical hacking in cybersecurity is twofold. Firstly, it serves as a proactive defense mechanism. By adopting the mindset of a potential attacker, ethical hackers meticulously assess systems and networks to uncover weaknesses and potential entry points. Through comprehensive vulnerability assessments and penetration testing, they expose vulnerabilities before they can be exploited by cybercriminals. This approach allows organizations to fortify their security measures, patch vulnerabilities, and reduce the risk of cyber attacks. Secondly, ethical hacking plays a vital role in raising awareness and educating individuals about cybersecurity [1]. Ethical hackers not only identify vulnerabilities, but they also share their findings with organizations, helping them understand the potential consequences of these vulnerabilities. By communicating the impact of cyber threats and promoting security best practices, ethical hackers contribute to creating a culture of security awareness among employees and end-users. As technology continues to advance rapidly, ethical hacking faces new



## Advances in Internal Combustion Engines: A Review of the Past Decades

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### **Abstract:**

The internal combustion engine (ICE) has been a fundamental technology in the transportation industry for over a century. In recent decades, significant advances have been made in improving the performance, efficiency, and environmental impact of ICEs. The review opens by discussing advancements in combustion technologies and engine design. Direct injection, turbocharging, and variable valve timing have all improved power output and fuel efficiency. Additionally, improvements in materials and manufacturing methods have produced lighter and more robust engine components, which have enhanced engine performance as a whole. Stricter emissions regulations have driven the development of catalytic converters, particulate filters, and selective catalytic reduction systems, significantly reducing harmful exhaust emissions. Furthermore, the implementation of hybridization and electrification technologies in ICEs has paved the way for cleaner and more efficient powertrains. The advancement is the integration of advanced engine management systems. The utilization of electronic control units (ECUs) and sophisticated engine control algorithms has enabled precise monitoring and optimization of engine parameters in real-time. This has led to improved fuel economy, reduced emissions, and enhanced overall vehicle performance.

### **Keywords:**

Internal combustion engines, Materials, Manufacturing techniques, Emission control technologies

### **Introduction:**

The internal combustion engine (ICE) has long been the workhorse of the transportation industry, powering various modes of transportation ranging from cars and trucks to ships and airplanes. Over the past few decades, significant advances have been made in improving the performance, efficiency, and environmental impact of internal combustion engines. These advancements have been driven by the need to meet increasingly stringent emission regulations, reduce fuel consumption, and address concerns about climate change [1]. One of the key areas of advancement is engine design. Engineers have made significant strides in optimizing the geometry and layout of engines to enhance their efficiency and power output. Direct injection, turbocharging, and variable valve timing are among the technologies that have been widely adopted, resulting in improved fuel economy and increased horsepower. Additionally, advancements in materials and manufacturing techniques have allowed for the production of lighter and more durable engine components, further improving overall engine performance. To address the growing concerns about emissions, extensive research has been conducted in emission control technologies. Stricter regulations have necessitated the development of innovative solutions to reduce harmful exhaust emissions [2]. The introduction of catalytic converters, particulate filters, and selective catalytic reduction systems has significantly reduced the levels of pollutants released by internal combustion engines, making them much cleaner and more environmentally friendly.



## Computational Fluid Dynamics (CFD) in Thermal Analysis and Design

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### **Abstract:**

Computational Fluid Dynamics (CFD) has emerged as a powerful tool in the field of mechanical engineering, enabling engineers to simulate and analyze fluid flow, heat transfer, and related phenomena with remarkable accuracy. The fundamental principles of CFD, including the governing equations, discretization methods, and turbulence modeling techniques, are briefly discussed. These principles serve as the foundation for simulating complex fluid flow and heat transfer phenomena. The application of CFD in thermal analysis is explored, highlighting its ability to analyze convective heat transfer in various systems such as pipes, heat exchangers, and electronic cooling devices. The insights gained from CFD simulations allow for a detailed understanding of fluid flow patterns, heat transfer rates, and temperature distribution within these systems. By employing CFD simulations, engineers can assess different design options, predict thermal performance, and optimize heat dissipation in systems such as heat sinks, fins, and electronic devices. This enables the development of more efficient and effective thermal management solutions.

### **Keywords:**

Computational Fluid Dynamics (CFD), Thermal Analysis, Design Optimization, Fluid Flow, Heat Transfer

### **Introduction:**

Computational Fluid Dynamics (CFD) has revolutionized the field of mechanical engineering by providing a powerful means to simulate and analyze fluid flow, heat transfer, and related phenomena. In the realm of thermal analysis and design, CFD has become an invaluable tool for engineers to gain deeper insights into the complex dynamics of heat transfer processes and optimize system performance. Thermal analysis involves understanding and predicting the behavior of heat transfer within various engineering systems [1]. It encompasses convective heat transfer in pipes, heat exchangers, and electronic cooling devices, as well as natural convection and radiation heat transfer in enclosures. Traditionally, such analyses relied on simplified analytical models or empirical correlations, which often fell short in capturing the intricacies of real-world scenarios. Enter Computational Fluid Dynamics (CFD), a numerical simulation technique that offers a comprehensive and detailed approach to thermal analysis. By employing CFD, engineers can accurately model fluid flow, heat transfer, and even multiphase phenomena, providing a deeper understanding of the underlying physics and aiding in the optimization of thermal design. The foundation of CFD lies in the fundamental governing equations of fluid flow and heat transfer, known as the Navier-Stokes equations. These equations, coupled with discretization methods like finite difference, finite volume, or finite element methods, allow engineers to discretize the system domain into computational grids and solve for fluid flow variables and temperature distribution. Turbulence modeling techniques, such as Reynolds-averaged Navier-Stokes models or Large Eddy Simulation, help capture the turbulent behavior of flows. Moreover, CFD plays a vital role in the analysis of multiphase flows, such as boiling,



## Quantum Computing: Algorithms, Implementations, and Potential Applications

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### **Abstract:**

Quantum computing has emerged as a promising field that leverages the principles of quantum mechanics to revolutionize computational capabilities. Quantum algorithms offer exponential speedup compared to classical counterparts for specific problem domains, such as factoring large numbers, database searching, and optimization. In this discuss notable quantum algorithms like Shor's algorithm, Grover's algorithm, and quantum simulation techniques. These algorithms exploit the inherent parallelism and superposition properties of quantum systems to solve complex problems more efficiently. Implementing quantum computing is a challenging task due to the need for precise control of quantum states and the susceptibility of quantum systems to decoherence. Various physical platforms, including superconducting circuits, trapped ions, and topological qubits, have shown promise in realizing quantum computers. Itdelve into the technical aspects and challenges associated with these implementations, such as error correction, scalability, and qubit connectivity. The potential applications of quantum computing span multiple domains, including cryptography, optimization, drug discovery, material science, and machine learning.

### **Keywords:**

Quantum computing, Algorithms, Implementations, Potential applications, Quantum mechanics, Exponential speedup, Shor's algorithm, Grover's algorithm, Quantum simulation, Superconducting circuits

### **Introduction:**

Quantum computing represents a groundbreaking paradigm shift in the field of computer science, leveraging the principles of quantum mechanics to unlock unprecedented computational capabilities. Traditional classical computers process information using bits that can represent either 0 or 1. In contrast, quantum computers employ quantum bits or qubits, which can exist in a superposition of both 0 and 1 simultaneously. This property allows quantum computers to explore multiple solutions simultaneously, enabling exponential speedup for certain computational problems compared to classical approaches [1]. One of the fundamental aspects of quantum computing lies in its algorithms. Notable examples include Shor's algorithm, which can efficiently factor large numbers and threaten current cryptographic methods, and Grover's algorithm, which provides a quadratic speedup for database searching. These algorithms harness the inherent parallelism and superposition properties of quantum systems, enabling more efficient and faster computation for specific problem domains. Implementing quantum computing is a complex endeavor due to the delicate nature of quantum systems. Quantum states are fragile and easily influenced by noise and environmental factors, leading to a phenomenon known as decoherence [2]. Various physical platforms, such as superconducting circuits, trapped ions, and topological qubits, have shown promise in realizing quantum computers. However, challenges related to error correction, scalability, and qubit connectivity must be overcome to build practical and robust quantum computing systems. While quantum computing is still in its early stages of development, recent advancements have demonstrated the feasibility and potential of this technology. However, practical

## **Detection of Colors based on Color Segmentation and Clustering of Images**

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### **Abstract:**

Segment-based image analysis techniques are becoming increasingly significant for creating and updating geographical information, primarily because satellite imagery's spatial resolution has improved. This paper provides a novel unsupervised K-means clustering approach for segmenting images based on colour data. We didn't utilise any training data in this. Two stages make up the overall project. Before the regions are clustered into a set of five classes using the K-means clustering algorithm, the colour separation of the satellite picture is first improved using decorrelation stretching. By eliminating feature calculation for each pixel in the image, it is possible to lower the computational cost with this two-step method. Although colour isn't typically utilised for image segmentation, it has a strong ability to distinguish between different sections of the image.

### **Keywords:**

Segmentation, Adaptive Histogram, K-means Clustering, PSNR

### **I. Introduction:**

#### **Image:**

An image [1] is an array, or a matrix, of square pixels (picture elements) arranged in columns and rows. An Image is a 2 dimensional capacity  $f(a, b)$ , where  $a$  and  $b$  are spatial directions and amplitude of  $f$  at any pair of coordinates  $(a, b)$  is called the power or gray level of the image.

#### **Image Processing:**

Image Processing includes methods to convert a real time object/ image into digital image form and perform some operations on it, in order that we can obtain an enhanced image or to obtain some useful information from it [2].

## A Novel Approach to improving Network stability and lifetime by enhancing leach in Wireless Sensor Networks

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### **Abstract:**

It has been researched how to reduce energy consumption and increase the lifespan of wireless sensor networks (WSNs). A major concern is the deployment of a transceiver station in a WSN. Assuming the base stations are static (fixed), they can move in certain circumstances to gather data from sensor nodes. This article takes into account the mobility of the base station to extend the WSN's lifetime and produce superior energy efficiency outcomes. In this study, we will apply the enhanced LEACH protocol, which employs an active-inactive strategy to reduce energy usage in wireless sensor networks. Comparing the results of the simulation to current routing protocols like SEP, LEACH, and DEEC, all performance measures will indicate a significant improvement.

### **Keywords:**

Wireless Sensor Network, MATLAB, Enhanced LEACH, Energy

### **I. Introduction:**

Wireless Networks comprise of various nodes which speak with each other over a remote station which have different sorts of systems: sensor system, specially appointed versatile systems, cell systems and satellite systems. As the requirement for imaginative and proficient method for data trade shoot up, remote systems are progressively being utilized to address these requests with constrained expenses to base prerequisites. Be that as it may, the developing fame and far reaching uses of remote systems are straightforwardly proportionate to their affinity for security misuse. The quality of its foundation additionally turns into the purpose of its most noteworthy defenselessness. Consequently diminishing the certainty level of the framework as it relates to accessibility, unwavering quality, information uprightness and security concerns. In an effective wireless sensor network, different routing protocols have been designed to select the optimized path in the IP network with less delay, large throughput, large lifetime and less packet loss to transfer the data to the destination via intermediate nodes [12]. Routing is the way toward choosing paths in a network along which to send arrange movement [14]. A routing protocol specifies how routers communicate with each other, disseminating information that enables them to select routes between any two nodes on a computer network [13]. Remote systems to be sure are a powerful method for correspondence for an assortment of stages (desktop, scratch pad, cell phone and so on.). Be that as it may, simply transporting information missing safe guarding the

## **Design and Optimization of Lightweight Structures for Aerospace Applications: A Review**

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### **Abstract:**

Lightweight structures play a crucial role in aerospace applications as they contribute to overall fuel efficiency, performance, and payload capacity of aircraft. The main objective is to achieve weight reduction without compromising structural integrity, while considering the specific requirements and constraints of the aerospace industry. The design process begins with a thorough understanding of the mission requirements, structural constraints, and material properties. Advanced materials such as composites, alloys, and polymers offer superior strength-to-weight ratios and are extensively utilized. By leveraging these materials, engineers can create innovative designs that significantly reduce the structural mass. To achieve optimal lightweight designs, computer-aided design (CAD) and finite element analysis (FEA) techniques are employed. CAD facilitates the creation of complex geometries with precise specifications, allowing for streamlined manufacturing processes. FEA helps evaluate the structural integrity and performance characteristics by subjecting the virtual models to various loading conditions. This analysis enables engineers to identify potential stress concentrations, deflections, and failure modes, guiding subsequent design modifications. Optimization algorithms play a crucial role in achieving lightweight structures. Techniques such as topology optimization, size optimization, and shape optimization are employed to refine the initial designs. Topology optimization algorithms identify the optimal material distribution within the structure, eliminating unnecessary material and reducing weight while maintaining structural integrity. Size optimization focuses on determining the optimal dimensions of the structural components, further reducing weight and ensuring adequate strength.

### **Keywords:**

Lightweight structures, Aerospace applications, Design optimization, Advanced materials, Composites, Alloys, Polymers

### **Introduction:**

In the aerospace industry, the pursuit of lightweight structures has become a paramount objective. The need to enhance fuel efficiency, increase payload capacity, and improve overall performance has led to a continuous quest for innovative design and optimization techniques [1]. Lightweight structures offer a significant advantage by reducing the mass of aerospace components without compromising their structural integrity. The design process begins with a comprehensive understanding of mission requirements, structural constraints, and the properties of advanced materials. Computer-aided design (CAD) and finite element analysis (FEA) techniques play a crucial role in the development of lightweight structures. CAD enables engineers to create intricate geometries with precise specifications, facilitating the optimization process. FEA allows for the virtual testing of structures under various loading conditions, enabling the identification of potential stress concentrations, deflections, and failure modes. By analyzing and modifying these virtual models, engineers can refine the design iteratively, ensuring optimal structural performance. To achieve lightweight designs, optimization algorithms are employed. These algorithms explore different design configurations, utilizing techniques such as topology optimization, size optimization, and shape optimization. Topology optimization identifies the

## Neutralistic Approach for Detecting Infection in Human Tissues

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### Abstract:

Infection in human tissues has a serious impact on people's life and health. Current research proposes an efficient approach to identify infection in human tissues. It is necessary to develop automatic methods in order to increase the accuracy of diagnosis for multi-type human tissues diseases. In this paper, infection in human tissues could be identified by a digital image processing. Here, we describe the establishment of tissue-like assemblies for human lung and neuronal tissue that we infected with a variety of viruses.

### Keywords:

Human Tissue, MATLAB, Radial Basis Function, Support Vector Machine, Bayesian, KNN Classifiers, K-Means Clustering

**I. Introduction:** Receivers have reported suffering from numerous infection clusters linked to allograft transplantation and negative results. To recipients of vascularized organs or tissues including bone, tendon, skin, or corneas, these clusters comprised infections that were spread. The precise risk of infection associated with organ or tissue transplantation is unknown, although it is influenced by a number of variables, including the epidemiology of particular infectious exposures, the organism's tissue tropism, and the possible pathogens' transmissibility during transplantation. There aren't much data on the microbial traits that determine transmissibility, not even for established pathogens. Similar to this, there are little data on the best methods for determining the hazards of allograft-associated transmission for new pathogens or pathogens that are discovered in new regions or populations, or emerging pathogens.

The number of organ and tissue transplants is rising daily. Prospective evaluation of the risk for allograft-derived infection is challenging due to the wide range of possible pathogens, technologies needed for detection, and individual recipient heterogeneity. These infections need to be separated from other illnesses linked to transplants, such as nosocomial infections and infections caused by tainted tissue during handling or processing.

Organ and tissue donors are assessed to determine which ones may be more likely to have transmissible diseases in an effort to reduce donor-derived illnesses after transplantation. The study of the possible donor's epidemiologic and clinical history (also known as donor screening) and the findings of communicable disease tests (also known as donor testing) are the current standards for donor evaluation. The findings of a physical examination and the donor's medical history are evaluated as part of the donor screening process, and the donor is also screened for behavioral risk factors linked to a higher incidence of communicable diseases (typically via a questionnaire). Donor testing comprises the donor's microbiological culture data (such as blood,

**A STUDY ON CONVENTIONAL AND NEW INTERNAL COMBUSTION ENGINE AND  
THEIR EFFECTS ON THE ENVIRONMENT****Gurpreet Singh<sup>1</sup> Dhiraj Parkash Dhiman<sup>2</sup>,**

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**Abstract:**

This paper will present one idea of how to improve overall internal combustion engine efficiency. We try to make a brief description of most important and basic parts of a new internal combustion engine. Described engine have several advantages over conventional IC engine.

**Keywords:** Internal combustion engine, fuels, motor vehicle, generators.

**Introduction:**

Why do internal combustion (IC) engine studies still need to be done? For power generation, trade, and transportation, society continues to rely significantly on IC engines. Because of this, engine research has a rich history dating back more than a century and is still active today. Model airplane engines that fit in the hand and massive marine engines that are as large as a four story structure are two sizes of reciprocating internal combustion (IC) engines. In addition to the 750 million passenger cars on the planet's roads, IC engines also power a wide range of utility devices (such as pumps, mowers, chainsaws, portable generators, etc.), tractors, propeller aircraft, ocean liners, and ships. Additionally, there are 250 million vehicles in the U.S. alone, or nearly one vehicle per person. In 2012, 60 million cars will be produced worldwide, a 50% increase from ten years ago. A portion of this growth can be attributed to the fact that China, which now accounts for one-fourth of global auto production and in 2011, became the world's largest auto market. In the European Union, where cars make up a third of the global market, diesel engines account for half of all vehicle power. Engine research therefore includes both diesel and gasoline engines, and even modest increases in their efficiency have a significant influence on both economy and emissions. Fuel is burned in enormous amounts due to the sheer number of cars and engines on the world. In fact, IC engines use 70% of the 86 million barrels of crude oil that we use each day. Additionally, the U.S. uses 10 million barrels per day for light-duty and heavy-duty vehicles combined, which equates to around 2.5 gallons per person daily. Since there aren't enough fuel reserves to cover this demand, 62% of the fuel is imported, costing the United States nearly \$1 billion per day at the current price of \$80 per barrel. This price will undoubtedly go up if global demand for vehicle fuels rises as a result of continued economic growth. This extensive usage of oil is accompanied by the release of pollutants including nitric oxides (NOx) and particulates (soot), as well as the creation of CO<sub>2</sub>. Most countries have established strict car emissions standards that are always being tightened since pollutant emissions have detrimental effects on both the environment and human health. Additionally, the 37 billion tons of CO<sub>2</sub> produced globally each year contributes to Green House Gases (GHG), which some worry may cause climate change with unknown effects. Fuel consumption would need to be drastically reduced in order to noticeably alter GHG trends. For instance, according to the International Energy Agency's plan, all automobiles globally should consume 30 to 50 percent less fuel per kilometer by 2050 than they do today. The goal is to limit the global average temperature rise which some climatologists project for 2050 (the 2DS scenario). Government mandates requiring such reductions impose a tall order

**AN ANALYSIS OF A COMPRESSION SCHEME FOR WIRELESS SENSOR NETWORKS****Baldeep Singh<sup>1</sup> Madhvi Arya<sup>2</sup>**

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**Abstract:**

We provide a succinct overview of compressive sensing (CS) used on the wireless sensor web in this paper. Since the majority of the energy used in wireless sensor networks (WSNs) is utilised for sampling and transmission, the sampling rate of the sensors dictates the rate of its energy consumption. CS theory used to minimise the number of samples that sensor nodes took in order to conserve energy in WSNs and hence increase the network lifetime. Additionally, CS is used to collect data for massive wireless sensor networks (WSNs), which are networks of thousands of sensors used for projects like infrastructure or environmental monitoring. Utilising compressive data gathering (CDG) is a development that aids in overcoming the difficulties posed by high communication costs.

**Keywords:** Compressive Sensing, WSNs, Compressive Data Gathering, Nyquist, Sparsity, Incoherence.

**Introduction:**

Recent developments in micro-electro-mechanical systems (MEMS) technology, wireless communications, and digital electronics have led to the development of low-cost, low-force, multifunctional sensor nodes that are small in size and communicate over short distances. These tiny sensor nodes, which are made up of sensing, information processing, and communication components, are based solely on the conception of sensor networks that rely on the cooperation of many customers. The following two methods are used to deploy sensors, which have been significantly improved by sensor networks:

- Sensors can be placed away from the actual phenomenon, i.e. Something known by sense perception. In this advance, large sensors that use some complex techniques to recognize the objects from environmental noise .
- Several sensors that perform only sensing can be deployed. The sides of the sensors and communications topology are carefully organized. They transmit time series of the sensed phenomenon to the central nodes where computations are done and the data are blended.

Since sensor nodes may produce a lot of redundant data, it is possible to aggregate comparable packets from different nodes to reduce the amount of transmissions. It can be concluded that calculation uses less energy than communication, leading to significant energy savings. Regarding energy economy and functionality, the location of the washbasin or cluster-head is also essential. We use compressive sensing (CS) related techniques and incorporate them into a WSN system for information collecting because of the asymmetrical structure of WSNs.

**Compressive Sensing Overview:**

The well-known Shannon sampling theorem, which states that the sampling rate must be twice the maximum frequency, is used in the conventional method of reconstructing signals or images from measurable data. Similar to this, according to the basic theorem of linear algebra, reconstruction is

**AN ANALYSIS OF THE IMPACT OF JOB SATISFACTION ON EMPLOYEE PERFORMANCE****Aaseesdeep Singh<sup>1</sup> Prabhjot Kaur<sup>2</sup>**

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**Abstract:**

When the workers and individuals engaged are able to derive job satisfaction from their job performances and other related elements, an organization is able to succeed. Human resources are recognized as the most important and valuable asset among all the resources of the company, and they are crucial to the effective operation of all the other resources. When the human resources are content with their work, they will do everything in their power to help the organization run smoothly and increase production. Job satisfaction refers to a person's level of contentment with their position; this idea is highly advantageous to both the organization's structure and its employees. This research paper's major goal is to pinpoint the variables that affect job happiness. Theories of job satisfaction, factors that affect job satisfaction and methods for measuring job satisfaction are the primary topics that have been considered.

**Keywords:** Job Satisfaction, Factors, Organization, Employees, Development, Measurement

**Introduction:**

The phrase "job satisfaction" describes a worker's overall perspective on his or her position. According to Locke, job satisfaction is a "pleasurable or positive emotional state resulting from the appraisal of one's job or job experiences." A person's job will be rewarding to the extent that it satisfies his primary need and is compatible with his expectations and values. In the workplace, job happiness is a crucial component. Employee satisfaction increases output, and the business environment is generally conducive. The contented employees are imaginative and creative. Increased job satisfaction is a result of the same variables that support high morale and a positive attitude. The critical elements play a role in the better level of job satisfaction.

- A difficult and accountable job.
- A lot of promotion possibilities.
- The management's impartial handling.
- Innovation and creativity in employment security concepts.
- Competitive pay and benefits.
- Freedom in the workplace.
- The use of participative management.
- Welfare amenities like a canteen, medical care, and uniforms;
- A pattern of spontaneous "TOP TO BOTTOM" and "BOTTOM TO TOP" communication [1].

A complex combination of intellect, emotion, and inclinations is represented by job satisfaction as well. The degree to which a person is content or unsatisfied with his or her job can be determined in a number of ways, but there is no one precise approach to measure job satisfaction. An employee's satisfaction with the many aspects of their job is measured using a questionnaire, and the total of all

**ANALYZING GA AND ACO TO SOLVE THE PROBLEM OF TRAVELING SALESMEN**

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**Abstract:**

Despite the widespread and quick advancements in technology today, several complex real-world NP problems continue to baffle researchers. The Travelling Salesman Problem (TSP), Knapsack Problem, Graph Colouring, Vehicle Routing, and other similarly complex puzzles have attracted the interest of numerous academics over the past few decades. TSP has shown to be a useful testing ground for comparing a variety of both old and new algorithms. The TSP issue appears to be fairly straightforward; however it is actually one of the more challenging traditional optimisation problems. It has been demonstrated that trying to solve TSP using standard methods may take more years than we have lived on the planet. Consequently, using heuristic techniques is the only practical choice left.

**Keywords:** Travelling Salesman Problem, Ant Colony Optimization, Genetic Algorithm

**I. INTRODUCTION**

For many years, nature has served as the primary source of inspiration for tackling challenging and difficult problems. Researchers are increasingly using nature-inspired heuristic algorithms to tackle NP-hard issues including the Travelling Salesman Problem (TSP), the Knapsack Problem, and vehicle routing. The Travelling Salesman issue is an example of a traditional optimisation issue that cannot be solved using standard methods, especially as the number of cities rises. It will take years to discover the best answer if one uses the standard way to solve TSP and takes into account all feasible tours. Heuristic algorithms are therefore a suitable answer to this issue. In this study, the commonly utilised heuristics Ant Colony Optimisation and Genetic Algorithm to solve TSP are taken into consideration. ACO and GA are contrasted for TSP situations in this study. TSP is shown as:

The TSP is the issue of designing a tour that visits each city exactly once while minimising the overall distance travelled, given a set of cities and known distances between each pair of cities.

The travelling salesman issue [1] is the most popular and extensively researched optimisation problem. Almost all novel approaches to optimisation problems are tested on TSP initially. TSP can be represented as an undirected weighted graph, where cities serve as the graph's vertices, paths serve as its edges, and the length of an edge is equal to the path's distance. It is a minimization problem that begins and ends at a given vertex, visiting each vertex precisely once in between. Despite the fact that it appears straightforward, it is one of the classic optimisation problems that cannot be resolved using a traditional mathematical strategy. Researchers have suggested a number of meta-heuristic ways to handle these kinds of problems, including Ant Colony Optimisation (ACO)[3], Particle Swarm Optimisation (PSO), Simulated Annealing (SA), and Genetic Algorithm (GA)[18]. Here, we'll talk about the ACO and GA methods to TSP. The genetic algorithm is represented as:

One of the first and most effective optimisation methods based on evolution is the genetic algorithm [18]. Search algorithms based on the principles of biological evolution's natural selection process are known as genetic algorithms (GA). The most fundamental idea is that the strong adapt and thrive while the weak perish. In other words, the "Survival of the Fittest" theory and evolution serve as the

## DETERMINING BEARING DEFECTS WITH DIGITAL IMAGE PROCESSING

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**Abstract:**

A major cause of poor quality and embarrassing situations for manufacturers are bearing flaws. The majority of the inspection procedures used in these businesses are laborious and manual. More thorough and accurate inspection procedures are needed to improve bearing defect identification accuracy. In order to detect potential defects, this research constructs a Bearing Defect Recognizer that combines local threshold holding with computer vision technology. The recognizer produces a less error-prone inspection method in real time and efficiently finds bearing problems. Primarily, the recognizer uses an image acquisition device to acquire digital bearing images and then transforms the RGB images into binary images using local threshold approaches and restoration processes. The area of the defective section and a computation of the potential defective and non-defective bearing are later outputs of the processed image. The results of the experiments demonstrate the proposed approach's sensitivity and dependability in identifying missing bearing balls as well as faults on the inner and outer races of bearings. The current system has a 94% accuracy rate.

**Keywords:** Defect detection; Image processing; Computer vision; Thresholding; Counting number of defects

**I. Introduction:**

All steel industries strive to create a variety of steel products that are competitive. The productivity and quality of the steel produced by each industry determine how much the competition is enhanced. There have been significant losses in this industry as a result of defective items. The majority of production-related flaws are still found via hand inspection. Inspectors' task is exceedingly time-consuming and tedious. About 70% of the population can be identified. Additionally, as one gets tired, visual inspection loses efficiency quickly. Steel bearing samples are increasingly being examined using digital image processing techniques.

As technology advances, steel is increasingly used to manufacture items, especially those that require ultra-lightweight and modular steel components like bearings. According to industry statistics, we have discovered that when bearings are manufactured utilising image processing, the steel material used in their construction is susceptible to a variety of problems. Therefore, we advise exploring a fully reliable system that makes use of image processing techniques (such as image segmentation and non-smooth corner detection) in order to develop a cost-effective Total Quality Management system for manufacturing units that would enable an eco-system of continuous monitoring and improvement while also lowering the cost.

This paper is organized into Section I includes Introduction, Section II Related work, Section III Model Presentation, Section IV Results and Section V Conclusion and future work.

**II. Related Work Done:**

Yonel, Izzet, and Dalci, K. The application of induction motor stator current signature analysis (MCSA) using Park's transform for the detection of rolling element bearing defects in three-phase induction motor is being studied by I Brahim Senol. The radial basis function (RBF) neural networks algorithm is briefly

**EFFECT OF GREEN BANKING ON INDIAN CUSTOMER****Manav Gupta<sup>1</sup> Muzafar Ahmed Ganai<sup>2</sup>**

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**Abstract:**

Green banking is a trend of the banking enterprise. In a softer facet banks do now no longer make a contribution directly to the inexperienced residence impact besides the use of strength saving machine and technique. Banks has faces in contributing to international warming crisis, i.e. using traditional/conservative structures and technique and inspiring Green House Gases emitting industries. Later is extra is treacherous for the mankind. Hence there's want and help that the banking enterprise have to improve to the event at considered necessary times. As the ocean tiers are growing and temperature is popping up at very excessive charges its miles the time to introspect and act as a consequence to save the planet. The evaluation changed into carried out with the aid of using the use of Chi-rectangular test. The examiner attempts to make an honest attempt to recognize the attention of the purchaser approximately the inexperienced banking merchandise, connectedness of clients toward the inexperienced practices and accessibility of inexperienced merchandise to the clients with the aid of using the personal zone banks. Banking aren't bodily associated with the environment, however the outside effect in their patron is substantial. So there's want for banks to undertake green techniques into their operations, buildings, investments and financing techniques.

**Keywords:** Green Banking, Green Banking Strategies, Indian Banks Initiatives, test, customer satisfaction

**1. Introduction**

First of all, environmental troubles are one of the reasons why the inexperienced advertising and marketing emerged. According to the American Marketing Association, inexperienced advertising and marketing is the advertising and marketing of merchandise which are presumed to be environmentally secure Green advertising and marketing refers to holistic advertising and marketing idea in which the product, advertising and marketing intake on disposal of services and products happen in a way this is much less damaging to the surroundings with developing focus approximately the results of global warming, non-biodegradable stable waste, dangerous effect of pollution etc., each manufacturers and customers are turning into an increasing number of touchy to the want for transfer into inexperienced services and products. Many human beings consider that inexperienced advertising and marketing refers totally to the advertising and marketing and marketing of merchandise with environmental characteristics. Generally phrases like phosphate free, recyclable, and refillable, ozone pleasant and surroundings pleasant are maximum of the matters customers frequently related to inexperienced advertising and marketing. Thus inexperienced advertising and marketing consists of a vast variety of sports, like product modification, modifications to the production process, packaging modifications, [1] in addition to modifying marketing and marketing. The economic establishments have an effect on the monetary improvement and increase of the usa each in phrases of Quantity and Quality, there through adopting diverse strategies for monetary increase. As environmental problem has gained more attention, strain is being located on all industries, together with economic establishments to put in force Green Initiatives. The banking enterprise affects monetary increase and improvement, each in phrases of best

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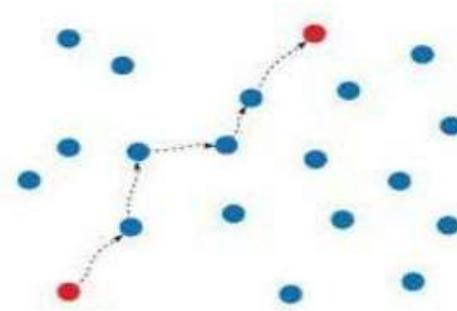
**Abstract:**

Communication based on wireless sensor networks happens across a wireless channel. There are numerous users in a large area, for instance, mobile users. Numerous towers in the local vicinity serve as nodes, or sensors, in wireless sensor networks. Thus, communication takes place between nodes without the need for a physical connection. In other words, data is transmitted from a transmitter node to a sink node, which connects to an external base station or to each other via a large number of intermediary nodes. Numerous nodes make up a network, with one serving as a source node and one or more serving as a destination node. Wireless sensor networks have the benefit of operating unattended in severe environments, where manual human monitoring methods are unsafe and ineffective.

**Keywords:** Wireless sensor network; Sensor; Bacteria Foraging Optimization; Routing; Nodes

## 1. INTRODUCTION TO WIRELESS SENSOR NETWORK

Thousands of sensor nodes make up a wireless sensor network (WSN), which is able to sense and analyse events in wireless communication systems. By detecting electronic circumstances relevant to the environment around the sensor and converting them into electrical signals, these nodes or sensors process events occurring nearby. From the transmitting node to the sink node, data is transmitted, which interact with one another either directly to an external base station or through a large number of intermediary nodes. The cluster will cover a larger geographic area if there are more nodes installed. A sensor that detects changes in the environment routes data packets to a destination sensor that is present in the sensor field. This procedure is shown in Figure 1.1, where the source and destination nodes are denoted by red dots. To guide the path until the destination or sink node was reached, these sensors talked with intermediate nodes. Low cost, multipurpose wireless sensor nodes are used to gather data from an area of interest and relay it to a sink node.



**Figure 1.1:** Deployment of sensors in environment [2]

### 1.1 Operating Stages of WSN Network

The five primary stages of a typical wireless sensor network are the cogitate stage, node establishment, post establishment stage, working stage, and post working stage. Typical sensor networks are run in a

**IMPACT OF ONLINE RECRUITMENT IN INDIA****Omkar Kaur<sup>1</sup> Vishali<sup>2</sup>**

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**Abstract:**

Online recruitment, additionally called e-recruitment is one of the international tendencies for HR functions .E-Recruitment is an influential a part of an enterprise for human useful resource making plans and taken into consideration as their aggressive strength. Competent human assets on the proper positions within side the enterprise is an essential useful resource and may be a center competency or a strategic gain for it. The goal of the e- recruitment system is to attain the variety and the exceptional of personnel that may be decided on which will assist the enterprise to gain its goals and objectives. With the identical goal, e-recruitment allows to create a pool of potential personnel for the enterprise so that, the control can pick out the proper candidate for the proper activity from this pool. By the enterprise, e –recruitment is the usage of generation, specifically web-based generation for the cause of figuring out and attracting high-satisfactory personnel. Through e recruitment, employers can keep assets through attaining large variety of potential personnel and facilitation of the recruitment system like employers marketing and marketing and personnel making activity programs online .In this aggressive international with growing flexibility within side the labor market, e-recruitment is turning into extremely critical in each business.

**Keywords:** HR department, Benefits, e-recruitment, work, method, negative impact

**1. Introduction:**

Recruitment is an important characteristic of human resource control which may be described because the procedure of looking the proper expertise and stimulating them to apply for jobs within side the organization. E-recruitment has been a problem of hobby over the last ten years. The time period on line recruitment, e-recruitment and net recruiting imply the formal sourcing of process facts on line. The procedure of recruiting has modified extensively over the past few decades. Hiring is a movement of bringing on a brand new person to an organization. It is a step within side the complete employee lifecycle and represents give up of a hit recruiting procedure. Sourcing is using one or extra strategies to narrate expertise to organizational vacancies. At the present time getting a great process may be very complex undertaking for any process seekers. The equal trouble additionally confronted via way of means of a company to collect sensible and certified employees. The conventional strategies of recruitment were revolutionized via way of means of the emergence of the Internet. This specialization of recruitment permits personnel employees to emerge as highly professional in recruitment strategies and their evaluation. The third-birthday birthday celebration e-recruiters offer offerings to companies who're fascinated to apply their internet web sites for process commercials and viewing ability candidates' published resumes at a rate decrease than maximum traditional recruitment strategies. Most e-recruiters offer loose offerings to candidates or jobseekers to submit their resume's on line in their databases. With this loose posting, the increase of one resume's is inevitable. Millions of resumes are published to well-known e-recruitment websites, turning into a real market; out of control and unconstrained via way of means of geography. [1]

The four primary activities consist of:

**MODELING AND OPTIMISATION OF A SOLAR ENERGY HARVESTING SYSTEM FOR WIRELESS SENSOR NETWORK****Dhiraj Parkash Dhiman<sup>1</sup> Mohit Parihar<sup>2</sup>,**<sup>1</sup>Assistant Professor, Department of Mechanical Engineering, Swami Vivekanand Institute of Engineering & Technology, Banur, Punjab-140601<sup>2</sup>Assistant Professor, Department of Mechanical Engineering, Swami Vivekanand Institute of Engineering & Technology, Banur, Punjab-140601**Abstract:**

The rapid proliferation of Wireless Sensor Networks (WSNs) in various applications has underscored the need for efficient and sustainable power sources. Solar energy harvesting has emerged as a promising solution to address the power constraints of battery-operated sensor nodes. The proposed system comprises solar photovoltaic (PV) panels, power management circuitry, and energy storage components. To achieve accurate modeling, a detailed analysis of the solar panel's characteristics, such as I-V and P-V curves, is conducted. Moreover, environmental factors such as solar irradiance, temperature, and shading effects are considered to enhance the realism of the model. The optimization process aims to maximize the overall energy harvesting efficiency by dynamically adapting the system's operating parameters. Advanced algorithms like Maximum Power Point Tracking (MPPT) are employed to ensure that the solar panels operate at their peak power output under varying environmental conditions. Furthermore, predictive models are utilized to anticipate the availability of solar energy, enabling the system to proactively adapt to changing light conditions. To validate the proposed modeling and optimization approach, a series of real-world experiments are conducted in various geographical locations and climate conditions. Performance metrics such as energy conversion efficiency, harvested energy density, and sensor node power consumption are analyzed and compared with traditional energy harvesting techniques. The results demonstrate significant improvements in the efficiency and reliability of the solar energy harvesting system for WSNs. The optimized system exhibits greater adaptability to dynamic environmental changes, leading to prolonged sensor network lifetime and reduced dependency on battery replacement or recharging.

**Keywords:** Solar Energy Harvesting, Wireless Sensor Network (WSN), Energy Optimization, Photovoltaic (PV) Panels, Power Management, Maximum Power Point Tracking (MPPT), Energy Storage, Environmental Factors

**Introduction:**

Wireless Sensor Networks (WSNs) have emerged as a pivotal technology in various domains, enabling real-time data collection and monitoring of physical environments. These networks consist of small, autonomous sensor nodes that communicate wirelessly to form a distributed sensing infrastructure. Despite their immense potential, one of the key challenges faced by WSNs is their reliance on traditional power sources, such as batteries, which limit their operational lifetime and require frequent maintenance. To address these power constraints and enhance the sustainability of WSNs, researchers have turned to renewable energy sources, with solar energy being a prominent contender [1]. Solar energy harvesting systems offer an attractive solution to power wireless sensor nodes, providing a continuous and eco-friendly source of energy. The effective modeling and optimization of such solar energy harvesting systems are crucial to achieving maximum energy efficiency and prolonged network lifetime. The objective of this research is to explore the modeling and optimization of a solar energy harvesting system

**NEURAL NETWORKS FOR DATA MINING**

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**Abstract:**

The main use of neural networks is data mining. In the Data Mining, there is a data warehouse where businesses keep the accumulated data over many years. The corporations make significant profits thanks to the database information that has been retrieved. Data mining tools assist people in making decisions. Data mining is not a hopeful endeavour. Artificial neural networks, regression, and decision trees are technologies used in data mining. In data mining using neural networks, there are two methods used: Rule extraction and straightforward learning. Comprehensive models can be produced using neural networks without the need for training time. This essay provides an introduction to data mining. In this essay, we conduct extensive research on data mining.

**Keywords:** Neural N/w, Data Mining, Artificial Neural N/w, Rule extraction

**1. Introduction**

The method of removing value from a database is known as data mining. There is a data warehouse where data is kept. There is a chance that the corporations will make money if the data can be pulled from the database.

A parallel processing network is a neural network. It makes use of the non-linear mapping concept. Data mining is not a hopeful endeavour. Data mining techniques aid in helping people make decisions. Data mining calls for high-quality data, the appropriate data, a sufficient sample size, and the appropriate instrument. For instance, the financial company had two options for figuring out the client's income. From a credit card and their normal bank accounts through direct transfers. This information wasn't extracted and used. Rule extraction and learn simple are the two methods used in data mining with neural networks.

**2. Artificial Neural Networks**

A mathematical or computational model is another name for an artificial neural network. Based on non-linear mapping systems, the human brain functions. These are very fine-grained networks. Units in networks are numerous. These units, which are connected by unidirectional connections, each have their own memory. These neurons operate off of local information. An artificial neural network has connections between groups of neurons. It possesses several traits, including parallel processing and self-organizing learning. An adaptive system is an ANN. It can alter both its figure and structure.

**3. Data Mining Process on Neural Network**

Data mining process constructed by some phases; data preparation, data mining and result expression shown in the figure;

**NOISE REDUCTION TECHNIQUES AND ACTIVE NOISE CONTROL IN MECHANICAL SYSTEMS****Prince Chawla<sup>1</sup> Ankur Gill<sup>2</sup>,**

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**Abstract:**

Noise pollution is a pervasive environmental issue that affects human health, productivity, and overall well-being. In mechanical systems, noise generation often arises from various sources such as engines, industrial machinery, and transportation systems, presenting a significant challenge for engineers and researchers. The first part of the abstract focuses on passive noise reduction techniques, which involve altering the system's design or materials to diminish noise propagation. These techniques include vibration isolation, sound-absorbing materials, and acoustic enclosures. By employing these methods, engineers can attenuate noise emissions at the source, thereby enhancing the acoustic environment and minimizing adverse effects on humans and nearby ecosystems. In contrast, the second part of the abstract delves into active noise control, a sophisticated approach that uses advanced signal processing and control systems to counteract noise in real-time. Active noise control systems sense the incoming noise, process it through adaptive algorithms, and generate anti-noise signals to cancel out the original noise. The application of active noise control in mechanical systems has shown promising results, particularly in closed environments where passive methods may be impractical. The main key components of active noise control, including error microphones, actuators, and digital controllers. It explores the challenges associated with implementing these systems, such as stability, convergence, and sensor positioning, and highlights recent advancements in adaptive control algorithms that enhance the efficiency and effectiveness of active noise control.

**Keywords:** Noise reduction techniques, Active noise control, Passive noise reduction, Vibration isolation, Sound-absorbing materials, and Acoustic enclosures, Signal processing, Control systems, Adaptive algorithms

**Introduction:**

Noise pollution is a ubiquitous challenge in modern society, affecting various aspects of human life and the environment. Mechanical systems, such as engines, industrial machinery, and transportation vehicles, are major contributors to this unwanted acoustic disturbance. As the world becomes more industrialized and urbanized, the need for effective noise reduction techniques and active noise control (ANC) in mechanical systems becomes increasingly critical. The adverse effects of noise pollution on human health are well-documented, including stress, sleep disturbances, hearing impairment, and cardiovascular issues [1]. Moreover, excessive noise can hinder communication, reduce productivity, and negatively impact the quality of life in residential, commercial, and industrial settings. Additionally, noise pollution can harm wildlife, disrupting their natural habitats and communication patterns. To combat these challenges, engineers and researchers have been developing innovative approaches to reduce noise emissions from mechanical systems. The two primary strategies employed are passive noise reduction techniques and active noise control. Passive techniques involve altering the design or employing specialized materials to reduce noise propagation. These methods are often cost-effective

## NOISE REDUCTION TECHNIQUES USING WAVELET TRANSFORMS

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### **Abstract:**

The wavelet transform is a crucial tool with numerous applications. In this study, it was suggested to analyse wavelet-based noise reduction methods. Three wavelet-based noise reduction strategies are discussed in this work. Wavelet Split Coefficient, Hard Thresholding, and Soft Thresholding are these techniques. It is possible to improve speech using these techniques. This makes it possible to effectively increase speech quality. The image's noise and blurring can be reduced or eliminated using the wavelet transform. In other words, it works well for removing noise in picture processing.

**Keywords:** Wavelet transforms, Wavelet Split Coefficient, Hard Thresholding, and Soft Thresholding

### **I. INTRODUCTION**

The most crucial tool that many academics use to examine various sorts of data is the wavelet transform. The wavelet transform offers a representation of the signal's time and frequency. As a result, the user can receive information regarding both time and frequency at once. The short-time Fourier transform (STFT), which uses a sliding window technique, likewise offers information about both time and frequency, but with significant restrictions. The use of the Short-time Fourier transform is constrained by the length of the sliding window. However, wavelet transform offers a solution to this issue, which is why it is now commonly utilised. There are essentially only two types of wavelet transform. Reversible wavelet transforms are those that allow the original signal to be retrieved after transformation. Since the original signal cannot be recovered after it has been altered, there is no need to obtain it in the second scenario. This wavelet transform is widely applied in a variety of fields. In the fields of signal processing and image processing, this transform is frequently utilized. In these two disciplines, blurring in images and noise in signals are both removed using the wavelet transform. The wavelet transform is also used to improve speech. Speech is a crucial component of a multimedia system. Thus, it is crucial to eliminate the noise found in speech signals, and the wavelet transform is the finest tool for this application. A number of signal and image processing applications now make good use of the wavelet transform [2]. It is helpful for digital image compression. Digital photos can be compressed so that they take up less memory and can be transmitted more quickly and consistently. Recently, the 18 cameras on NASA's Mars rovers' 18 cameras compressed images using wavelet transforms [2]. The wavelet-based method used in the Mars Rovers' software is created to specifically fulfil the needs of deep-space communication [2]. Additionally, wavelet transforms are the foundation of JPEG2K. In order to analyse waveforms that are limited in both frequency and duration, wavelet transforms a signal into a collection of wavelets [3]. We may obtain frequency information by utilising the wavelet transform, which is not possible when working in the time domain. Depending on the user application, there are numerous distinct wavelet systems that can be employed successfully.

### **II. NOISE REDUCTION METHODS**

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## REVIEW OF CONTENT-BASED IMAGE RETRIEVAL MODELS FOR EFFICIENT FEATURE EXTRACTION IN DATA ANALYSIS

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### **Abstract:**

One of the most amazing study areas in computer vision has been content-based picture retrieval and feature selection. The widespread usage of photographs in a variety of applications makes content-based image retrieval extremely important. In data mining, feature selection is a crucial subject, particularly for datasets with high dimensions. Subsets of the features that can be obtained from the data are chosen for application of a learning algorithm in the feature selection (also known as subset selection) process, which is frequently employed in machine learning. Choosing a subset of input variables by removing characteristics with little to no predictive information is the fundamental goal of feature selection. The three main classes of feature selection methods are filter, wrapper, and embedding method.

**Keywords:** CBIR, Feature selection, Filter, Wrapper and Embedded

### **I. INTRODUCTION**

Numerous strategies for storing, browsing, searching, and retrieving photographs have been studied in recent years due to the exponential growth in digital image collections. Visual information retrieval and picture databases are currently active research areas [1, 2]. The conventional method for retrieving photographs is to annotate them with text and then utilise a text-based database management system [3]. Using the visual content of the photos, which are indexed according to their content, CBIR systems retrieve pertinent images from a database [4]. So-called low-level features, such colour, texture, and shape, are frequently used by content-based image indexing and retrieval (CBIR) systems to analyse the content of images [20].

A user sends a query image or sequence of photographs, and the system is required to obtain as comparable of a set of images from the database as feasible. Support for searching across extensive image databases is another duty. Search engines for picture data-bases, where the photos are expected to be categorised or organised according to similar qualities, are called Content-Based picture Retrieval (CBIR) systems [5].

With the help of low level feature extraction, images are indexed using the content based image retrieval (CBIR) technique, and only the features of the indexed images are used for image retrieval. A user enters a search term into an efficient picture retrieval system, and the system should return photos that are somehow connected to the query [6].

## REVIEW ON GREEN MARKETING

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### **Abstract:**

Green marketing is a new phenomenon which has developed in the global market and has become an important concept in India and other countries. During recent times consumers prefer more environmental friendly products over traditional products and their opinion and preferences has been changed towards the green products because of environmental issues. Green marketing means production, promotion and distribution of products and services which are environment friendly in nature and protect the environment from its degradation. Green marketing is a modern concept and it is adopted by companies and business firms due to harmful effect on the environment. This research paper explains the concept of green marketing, evolution of green marketing, green marketing mix, and challenges of green marketing and also explains the companies who are adopting green strategy in the market and also explains the factors which can influence the green marketing. This research paper is descriptive in nature and based on secondary sources which are collected from different sources such as books, websites, articles and research paper.

**Keywords:** Green marketing, Evolution of green marketing, Green marketing mix, Green strategy

### **Introduction:**

Global warming, carbon credits, ozone depletion, environmental hazards, environment impact assessment have all become common terminology in the 21st century and it is an indication of environmentally conscious society. Society becomes more concerned about natural environment when ill effects of environmental degradation are experienced by the society. One of the reasons for this degradation is problems that arise out of mass production, mass consumption and mass marketing of environmentally irresponsible products. As a result business houses have begun to modify their behavior in an attempt to address these kinds of ‘new’ concerns of the society. Conventional marketing involves selling products and services that satisfy consumer needs at affordable prices but green marketing has the additional challenge of defining ‘what is green’ and developing and selling products that the consumer will like[1].

Green marketing also known as environmental marketing involves a range of activities including product modification changes in production process, changes and modifications in packaging as well as modifying advertising. As defined by Tapan K. Panda “Green or Environmental Marketing consists of all activities designed to generate and facilitate any exchange intended to satisfy human needs or

## ROUTING PROTOCOLS BASED ON CHAIN THEORY - A REVIEW

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### **Abstract:**

Recently, wireless sensor networks have emerged as a key computing platform. A group of nodes arranged into a cooperative network constitutes a wireless sensor web. There is processing power in each node. In the design and deployment of wireless sensor networks, energy conservation and maximising network longevity are frequently acknowledged as major challenges. Due to the energy constraints of wireless sensor networks, routing protocols' top priorities are to reduce energy consumption and increase network longevity. The main problems in the design and implementation of WSN are energy conservation and maximising network longevity.

**Keywords:** Wireless sensor network, Hierarchical routing protocol, Energy efficient Chain-based routing

### **I. Introduction:**

Large-scale wireless sensor networks may now be deployed thanks to the quick advancements in MEMS and low-power wireless transmission [1]. The newly developed field of wireless sensor networks integrates information from sensing, processing, and communication, then sends report messages to a remote base station [2]. The base station gathers and examines the received report messages to determine whether an extraordinary or uncommon event is occurring in the deployed zone. The research of wireless sensor networks has been recognised to be plagued by the most important problem of all: energy efficiency. In wireless sensor networks, hierarchical approaches have become a prominent method for increasing energy efficiency [3]. In order to convey data to the destination via intermediary nodes with the least amount of delay, throughput, lifetime, and packet loss, various routing protocols have been devised [11]. The process of choosing which paths to send ordered movement down inside a network is known as routing [14]. A routing protocol must be followed for routers to interact with one another in order for them to determine the optimum route between any two nodes on a computer network [13]. There are a few hierarchical routing protocols that use chains-based data transmission in wireless sensor networks, and many of the hierarchical routing protocols that have been presented by academics use the clustering strategy for routing. In WSNs, chain-based routing is becoming more and more effective [4]. WSNs are made up of excellent sensor nodes that are battery-operated, tiny in size, and affordable. These WSNs can be used for a variety of purposes, including weather monitoring, environmental monitoring, border security, and military surveillance. These programmes read data instantly, thus the energy they need should be reduced. WSNs are used in challenging environments. Since it is not possible to replace or charge battery of sensor nodes, then it is desirable to design communication protocols such that energy source is used effectively and the time lag in the network with minimum.

## RURAL ENTREPRENEURSHIP IN INDIA

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### **Abstract:**

Indian economic system is primarily based totally on rural development. Land being restrained is not able to soak up the labor pressure in agriculture. The hole among rural urban disparities needs to be lessened. Government of India has been continuously assigning growing significance and aid for the advertising and boom of rural entrepreneurship. Optimum usages of nearby resources, Entrepreneurial profession of rural are a few primary standards of entrepreneurship. Productivity, efficiency, Economic boom, Transformational and insecurity Policy results rural entrepreneurship of globalization There are a few demanding situations like Family demanding situations, Social demanding situations, Technological demanding situations, coverage demanding situations have an effect on Rural Entrepreneurship in India. Traditional approaches to recruitment and retention are simply now no longer operating for maximum places, and states are seeking out possible options which specifically consist of entrepreneurship. Rural marketers have effectively assorted into or commenced new groups in markets as various as ago-food, crafts, recycling, entertainment and health

**Keywords:** Rural, villages, awareness, development, government, women, entrepreneurship

### **1. Introduction:**

India is a rustic of villages. About three-fourth of India's populace are residing in rural regions out of which 75% of the labor pressure continues to be incomes its livelihood from agriculture and its allied activities. Land being restricted is unable to soak up the labor pressure in agriculture. Therefore, there may be a want to develop rural industries to remedy rural unemployment and rural migration to cities. Growth and improvement of rural economic system is a vital pre-situation to improvement of the kingdom as a whole. The hole among rural city disparities must be lessened.

The gap among rural city disparities ought to be lessened. The trendy of dwelling of the agricultural humans ought to be increased. Entrepreneurship in rural zone offers a solution to the above troubles. Indian rural zone is no longer primitive and isolated. Therefore, entrepreneurship within side the rural and tribal region looms massive to remedy the troubles of poverty, unemployment and backwardness of Indian economy. Rural industrialization is regarded as a powerful approach of accelerating the technique of rural improvement. Government of India has been constantly assigning increasing significance and guide for the promotion and boom of rural entrepreneurship. Today rural entrepreneurship has emerged as a dynamic concept. In general parlance rural entrepreneurship is described as “entrepreneurship rising at village stage that could take location in a selection of fields of Endeavour which include industry, commercial enterprise, agriculture and act as a potent issue for standard monetary improvement. Compared to in advance day's improvements of rural regions were related to entrepreneurship. Defining entrepreneurship isn't a clean task. Entrepreneurship approach

## THE IMPACT OF COMPUTER VIRUSES

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### **Abstract:**

The study's objectives are to analyze the results of computer virus attacks and provide advice on how people may protect their home computers from such attacks. It is essential to have a conversation among computer users about viral attacks and how to prevent them in today's technologically advanced world. Users of personal computers are given viable solutions after the identification of frequent causes of computer virus attacks so they can prevent such attacks in the future and enhance their computer skills.

**Key Words:** Virus, attacks, personal computer, preventive mechanisms

### **Introduction:**

In this we study to find the factors which lead the virus attacks among personal computer users. Today's society has seen a dramatic increase in the use of computers. As a result users of personal computer today need to have comprehensive virus protection mechanisms to face the growing threats of computer viruses. Virus attacks on computer are more harmful that shows up more damage to the computer. It is important to analyze the actions that a virus performs in one's system and also the activities that are possible to occur over time. This helps in protecting our PC with needful security mechanisms to safeguard the secure information. The purpose of this research paper is to introduce to the reader the threats that the computer viruses can create and provide guidelines on how individuals can protect themselves against these viruses. Nowadays many computer viruses are designed to self-replicate and self-install over a very short period of time. They come encoded with specific instructions to destroy and advance through its host computer, and can affect a multitude of programs and applications very quickly. Recognizing the symptoms of a computer virus can help to successfully remove it from the infected computer as quickly as possible; the sooner this is completed, the easier it will be to recover any documents or programs that may be damaged, and prevent the virus from further spreading. After identification of typical factors which leads to computer virus attacks the possible solutions are put forwarded to PC users to surmount this virus attacks and for their future improvement in computer usage. [1].

### **Computer Viruses:**

A virus [3] is a program designed by a computer programmer (malicious hacker) to do a certain unwanted function. The virus program can be simply annoying like displaying a happy face on the

**THE TECHNOLOGY OF SUSTAINABLE CONCRETE**

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**Abstract:**

The growing concern over global warming and significant ecological changes requires sustainable development in all fields of science and technology. Concrete not only consumes huge amount of energy and natural sources, but also emits large amount of CO<sub>2</sub>, mainly due to the production of cement. It is evident that such large amount of concrete production has put significant impact on the energy, resource, environment, and ecology of the society. Hence, how to develop the concrete technology in a sustainable way has become a significant issue. In this paper, some of Korean researches for sustainable development of concrete are presented. These are sustainable concrete using recycled aggregate and supplementary cementing materials and sustainable reinforcement of new concrete structure.

**Keywords:** Aggregate, recycled, technology

**Introduction:**

The organizing principle for sustaining finite resources sufficient to meet the requirements of upcoming generations of life on the planet is sustainable development. It is a process that imagines a preferred future state for human societies in which biotic systems' "integrity, stability, and beauty" are preserved while living circumstances and resource use continue to suit human requirements [1]. The 1987 Brundtland Report is where the concept of sustainable development gets its strongest inspiration. The report 'Our Common Future', sometimes known as the Brundtland Report, was published by the United Nations World Commission on Environment and Development in 1987. One of the most well-known definitions of sustainable development can now be found in this study [1]. "Sustainable development is growth that satisfies existing requirements while not jeopardizing the capacity of future generations to satiate their own needs. It includes two important ideas:

- The idea of "needs," especially the fundamental requirements of the world's impoverished, to which top priority should be accorded; and
- The notion that the environment's capacity to meet existing and future needs is constrained by the state of technology and social organization.

The most often utilized building material is concrete. Cement is the main component of concrete and was produced in the world in 2014 in amounts of 4.3 billion tons, as illustrated in Figures 1 and 2 [2]. The main source of greenhouse gas emissions is the cement industry. As a result, the concrete industry has a big impact on global ecology. Even in Korea, the need for sustainable concrete technology development is becoming critical. Greenhouse gases are a significant contributor to climate change. According to Figure 3 [3], Korea produced 1.75% of the world's CO<sub>2</sub> emissions in 2014, ranking as the 9th highest emitter of greenhouse gases. The creation of low-carbon concrete materials and structures, as well as the extension of the service life of concrete structures, are currently the focus of research on sustainable development of concrete. Therefore, two categories—sustainable concrete and sustainable reinforcement—are used to present some sustainable concrete technologies that have developed in Korea in this study.

**USING OVERSAMPLING TO SOLVE CLASS IMBALANCE PROBLEMS WITH LARGE DATASETS****Pertik Garg<sup>1</sup> Jarnail Singh<sup>2</sup>,**

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**Abstract:**

Data is the important component for any organization decision making purposes. Various applications are producing the multimedia data in millions of bytes. For better analysis of the data there requires better data mining techniques. These techniques will extract the relevant data from the large repository. But while analysis the datasets there can be misclassification of the data items. Developing techniques for the machine learning of a classifier from class-imbalanced data presents an important challenge. One class can have large data compared to the other class. Like in current research the late flights has substantially lower amount of data compared to on-time flights data. It in results leads to the poor analysis. The oversampling technique is the best technique for balance the minority class. Both classes then will be having balanced classes. All the performance factors like G-mean and AUC (Area under Curve) are giving better results compared to imbalanced classes.

**Keywords:** Oversampling, Imbalance, Data mining, AUC, G-mean

**Introduction:**

With the internet age the data and information explosion have resulted in the huge amount of data. Fortunately to gather knowledge from such abundant data there exist data mining techniques. As per the definition by G. Ditzler in his book “Data Mining: Concepts and Techniques” [1], the data mining is - Extraction of interesting, non trivial, implicit, previously unknown and potentially useful patterns or knowledge from huge amount of data. Data mining has been used in various areas like Health care, business intelligence, financial trade analysis, network intrusion detection etc.

General process of knowledge discovery from data involves data cleaning, data integration, data selection, data mining, pattern evaluation and knowledge presentation. Data cleaning, data integration constitutes data preprocessing. Here data is processed so that it becomes appropriate for the data mining process. Data mining forms the core part of the knowledge discovery process. There exist various data mining techniques viz. Classification, Clustering, Association rule mining etc. Our work mainly falls under the classification data mining technique.

Classification is one of the important techniques of data mining. It involves use of the model built by learning from the historical data to make prediction about the class label of the new data/observations. Formally, it is task of learning a target function  $f$ , that maps each attribute set  $x$  to a set of predefined class labels  $y$ . Classification model learned from historical data is nothing but the target function. It can serve as a tool to distinguish between the objects of different classes as well as to predict class label of unknown records. Fig 1 shows the classification task which maps attribute set  $x$  to its class label  $y$ .

## VIDEO WATERMARKING: AN OVERVIEW

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### **Abstract:**

Digital audio, video, and image signals and documents can be marked with hidden copyright notices or other verification messages using a process called watermarking. Such a message consists of a collection of bits that describe details about the signal or the signal's creator (name, location, etc.). The technique draws its name from watermarking of paper or money as a security measure. Watermarking can be done using a variety of methods. There have been numerous thorough examinations on the watermarking technologies now in use. We will discuss several reviews of video watermarking in the current paper.

**Key word:** Video watermarking, DCT, WPT, Robust

### **Introduction:**

Multimedia apps get a tone of additional features from video watermarking. By enabling the addition of comments to video material, it enables the indexing of video mail. It also enables the indexing of films or news articles by making available the use of markers that may be used to their advantage by search engines. Watermarking is undoubtedly a promising approach to give quick access to multimedia data because the amount of images and video contents online is growing much more quickly than the capabilities of today's search engine. We can prevent unauthorized usage of the video material by using a video watermark.

### **Features of Video Watermarking:**

Watermarking is a kind of copyright defence. If the original data is copied, altered, or used without the owner's consent, the owner of the original data wishes to be able to demonstrate ownership. The following criteria must be met in whole or in part by a watermark algorithm.

#### **A. Robustness**

Robustness refers to the ability of the used watermarking method to maintain the watermark despite numerous attacks.

#### **B. Quality of the image**

It is important to watermark in a method that does not degrade the video's quality or the hidden data after watermarking. To the naked eye, the visual alterations shouldn't be visible.

#### **C. Reliability of the watermark**

There is always a chance that the user is aware of the precise algorithm used to find and disable the watermark. The choice of the watermarking key is the only way to secure the watermark, so to speak. Now, it should be nearly impossible to identify the exact key to match with the one during embedding even if the user on the other side knows the exact algorithm. This affects the watermark's dependability or power.

#### **D. Universal**

## WATERMARKING AND ITS TECHNIQUES: A REVIEW

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### **Abstract:**

The necessity for copyright enforcement technology that can prevent copyright ownership and theft of multimedia items has become critical due to the rapid evolution of networked multimedia systems. Numerous data-hiding technologies, such as Steganography and cryptography, have been developed. One technique for concealing information in a digital image is steganography. Many of the existing digital watermarking methods are based on the relationship between steganography and cryptography. Recent developments in digital copyright protection techniques have generated a lot of interest. We'll talk about the watermarking process and its numerous methods in this essay.

**Keywords:** Watermarking; LSB; DFT; DCT; DWT; Performance Evaluation Metrics

### **INTRODUCTION**

The public's access to digital material including audio, photos, and videos has regularly grown as a result of the Internet's rapid expansion. Analogue media is not preferred over digital media. Because of the ease with which digital content may now be created, copied, transmitted, and distributed, there is an urgent need for copyright enforcement systems that can safeguard the ownership of multimedia objects. For this, a variety of information-hiding methods, including cryptography, steganography, and watermarking, are being deployed [1]. Steganography involves hiding their mere existence, while cryptography protects the substance of messages by encrypting the message. Modern steganographic communication channels are simple to utilise thanks to advancements in computer and network technologies. Digital media is protected by copyright, data authentication, and security thanks to digital watermarking techniques [2]. It is a method connected to the long-ago covered writing method of information concealment [3]. Digital watermarking is the process of incorporating a secret piece of information, such as a watermark, into digital multimedia files like images, sounds, and videos. To identify the true owner or identity of the digital media, the encoded information is extracted. The following uses for watermarking exist: Copy Control, Broadcast Monitoring, Authentication, Proof of Ownership (copyright and IP protection), Data Hiding, and Copy Control. Fig. 1 illustrates a digital watermarking example.



Digital watermarking

We provide a brief overview of the history of digital watermarking in Section 2, followed by a discussion of the fundamentals of digital picture watermarking, including its prerequisites and uses. The processes utilised for digital watermarking are presented in Section 3. The performance evaluation metrics are

## WIRELESS AD HOC NETWORKS

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### **Abstract:**

Ad hoc wireless networks are made up of a group of nodes that are randomly and dynamically distributed around the network, connected to one another, and capable of changing often. A routing protocol chooses the routes between the nodes for communication within the network.

Ad hoc network routing protocol's major goal is to maintain a precise and organised path between node pairs so that messages can be transmitted in a specific amount of time. In addition to analysing the routing protocol for ad hoc wireless networks, this study also provides information on the features of the various protocols used in the network. It is a peer-to-peer wireless ad hoc network that is spontaneously generated by a group of mobile nodes. Each node in this network has the ability to function as a router for its peer to disseminate the packets. Without using any pre-existing structure or a centralised administration, a dynamic wireless ad hoc network was developed.

**Keywords:** Wireless communication, ad hoc network, routing protocols

### **Introduction:**

A decentralised sort of wireless network is a wireless ad hoc network. Because it doesn't rely on pre-existing infrastructure like routers in wired networks or access points in wireless network management, the network is ad hoc. Instead, each node takes part in routing by sending data to other nodes, so network connectivity is used to dynamically decide which nodes forward data. Ad hoc networks can use flooding in addition to traditional routing to forward data.

Any collections of networks that are open to association with any other ad hoc network device within connection range are often referred to as ad hoc networks. The term "ad hoc network" frequently refers to a Wi-Fi node that complies with the IEEE 802.11a and 802.11ac wireless standards.

Ad hoc mode is a way for wireless devices to directly connect with one another on wireless computer networks. All wireless devices within range of one another can discover and communicate with one another in a peer-to-peer fashion when operating in ad hoc mode, which eliminates the need for central access points (including those included in broadband wireless routers). Each wireless adapter must be set up for ad hoc mode rather than the alternate infrastructure mode in order to create an ad hoc wireless network. The same SSID and channel number must also be used by all wireless devices on the ad hoc network.

An ad hoc network is essentially a transient network connection established for a particular function (like data transfer between computers). If a network has been in place for a while, it is simply a local area network (LAN).

### **Related Work:**

#### **A. Comparison of Ad Hoc Routing Protocols**

## A REVIEW OF DESIGN OPTIMIZATION METHODS FOR ELECTRICAL MACHINES

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### **Abstract:**

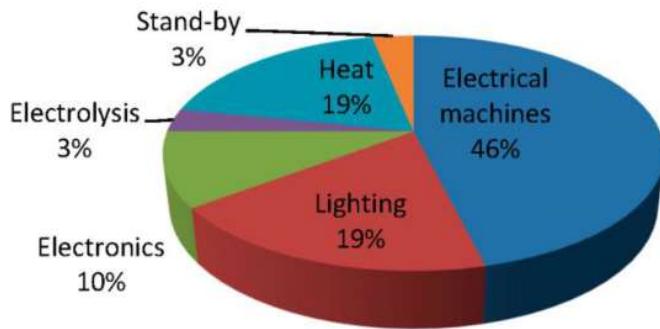
Design optimization plays a crucial role in improving the performance and efficiency of electrical machines. It is highlighting the importance of design optimization in electrical machines, emphasizing the need for efficient utilization of resources and the attainment of optimal machine performance. It introduces the challenges faced in the design process, such as trade-offs between conflicting objectives, multi-physics phenomena, and complex design constraints. The various design optimization techniques that have been applied to electrical machines such as analytical methods, heuristic algorithms, metaheuristic algorithms, and surrogate-based optimization. The advantages and limitations of each approach are discussed, providing insights into their applicability and performance in different scenarios. This includes the use of finite element analysis, computational fluid dynamics, and multiphysics simulation tools to accurately model the behavior and performance of electrical machines. The objectives commonly targeted in design optimization, such as maximizing efficiency, minimizing losses, reducing weight and size, enhancing thermal management, and improving specific performance metrics like torque, power density, or noise levels. It highlights the challenges in balancing these objectives and presents multi-objective optimization techniques that allow for trade-off analysis and Pareto front exploration.

**Keywords:** Design optimization, Electrical machines, Design constraints, Analytical methods, Heuristic algorithms, Metaheuristic algorithms, Surrogate-based optimization, Modeling and simulation, Finite element analysis, Computational fluid dynamics

### **Introduction:**

The design optimization of electrical machines plays a vital role in achieving enhanced performance, efficiency, and reliability. As the demand for energy-efficient systems continues to grow, it becomes imperative to develop advanced design techniques that maximize the utilization of available resources while meeting stringent design constraints. Electrical machines, including motors and generators, are critical components in various industries such as automotive, aerospace, renewable energy, and industrial automation [1]. The performance of these machines directly impacts system efficiency, energy consumption, and overall operational costs. Therefore, optimizing their design becomes essential to improve efficiency, reduce losses, and enhance overall performance. Design optimization poses several challenges due to the complex nature of electrical machines. Designers often face trade-offs between conflicting objectives, such as maximizing power output while minimizing losses or maximizing torque while minimizing size and weight. Additionally, electrical machines are subject to multi-physics phenomena, including electromagnetics, heat transfer, mechanical stresses, and fluid dynamics, which further complicate the design process (Fig. 1). Meeting stringent design constraints, such as temperature limits, mechanical stresses, and manufacturing limitations, adds another layer of complexity to the optimization problem. To address these challenges, researchers and engineers have developed various

design optimization techniques. These techniques can be broadly categorized into analytical methods, heuristic algorithms, metaheuristic algorithms, and surrogate-based optimization. Analytical methods use mathematical formulations and closed-form solutions to optimize specific aspects of the machine design [2]. Heuristic algorithms, such as genetic algorithms and particle swarm optimization, provide efficient search strategies to explore the design space and identify promising solutions. Metaheuristic algorithms, such as simulated annealing and evolutionary algorithms, offer global optimization capabilities and can handle complex design problems. Surrogate-based optimization employs surrogate models, such as response surface models or neural networks, to approximate the behavior of the machine and optimize the design efficiently. In recent years, the integration of design optimization with advanced modeling and simulation techniques has gained significant attention. Finite element analysis (FEA), computational fluid dynamics (CFD), and multiphysics simulation tools enable accurate modeling of electrical machines' behavior and performance [3]. This integration facilitates the consideration of various physical phenomena and allows designers to evaluate multiple design iterations efficiently. Moreover, the emergence of machine learning and artificial intelligence algorithms has revolutionized the design optimization process. These algorithms enable automated and data-driven approaches to optimization, leveraging large datasets and learning from past design experiences. Machine learning algorithms can assist in exploring the design space, identifying patterns, and suggesting optimal designs, thereby speeding up the design process and improving overall efficiency.



**Fig. 1: Global electricity demand by sector and end-use**

### Fundamentals of Design Optimization:

Design optimization for electrical machines involves the systematic exploration and improvement of machine configurations, parameters, and operating conditions to achieve desired performance objectives while satisfying design constraints [4]. It encompasses various fundamental principles and considerations that guide the optimization process. Here are some key fundamentals of design optimization for electrical machines:

**Problem Formulation:** The optimization problem must be properly defined and formulated. This includes specifying the design objectives, such as maximizing efficiency or minimizing losses, as well as any constraints, such as temperature limits or manufacturing limitations. The problem formulation should be clear and precise to guide the optimization process effectively.

**Design Variables:** Design variables represent the parameters that can be adjusted or modified during the optimization process. These variables can include geometric dimensions, material properties, winding configurations, cooling mechanisms, and operating conditions. Selecting appropriate design variables is crucial for capturing the design space comprehensively and allowing meaningful optimizations.

**Objective Functions:** Objective functions quantify the design goals that are to be optimized. These functions can be single or multiple, depending on the specific optimization problem. Common objective functions in electrical machine design include efficiency, power factor, torque, power density, and noise levels. The objective functions should be carefully defined to accurately reflect the desired machine performance.

**Design Constraints:** Design constraints are the limitations or requirements that the optimized design must satisfy. These constraints can be related to mechanical, thermal, electrical, or manufacturing aspects [5]. For example, constraints may include maximum temperature limits, magnetic flux density limitations, mechanical stress limits, or manufacturing cost constraints. Incorporating relevant design constraints is crucial for ensuring the feasibility and reliability of the optimized design.

**Optimization Algorithms:** Design optimization involves the use of various algorithms to search and explore the design space. These algorithms can be categorized as analytical methods, heuristic algorithms, metaheuristic algorithms, or surrogate-based optimization. Analytical methods utilize mathematical formulations to obtain closed-form solutions, while heuristic and metaheuristic algorithms provide search strategies to navigate the design space and find optimal or near-optimal solutions. Surrogate-based optimization uses surrogate models to approximate the behavior of the machine and perform efficient optimizations. Selecting appropriate optimization algorithms depends on the complexity of the design problem and the trade-offs between computational efficiency and solution quality.

**Design Space Exploration:** Design optimization often requires the exploration of a vast design space to identify optimal solutions. This exploration can be conducted systematically through techniques like grid search or by employing search algorithms that intelligently sample the design space. Efficient exploration techniques help in identifying promising regions of the design space and avoiding local optima.

**Trade-off Analysis:** Electrical machine design often involves trade-offs between conflicting objectives. For instance, improving one performance metric may come at the cost of degrading another. Multi-objective optimization techniques, such as Pareto optimization, facilitate trade-off analysis by generating a set of optimal solutions that represent the trade-off between different objectives. Designers can then make informed decisions based on their priorities and requirements.

**Validation and Verification:** Once an optimized design is obtained, it is essential to validate and verify its performance using appropriate simulation tools and experimental testing. Validating the optimized design ensures that it meets the desired performance objectives and satisfies all relevant design constraints. This step helps ensure the reliability and effectiveness of the design optimization process.

### **Optimization Techniques for Electrical Machine Design:**

Optimizing the design of electrical machines involves the application of various techniques to improve their performance, efficiency, and other desired characteristics [6]. Here is some key optimization techniques commonly employed in electrical machine design (Fig. 2):

**Analytical Design:** Analytical design techniques utilize mathematical formulations and closed-form solutions to optimize specific aspects of electrical machines. These techniques are often employed for simple machine configurations and can provide quick insights into the impact of design variables on performance parameters. Analytical design approaches include magnetic circuit analysis, analytical modeling of electromagnetic fields, and optimization algorithms based on mathematical equations.

**Gradient-Based Methods:** Gradient-based optimization methods, such as gradient descent or Newton's method, utilize the gradient information of the objective function with respect to the design variables.

These methods iteratively update the design variables in the direction of steepest descent to find local optima. Gradient-based methods are effective when the objective function is smooth and differentiable, allowing for efficient convergence to optimal designs.

**Genetic Algorithms (GA):** Genetic algorithms are population-based metaheuristic optimization techniques inspired by natural evolution. GA employs operators such as selection, crossover, and mutation to create a population of potential solutions. The solutions evolve over generations, with fitter solutions being more likely to survive and produce offspring. GA explores the design space globally, making it suitable for multi-modal or non-convex optimization problems.

**Machine Learning and Artificial Intelligence:** Machine learning and artificial intelligence techniques are increasingly being integrated into the design optimization of electrical machines. These techniques leverage large datasets and historical design information to automate the optimization process and discover hidden patterns and relationships [7]. Machine learning algorithms, such as neural networks or decision trees, can assist in exploring the design space, suggesting optimal designs, or predicting the performance of novel designs. Reinforcement learning algorithms can be used to train controllers for optimal machine operation.

**Particle Swarm Optimization (PSO):** Particle swarm optimization is a population-based metaheuristic algorithm inspired by the collective movement of bird flocks or fish schools. In PSO, a population of particles explores the design space by adjusting their positions and velocities based on the best-performing solutions encountered. PSO balances exploration and exploitation to find optimal or near-optimal designs efficiently.

**Heuristic Algorithms:** Heuristic algorithms are search-based optimization methods that provide efficient strategies for exploring the design space and finding near-optimal solutions. These algorithms, such as genetic algorithms, particle swarm optimization, or simulated annealing, mimic natural processes like evolution or collective intelligence to iteratively refine the design. Heuristic algorithms are effective for handling complex design problems with multiple objectives and design constraints.

**Metaheuristic Algorithms:** Metaheuristic algorithms are a subset of heuristic algorithms that offer global optimization capabilities and are well-suited for complex design optimization problems. These algorithms, such as evolutionary algorithms, ant colony optimization, or tabu search, explore the design space by generating and evolving a population of potential solutions. Metaheuristic algorithms can handle non-linear and multi-modal objective functions, making them suitable for optimizing electrical machines with intricate design requirements.

**Simulated Annealing (SA):** Simulated annealing is a metaheuristic algorithm inspired by the annealing process in metallurgy [8]. SA starts with an initial design and iteratively explores the design space by accepting or rejecting new solutions based on a probability distribution. Initially, the algorithm explores a wide range of solutions, and as the optimization progresses, it gradually narrows down the search space, similar to the cooling of a material. SA is effective for finding global optima in complex design problems.

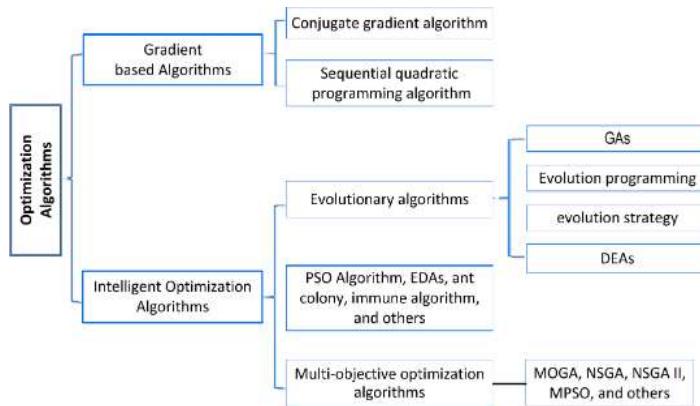
**Evolutionary Algorithms (EA):** Evolutionary algorithms encompass a family of optimization techniques inspired by biological evolution. These algorithms, such as genetic programming or evolutionary strategies, simulate the process of natural selection, crossover, and mutation to evolve a population of candidate solutions. Evolutionary algorithms are capable of handling complex design problems, offering global search capabilities and the ability to handle constraints.

**Surrogate-Based Optimization:** Surrogate-based optimization techniques employ surrogate models, such as response surface models or neural networks, to approximate the behavior of the electrical machine and perform efficient optimizations. These surrogate models are trained using a limited number

of evaluations, reducing the computational cost associated with expensive simulations or physical testing. Surrogate-based optimization methods enable fast exploration of the design space and can handle black-box optimization problems.

**Multi-Objective Optimization:** Electrical machine design often involves multiple conflicting objectives, such as maximizing efficiency while minimizing size or cost. Multi-objective optimization techniques, such as Pareto-based approaches or multi-objective genetic algorithms, aim to generate a set of optimal or near-optimal solutions that represent the trade-offs between different objectives. These techniques enable designers to explore the design space, visualize trade-offs, and make informed decisions based on their preferences and requirements.

**Hybrid Approaches:** Hybrid optimization approaches combine multiple optimization techniques to leverage their strengths and overcome their limitations [9]. For example, combining gradient-based methods with evolutionary algorithms or using surrogate models within genetic algorithms can enhance the efficiency and effectiveness of the optimization process. Hybrid approaches are tailored to specific design problems and aim to exploit the complementary characteristics of different optimization techniques.



**Fig. 2: Popular optimization algorithms for design of electrical machines**

#### Electromagnetic Design Optimization:

Electromagnetic design optimization is a crucial aspect of improving the performance and efficiency of electrical machines. By optimizing key design parameters, such as geometry, winding configuration, and material selection, designers can enhance the electromagnetic behavior of these machines. Techniques such as magnetic circuit analysis and finite element analysis (FEA) play a fundamental role in simulating and analyzing the electromagnetic phenomena within the machines. Design parameter optimization allows for adjusting geometric dimensions and winding configurations to achieve desired objectives, such as maximizing efficiency or torque. Optimization algorithms like gradient-based methods, genetic algorithms, or surrogate-based optimization help explore the design space and identify optimal values for these parameters. Winding optimization focuses on optimizing the winding layout, number of turns, and connection schemes to improve performance metrics and increase efficiency [10]. Material selection and optimization are also critical in electromagnetic design optimization. By selecting optimal materials or optimizing their properties, such as magnetic permeability or resistivity, designers can minimize losses, improve magnetic coupling, and enhance overall efficiency. Multi-physics optimization techniques consider the interactions between electromagnetic fields, thermal behavior, and mechanical stresses. This comprehensive approach enables designers to account for multiple performance aspects and optimize the design parameters accordingly. Sensitivity analysis helps identify critical parameters and prioritize optimization efforts, while validation and verification ensure that the

optimized design meets the desired electromagnetic objectives and constraints.

### **Case Studies and Applications:**

**Optimization of Permanent Magnet Synchronous Motors (PMSM):** Design optimization methods have been extensively applied to PMSMs to improve their performance and efficiency[11]. By optimizing parameters such as the magnet configuration, stator winding layout, and rotor shape, researchers have achieved significant enhancements in torque density, power factor, and overall efficiency. Genetic algorithms, particle swarm optimization, and finite element analysis-based optimizations have been employed to explore the design space and identify optimal configurations. These optimization methods have found applications in various industries, including electric vehicles, robotics, and renewable energy systems.

**Design Optimization of Induction Motors:** Induction motors are widely used in industrial applications, and their design optimization aims to improve efficiency and reduce losses. Researchers have employed surrogate-based optimization techniques to optimize rotor slot geometry, winding configurations, and magnetic material selection. The objective is to achieve improved efficiency while considering constraints such as torque ripple and thermal limitations. Surrogate models based on response surface methodology or artificial neural networks have been utilized to efficiently explore the design space and identify optimal designs for specific operating conditions.

**Optimization of Switched Reluctance Motors (SRMs):** SRMs offer advantages such as simplicity, robustness, and cost-effectiveness. Design optimization methods have been applied to SRMs to enhance their performance further [12]. By optimizing the rotor and stator pole shapes, winding configurations, and magnetic material properties, researchers have achieved improvements in torque ripple reduction, power factor, and efficiency. Evolutionary algorithms, such as genetic algorithms and particle swarm optimization, have been used to explore the design space and identify optimal solutions for SRMs in applications like electric vehicles, appliances, and industrial machinery.

**Optimization of Transformer Design:** Transformers play a critical role in power transmission and distribution systems. Design optimization techniques have been employed to improve their efficiency, reduce losses, and optimize the core and winding configurations. By exploring different core materials, geometries, and winding arrangements, researchers have achieved improvements in efficiency and size reduction. Finite element analysis-based optimizations and multi-objective algorithms have been used to find optimal designs that balance conflicting objectives, such as minimizing losses and reducing manufacturing costs.

**Design Optimization of Magnetic Bearings:** Magnetic bearings offer advantages such as low friction, reduced maintenance, and increased system reliability. Design optimization methods have been applied to magnetic bearings to optimize their electromagnetic and structural configurations. By optimizing the magnetic field distribution, coil geometry, and material selection, researchers have achieved improvements in bearing stiffness, load capacity, and stability. Metaheuristic algorithms and finite element analysis have been employed to explore the design space and identify optimal designs for magnetic bearing applications in high-speed machinery, turbines, and aerospace systems.

### **Emerging Trends and Future Directions:**

**Multi-Physics and Multi-Domain Optimization:** As electrical machines become more complex and integrated with other systems, there is a growing need for multi-physics and multi-domain optimization. This involves simultaneously optimizing electromagnetic, thermal, mechanical, and other relevant aspects to achieve optimal performance [13]. Future research will focus on developing advanced

optimization techniques and integrated simulation tools that can handle the interdependencies between different physical phenomena and optimize across multiple domains.

**Uncertainty Quantification and Robust Optimization:** Design optimization methods for electrical machines traditionally assume deterministic parameters and operating conditions. However, real-world variations and uncertainties can significantly impact performance [14]. Future directions will involve incorporating uncertainty quantification techniques and performing robust optimization that accounts for uncertainties in parameters, load variations, and manufacturing tolerances. This will result in more reliable and robust machine designs.

**Integration of Machine Learning and Optimization:** The integration of machine learning and optimization techniques is an emerging trend in design optimization for electrical machines. Machine learning algorithms can be employed to learn from historical design data, explore the design space more efficiently, and provide initial design suggestions for optimization algorithms. This fusion of machine learning and optimization enables data-driven design optimization approaches that can significantly speed up the design process and discover new design solutions.

**Automated Design Exploration and Generative Design:** With the advancements in computational power and optimization algorithms, there is a growing trend towards automated design exploration and generative design. These approaches involve defining design objectives and constraints and allowing the optimization algorithms to autonomously explore the design space, generating innovative and optimal solutions. Automated design exploration and generative design methods will enable designers to efficiently identify novel and unconventional designs that may not have been considered through traditional approaches.

**Multi-Objective Optimization for Sustainability:** In line with the increasing focus on sustainability, multi-objective optimization techniques will play a crucial role in electrical machine design. Optimization objectives will go beyond traditional performance metrics and include factors such as energy efficiency, environmental impact, and lifecycle analysis. Multi-objective optimization will allow designers to balance performance, efficiency, and sustainability aspects, enabling the development of more environmentally friendly and energy-efficient electrical machines.

**Integration of Optimization with Additive Manufacturing:** Additive manufacturing, or 3D printing, offers new possibilities for design and manufacturing of electrical machines. Future directions will involve integrating optimization methods with additive manufacturing techniques to exploit the design freedom offered by additive manufacturing processes[15]. This integration will enable the creation of complex geometries, topology optimization, and customized designs that maximize performance and efficiency while leveraging the unique capabilities of additive manufacturing technologies.

**Optimization for Smart and Connected Systems:** The advent of smart and connected electrical systems, such as the Internet of Things (IoT) and Industry 4.0, will introduce new challenges and opportunities for design optimization. Optimization methods will need to consider the interconnected nature of electrical machines within larger systems, optimizing not only the machine itself but also its integration, control, and communication with other components and systems. Future research will focus on developing optimization techniques that optimize the overall system performance, considering the interactions and dependencies between different components and subsystems.

### **Conclusion:**

In conclusion, design optimization methods for electrical machines have significantly advanced the field by enabling the development of high-performance, efficient, and reliable machines. Through the use of various optimization techniques, such as heuristic algorithms, metaheuristic algorithms, surrogate-based

optimization, and machine learning, designers have been able to explore the design space, identify optimal solutions, and achieve improvements in key performance parameters. The integration of modeling and simulation tools, such as finite element analysis and computational fluid dynamics, has further enhanced the design optimization process by providing accurate predictions of machine behavior and performance. Additionally, the consideration of multi-physics phenomena, uncertainty quantification, and robust optimization has contributed to more robust and reliable designs that can withstand variations and uncertainties. Furthermore, emerging trends, such as the integration of machine learning, additive manufacturing, and multi-objective optimization, offer exciting opportunities for further advancements in design optimization for electrical machines. These trends aim to automate the design exploration process, optimize for sustainability, leverage additive manufacturing capabilities, and optimize the overall system performance in smart and connected systems. Overall, design optimization methods continue to play a crucial role in pushing the boundaries of electrical machine design, resulting in machines that are more energy-efficient, environmentally friendly, and tailored to meet the specific requirements of diverse applications.

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## **ADVANCEMENT IN SURFACE FINISHING BY ABRASIVE FLOW MACHINING: A REVIEW**

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### **Abstract:**

Surface finishing plays a crucial role in various industries, ranging from aerospace and automotive to medical devices and electronics. Over the years, abrasive flow machining (AFM) has emerged as a reliable and effective method for achieving high-quality surface finishes. Traditionally, AFM involves the controlled extrusion of a viscoelastic medium containing abrasive particles through workpiece surfaces, resulting in material removal and surface improvement. Recent advancements have focused on optimizing the process parameters to achieve superior surface finishes. Through the application of computational fluid dynamics (CFD) simulations and experimental studies, researchers have been able to enhance the understanding of fluid flow behavior and optimize key process variables such as flow rate, pressure, viscosity, and abrasive concentration. In addition to process optimization, advancements in tooling design have played a vital role in improving the effectiveness of AFM. The development of advanced tooling configurations, including new types of dies, molds, and nozzles, has led to better control over the abrasive flow, enabling targeted material removal and surface polishing. These designs incorporate features such as turbulence-inducing structures, multi-channel arrangements, and adaptable geometries, which enhance the efficiency and accuracy of the AFM process. The advancements in AFM techniques have resulted in significant improvements in surface finish quality, including reduced roughness, enhanced geometric accuracy, and improved integrity. These developments have not only expanded the application range of AFM but have also provided manufacturers with a more efficient and cost-effective alternative to traditional finishing methods.

**Keywords:** Surface finishing, Abrasive flow machining, Computational fluid dynamics (CFD), Nanoparticles, Composite particles, Smart materials

### **Introduction:**

Surface finishing is a critical aspect in the manufacturing industry, playing a vital role in achieving functional and aesthetic requirements of various components and products. The demand for superior surface finishes has led to the exploration and development of advanced techniques. One such technique that has gained significant attention and advancements is abrasive flow machining (AFM). AFM offers an efficient and effective means of achieving high-quality surface finishes on a wide range of materials. Abrasive flow machining involves the controlled extrusion of a viscoelastic medium, mixed with abrasive particles, through the surfaces of workpieces. The abrasive-laden medium removes material and polishes the surface, resulting in improved finish quality, reduced roughness, and enhanced geometrical accuracy [1]. It is a versatile technique used across diverse industries such as aerospace, automotive, medical devices, and electronics, among others. In recent years, significant advancements have been made in AFM, driven by the need for enhanced surface finishing capabilities. Researchers and engineers have focused on optimizing the process parameters to achieve superior results. Through

the utilization of computational fluid dynamics (CFD) simulations and experimental studies, a better understanding of fluid flow behavior has been achieved. This knowledge has led to the refinement of key process variables, including flow rate, pressure, viscosity, and abrasive concentration, resulting in improved control and precision during AFM. Moreover, advancements in tooling design have played a crucial role in enhancing the effectiveness of AFM. Innovations in die, mold, and nozzle configurations have enabled better control over the flow of the abrasive medium. Turbulence-inducing structures, multi-channel arrangements, and adaptable geometries have facilitated targeted material removal, resulting in improved surface finish quality and geometrical accuracy [2]. Material advancements have also contributed to the progress of AFM. The introduction of advanced abrasives, such as nanoparticles and composite particles, has allowed for finer and more precise material removal. Additionally, the integration of smart materials into the viscoelastic medium has provided temperature control, viscosity modulation, and self-healing properties, thereby enhancing the overall performance and versatility of AFM.

### **Process Improvements:**

Abrasive flow machining (AFM) has undergone significant process improvements in recent years, leading to enhanced efficiency, precision, and surface finish quality. These process improvements have been achieved through advancements in process optimization, tooling design, and material selection [3]. The optimization of process parameters, innovative tooling designs, advancements in material selection, automation and control, and in-process monitoring techniques have collectively contributed to the continuous improvement and wider adoption of AFM in various industries (Fig. 1). As technology continues to advance, it is expected that AFM will further evolve, offering even more efficient and effective surface finishing solutions. It explores these process improvements in detail.

**Process Optimization:** Process optimization plays a crucial role in maximizing the effectiveness of AFM. Through the use of computational fluid dynamics (CFD) simulations and experimental studies, researchers have gained a deeper understanding of the fluid flow behavior in AFM. This knowledge has allowed for the refinement of key process parameters, including flow rate, pressure, viscosity, and abrasive concentration. By optimizing these parameters, manufacturers can achieve better control over material removal rates, surface roughness, and geometric accuracy, resulting in improved surface finish quality.

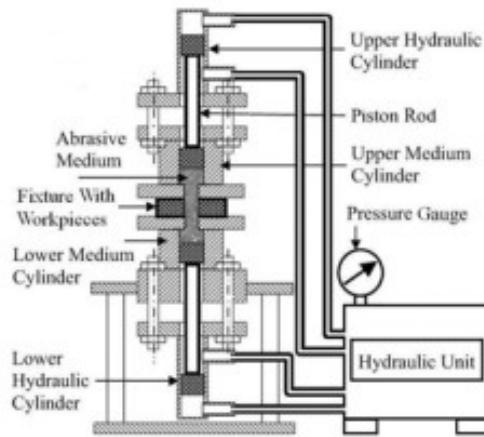
**Tooling Design:** Advancements in tooling design have contributed significantly to the process improvements in AFM. The development of innovative tooling configurations, such as improved dies, molds, and nozzles, has enabled more precise and controlled abrasive flow. Turbulence-inducing structures within the tooling promote better mixing of the abrasive particles with the viscoelastic medium, ensuring uniform material removal. Additionally, multi-channel arrangements and adaptable geometries have facilitated targeted material removal, allowing for complex part geometries and improved surface finish consistency.

**Material Advancements:** The selection and development of advanced abrasives have also led to process improvements in AFM. Nanoparticles and composite particles have been introduced as abrasives, providing finer and more precise material removal capabilities [4]. These advanced abrasives offer improved cutting efficiency and reduce the risk of surface damage. Additionally, the integration of smart materials into the viscoelastic medium has enhanced process control. These smart materials can exhibit properties such as temperature control, viscosity modulation, and self-healing capabilities, ensuring more stable and consistent AFM performance.

**Automation and Control:** Automation and control systems have been increasingly integrated into Vol. 50, No.2(XII) July-December 2020

AFM processes, leading to improved process efficiency and consistency. Automated control of process parameters, such as flow rate and pressure, allows for precise and repeatable material removal. Real-time monitoring and feedback systems enable adjustments to be made during the process, ensuring optimal performance and surface finish quality. Furthermore, the integration of robotics and computer numerical control (CNC) systems has enabled the automation of tooling movements, resulting in increased process speed and accuracy.

**In-process Monitoring and Quality Control:** Advancements in in-process monitoring and quality control techniques have further improved AFM processes. Real-time monitoring of process variables, such as pressure, flow rate, and temperature, enables timely adjustments and ensures consistent performance. Non-destructive testing methods, such as laser profilometry and optical inspection systems, allow for the measurement and evaluation of surface roughness, texture, and geometric accuracy during the AFM process. This enables immediate feedback and quality control, reducing the likelihood of defects and ensuring desired surface finish outcomes.



**Fig. 1: Abrasive flow machining (AFM) process**

#### Tooling Innovations:

Tooling design plays a critical role in achieving optimal performance and surface finish quality in abrasive flow machining (AFM). These tooling innovations in AFM have revolutionized the control and precision of abrasive flow, leading to improved surface finish quality, enhanced geometric accuracy, and better process consistency [5]. By incorporating turbulence-inducing structures, multi-channel arrangements, adaptable geometries, composite materials, and temperature control mechanisms, manufacturers can optimize the AFM process to meet the specific requirements of different workpieces. Recent innovations in tooling have led to significant advancements in AFM processes, enabling better control over abrasive flow, enhanced material removal, and improved surface finish consistency.

**Turbulence-Inducing Structures:** One of the notable tooling innovations in AFM is the incorporation of turbulence-inducing structures within the die or mold. These structures are designed to induce controlled turbulence in the viscoelastic medium containing abrasive particles. Turbulence helps in better mixing and distribution of the abrasive particles, ensuring uniform material removal and improving surface finish consistency across the workpiece. By optimizing the design and placement of these structures, manufacturers can achieve more precise and controlled abrasive flow, leading to enhanced surface finish quality.

**Multi-Channel Arrangements:** In AFM, multi-channel tooling configurations have gained popularity due to their ability to provide improved control over the abrasive flow. By incorporating multiple channels within the tooling, manufacturers can direct the flow of the viscoelastic medium and abrasive

particles to specific areas of the workpiece. This enables targeted material removal, allowing for the precise shaping and finishing of complex part geometries. Multi-channel arrangements offer versatility and flexibility in controlling the abrasive flow, enhancing the overall performance and effectiveness of AFM.

**Adaptable Geometries:** Tooling with adaptable geometries has emerged as an innovative solution in AFM. These tooling designs allow for the adjustment of the shape and size of the flow channels, enabling better adaptation to different workpiece geometries and surface profiles. Adaptable geometries offer improved flexibility in controlling the abrasive flow and optimizing material removal rates [6]. By customizing the tooling to match the specific requirements of the workpiece, manufacturers can achieve higher precision, enhanced surface finish quality, and improved geometric accuracy.

**Composite Tooling Materials:** The use of advanced composite materials in tooling has brought about notable advancements in AFM. Composite tooling materials offer several benefits, including improved wear resistance, reduced tooling damage, and enhanced tool life. These materials can withstand the abrasive nature of the process and maintain their structural integrity for longer periods. By using composite tooling materials, manufacturers can reduce downtime for tooling replacement, increase productivity, and ensure consistent surface finish quality throughout the AFM process.

**Integrated Temperature Control:** Tooling innovations in AFM have also focused on integrating temperature control mechanisms. Controlling the temperature of the tooling and viscoelastic medium is crucial for maintaining consistent process performance. Integrated cooling or heating elements in the tooling design help regulate the temperature, ensuring the optimal viscosity of the medium and preventing thermal damage to the workpiece. Temperature control features enhance process stability, reduce the risk of surface defects, and improve the overall quality of the surface finish.

### **EMERGING APPLICATIONS:**

Abrasive flow machining (AFM) has found numerous applications across various industries due to its ability to achieve high-quality surface finishes. In recent years, AFM has expanded its reach and has been increasingly adopted in emerging applications [7]. It highlights some of the emerging applications where AFM is proving to be a valuable surface finishing technique.

**Additive Manufacturing (3D Printing):** As additive manufacturing, or 3D printing, gains popularity across industries, the need for post-processing techniques to improve surface finish quality becomes crucial. AFM has emerged as an effective solution for post-processing additive manufactured parts. It can help remove the layer lines, support structures, and improve the surface roughness of 3D printed components. AFM enables the achievement of smoother and more uniform surface finishes, enhancing the aesthetic appeal and functional performance of the parts.

**Micro- and Nano-manufacturing:** With the growing demand for miniaturized components and devices in fields such as electronics, microelectronics, and medical devices, AFM has found applications in micro- and nano-manufacturing. AFM can precisely finish small-scale features, such as microchannels, microcavities, and intricate patterns on microelectromechanical systems (MEMS) devices. It offers a non-contact and non-destructive method for achieving high surface finish quality and geometric accuracy in miniature components.

**Aerospace and Gas Turbine Components:** The aerospace industry demands stringent surface finish requirements to ensure optimal performance and durability of aerospace components, such as turbine blades, vanes, and airfoils. AFM is gaining prominence in the aerospace sector as it can effectively remove burrs, sharp edges, and surface irregularities while preserving the critical geometries of these components. AFM enables precise surface finishing of complex and contoured aerospace parts,

improving aerodynamic performance and reducing drag.

**Medical Implants and Devices:** In the medical industry, AFM is being increasingly used for finishing medical implants and devices. AFM can achieve the desired surface finish on implants, such as orthopedic implants and dental prosthetics, to ensure biocompatibility, reduce wear, and improve osseointegration [8]. Additionally, AFM is employed for polishing surgical instruments, endoscopic tools, and other medical devices to improve their functionality, ease of cleaning, and overall performance.

**Automotive Components:** Automotive manufacturers are adopting AFM as a surface finishing technique for various components. AFM can improve the surface finish quality of critical automotive parts, such as engine components, pistons, cylinder liners, gears, and transmission parts. By removing surface imperfections and enhancing the surface integrity, AFM contributes to reduced friction, improved fuel efficiency, and extended component lifespan.

**Semiconductor and Electronics:** In the semiconductor and electronics industry, AFM has gained traction for post-processing applications. AFM can polish and smoothen the surfaces of semiconductor wafers, integrated circuits (ICs), and electronic components, improving their performance and reliability. It helps remove defects, scratches, and roughness on delicate surfaces, ensuring optimal electrical conductivity and minimizing signal losses.

### **Benefits and Limitations:**

#### **Benefits of Abrasive Flow Machining (AFM):**

- a) Superior Surface Finish: AFM enables the achievement of excellent surface finish quality, with reduced roughness and improved aesthetics. It can remove surface imperfections, burrs, and irregularities, resulting in smooth and polished surfaces.
- b) Geometric Accuracy: AFM can maintain the desired geometry of the workpiece while improving the surface finish. It allows for precise material removal, ensuring dimensional accuracy and preserving critical features.
- c) Versatility: AFM can be applied to a wide range of materials, including metals, polymers, ceramics, and composites [9]. It is suitable for various complex part geometries and can finish internal passages, cavities, and intricate patterns.
- d) Process Control: AFM offers precise control over process parameters such as flow rate, pressure, and abrasive concentration. This control enables consistent and repeatable results, ensuring uniform material removal and surface finish quality.
- e) Non-Destructive: AFM is a non-destructive process that removes material evenly without causing thermal damage or inducing stress. It preserves the structural integrity of the workpiece, making it suitable for delicate or sensitive components.
- f) Automation and Efficiency: AFM can be automated, leading to increased process efficiency and productivity. With advancements in robotics and CNC systems, tooling movements and process parameters can be precisely controlled, reducing manual labor and cycle times.

#### **Limitations of Abrasive Flow Machining (AFM):**

- a) Limited Material Removal Rate: AFM is a time-consuming process due to its relatively low material removal rate compared to other machining techniques. It may not be suitable for applications requiring rapid material removal or high production volumes.

- b) Complex Tooling Design: The design and fabrication of tooling for AFM can be complex and require expertise. The development of tooling configurations tailored to specific workpieces may involve higher costs and longer lead times.
- c) Surface Integrity: Although AFM improves surface finish quality, it may not be suitable for applications that require pristine surfaces without any residual subsurface damage. The viscoelastic medium may cause slight subsurface deformation or alteration.
- d) Limited Access to Confined Areas: AFM may have difficulty accessing and finishing internal and narrow cavities or passages. The tooling design and flow dynamics may limit its ability to reach and effectively finish such areas.
- e) Abrasive Media Management: Proper management and control of the abrasive media are essential for consistent performance and surface finish quality. Monitoring and replenishing the media, as well as handling waste disposal, require attention and maintenance.
- f) Cost Considerations: AFM may involve higher initial equipment and tooling costs compared to traditional finishing methods. The complexity of tooling design, the need for specialized abrasive media, and the requirement for process optimization may contribute to increased overall costs.

### **Future Developments:**

Abrasive flow machining (AFM) has seen significant advancements over the years, but the field continues to evolve, driven by the demand for higher precision, efficiency, and surface finish quality. Several potential future developments can be anticipated in AFM [10]:

**Process Modeling and Simulation:** Advancements in computational modeling and simulation techniques will play a crucial role in further optimizing AFM processes. Improved modeling of fluid flow behavior, abrasive particle interaction, and material removal mechanisms will enhance process predictions and enable more precise process parameter optimization.

**Advanced Abrasives and Media:** The development and utilization of advanced abrasives and media will continue to enhance AFM capabilities. Novel abrasive materials, including engineered nanoparticles and composite particles, can offer superior cutting efficiency, reduced wear, and improved surface finish quality. The integration of smart materials in the viscoelastic medium may provide enhanced process control and self-healing properties.

**In-situ Monitoring and Control:** The incorporation of advanced sensing and monitoring technologies will enable real-time monitoring of key process variables during AFM. In-situ monitoring of parameters such as pressure, flow rate, temperature, and surface roughness will facilitate adaptive control strategies and ensure consistent and optimal surface finish quality.

**Integration with Additive Manufacturing:** AFM will likely be further integrated with additive manufacturing (3D printing) processes to enhance the post-processing of printed components. Advanced tooling designs and process control strategies specific to additive manufacturing will be developed to improve the surface finish of 3D printed parts, reduce post-processing time, and enhance overall part quality.

**Automation and Robotics:** The automation of AFM processes using robotics and advanced control systems will continue to evolve. Robotic systems can facilitate precise tooling movements, optimize process parameters, and enhance overall process efficiency. Integration with artificial intelligence (AI) algorithms may enable autonomous decision-making and adaptive process control.

**Surface Analysis and Characterization:** Advancements in surface analysis and characterization techniques will provide a deeper understanding of the effects of AFM on surface properties. High-resolution imaging, profilometry, and metrology techniques will help evaluate surface roughness,

texture, and geometric accuracy, enabling improved quality control and surface finish optimization.

**Integration with Industry 4.0:** AFM processes will likely be integrated into the broader framework of Industry 4.0, utilizing data-driven insights, connectivity, and smart manufacturing concepts. This integration will enable real-time data exchange, remote monitoring, predictive maintenance, and optimization of AFM processes within the digital manufacturing ecosystem.

### **Conclusion:**

In conclusion, abrasive flow machining (AFM) has experienced significant advancements in surface finishing capabilities, driven by process optimization, tooling innovations, and material advancements. The optimization of process parameters, such as flow rate, pressure, and abrasive concentration, has led to improved control, precision, and surface finish quality. Innovative tooling designs, including turbulence-inducing structures, multi-channel arrangements, and adaptable geometries, have enhanced abrasive flow control and enabled targeted material removal, resulting in improved surface finish consistency and geometric accuracy. The integration of advanced abrasives and smart materials has further expanded the scope and effectiveness of AFM, enabling finer material removal and enhanced process control. AFM has found emerging applications in various industries, including additive manufacturing, micro- and nano-manufacturing, aerospace, medical implants, automotive components, and semiconductor/electronics. These applications highlight the versatility and value of AFM in achieving high-quality surface finishes in diverse fields.

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## CONTRACTS MANAGEMENT IN CONSTRUCTION PROJECTS

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### **Abstract:**

Contract Management at its best is about managing risk, and managing relationships. At its simplest, a contract is a document describing a relationship between two parties what each of them agree to do, and who carries the risk if things don't turn out as planned. Contract Management is about managing that relationship, and those risks, to ensure that both parties get the result they originally wanted. Every construction project is bound by a Contract. Proper Contract Management plays a major role in the effective management of your construction projects. Adhering to all the Contractual obligations, the terms and conditions can save both cost and time. The procedures to commence work, the documents required at each stage of the project, variation procedures, payment terms, basis for termination and suspension of works by either parties, completion of work, roles and responsibilities of all the stake holders and their staffs, dispute resolution methods, Arbitration procedures etc are all mentioned in the contract.

**Keywords:** Contract, contractor, client, management, construction

### **1. Introduction:**

Contact management in construction is a process through which partners in a project define their roles and responsibilities to ensure the project runs flawlessly and cohesively. Similarly, contract management mitigates risk by defining parties' roles and consequences when a party doesn't meet its mandate. Contract management in construction involves managing the relationships between project partners such as vendors, contractors, financiers, employees, and customers. The goal of construction contract management is to ensure optimal and transparent operational and financial performance and reduce risks for the project's entirety. Contract management poses a bigger challenge in the construction industry as the field is riddled with a high-risk, hazardous, and highly competitive environment. As a result, handling contractor and sub-contractor input while ensuring safety and health standards are met makes managing any construction project challenging.

### **2. Essential Elements of Successful Contract Management:**

It isn't enough that an organization has professionals in place to handle construction contract management. Employees must be augmented with the presence of processes and software companions to satisfy increasing compliance and analytical needs. When a contract management strategy is successfully implemented, organizations can expect to see:

The expected business benefits and financial returns are being realized.

The supplier is cooperative and responsive to the organization's needs.

The organization encounters no contract disputes or surprises.

The delivery of services is satisfactory to both parties.

### **3. Stages of Contract Management:**

Contracts play a significant role in the end-of-quarter crunch and are broken up into stages to organize efforts and structure the typical contract process.

#### **Generation:**

To start a contract's lifecycle, the first draft of the document has to be created. Almost no organizations are starting new contracts from scratch, but this can still be a lengthy process. While 48% of respondents have evolved to utilize a dedicated contract lifecycle management tool, the most common methods for contract generation are still standalone tools like Microsoft Word (68%) and Google Docs (50%).

It's encouraging that there's some growth to reduce the number of tools involved in contract generation, but it also seems clear that adoption to the next generation of tools is only partial. Our survey showed that plenty of today's organizations are using more than one tool to create new agreements. Reluctance to move away from traditional, disconnected technology often results in a lengthy contract generation process and additional room for error. [1]

#### **Negotiation:**

After a contract is generated, all parties involved need to negotiate back and forth until final terms are agreed to. For respondents in our survey, this stage in the process is the most time-intensive. Nearly half of respondents say that standard steps such as collecting signatures, catching mistakes, and legal approval are the biggest obstacles to faster negotiation. These delays result in at least three new versions of a document before it is completed.

One of the main causes of these hurdles is the lack of a platform to share contracts and collaborate on revisions. The existence of multiple versions of the same contract makes it easier to make mistakes or lose track of progress made elsewhere. Keeping the negotiation and process centralized through online collaboration tools reduces the possibility of human error and ensures all parties have access to the most recent version of the contract.

#### **Routing:**

Contracting professionals are using a wide range of tools to share contracts internally and externally. While the most popular routing tools are email (73%) and cloud storage systems (64%), a significant number of today's contracting workers are still relying on outdated systems like postal mail (29%) and fax (20%). All of these contract sharing methods have the same primary flaw: they take the contract and the users out of the CLM system. When contract routing relies on more than one solution, it opens the door for several new problems, like reduced visibility or lost documents. It also makes it easy to accidentally share the contract with the wrong party, which 26% of our respondents have done.

#### **Approval/signature:**

When it's time to finalize a contract by collecting signatures, today's contracting professionals have largely matured to utilize modern tools. Around two-thirds of our respondents use e-signature software or a CLM tool for collecting signatures.

However, nearly one-third of respondents are still sending contracts for approval via email attachment or hard copy. These manual processes run into serious problems at scale. With around a quarter of teams reporting that approximately 5 unique people are involved in the contract approval process, the delays and inefficiencies of these exchanges can add up quickly. When it comes to workflow obstacles, a range of different departmental approvals (legal, pricing, procurement) and signature collection delay around 30-40% of organizations. These approvals are the biggest hurdles for today's contracting workflows.

The more disjointed approvals are from a central CLM platform, the more likely it is for delays and errors to occur.

**Storage:**

Once a contract is finalized, cloud storage is popular with modern organizations. Around two-thirds of respondents use cloud storage to manage completed contracts, either exclusively or in conjunction with on-premises servers. Only 10% of organizations in our survey reported relying on paper file cabinets to store agreements. However, even with a majority of organizations storing contracts in the cloud, 46% of respondents report being unable to locate a stored contract.

Making these contracts easy to find is also critical to management workflows since more than two-thirds of respondents need to locate archived contracts on a daily or weekly basis. And when they do need to access a contract, it takes an average of 45 minutes to locate the correct file and nearly 90 minutes to find specific terms within that document. A CLM tool is an ideal way to facilitate unified storage and naming conventions. This will speed up the process of finding the right document and locating the relevant clauses within that document. Once the CLM is established, additional insights can be gained through AI and other advanced analytics tools.

**Revisions and amendments:**

Gathering all documents pertinent to the contract's initial drafting is a difficult task. When overlooked items are found, systems must be in place to amend the original contract.

**Auditing and reporting:**

Contract management does not simply entail drafting a contract and then pushing it into the filing cabinet without another thought. Contract audits are important in determining both organizations' compliance with the terms of the agreement and any possible problems that might arise.

**Renewal:**

Using manual contract management methods can often result in missed renewal opportunities and business revenue loss. Automating the process allows an organization to identify renewal opportunities and create new contracts. [2]

#### **4. Contractor's Project Manager**

A contractor's project manager should:

- Be a team member and be able to effectively represent the interests of the contractor, subcontractors, suppliers, and the contractor's consultants. The contractor's project manager has primary responsibility for compliance with the requirements of the contract documents.
- Have good communications skills.
- Know the contents of the owner-contractor agreement, subcontracts, and purchase orders.
- Know and understand the standard forms to be used for the project, particularly the conditions of the contract, and the underlying principles of contract law upon which they are based.
- Have a working knowledge of applicable safety regulations and understand the importance of maintaining the contractor's safety program.
- Have sufficient training in cost accounting, budgeting, and construction scheduling to be able to monitor and report the project's budget and schedule status.
- Have a working knowledge of construction materials, construction trades, means and methods, and the relationships between subcontractors, suppliers, and manufacturers.
- Understand the codes and regulations that govern the project.
- Be open-minded, fair, and responsive.

Many of the duties of the contractor's project manager are similar to those of the construction contract administrator. It is important to note, however, that the construction contract administrator represents the owner on the project, while the project manager represents the contractor. Each is responsible for contract compliance by its respective party to the contract.

It is advisable that personnel who serve in either of these capacities have appropriate training, supplemented by sufficient field experience.

## **5. General Conditions of Contract:**

### **Security Deposit:**

The security deposit in the construction industry is nothing but it is security money deposited by the contractor as a tendering amount with the department.

The contractor shall deposit around 10% of the estimated cost as security money with the department including the earnest money which is already deposited at the time of submitting the tender.

### **Compensation for the Delay:**

In the construction work, the work shall be started from the 15th day after the order of work or any specified date during the contract.

If there is any delay in the completion of the construction project then the contractor is liable to pay compensation to the department or owner around 10% of the contract price.[3]

### **Incentive for Early Completion:**

If the contractor completes the work ahead of the scheduled completion time, a bonus of 1% of the tendered value per month computed on a per-day basis, shall be payable to the contractor.

The incentive is subject to a maximum limit of 5% of the tendered value. The amount of bonus, if payable, shall be paid along with the final bill after completion of work.

### **Power to Take Possession:**

If the contractor is not able to pay compensation for the delay of work then in this situation the authority may take possession of all tools, plants, materials, and sell them after sending a written letter to the contractor.

### **Extension of Time:**

In the construction, if the delay in the completion of project work is not due to the contractor, then in this situation contractor should write a letter to the department or owner for the extension of time.

The department or owner first check the reason for the delay in the project, if the delay in the project is not from the contractor side then the owner or department grant a suitable extension of time.

### **Completion Certificate:**

In the construction work, the completion certificate means the clearance of the site including instruments, surplus materials, etc after the completion of construction work.

In the contract document, a specific date is mentioned for the completion certificate, if the contractor is failed to clear the site on the specific date then the owner or department clears the site with the expenses of the contractor.

### **Payment on Certificate:**

In the construction field, the final payment to the contractor shall be made on the issue of the completion certificate and the intermediate payment shall be regarded as an advance against the final payment.

### **Monthly Payment on Bills:**

The monthly payment on bills in the construction industry shall be submitted by the contractor on the date or before the date fixed for the works executed in the previous months. [4]

## 6. Types of Construction Contracts

Based on the various parameters following are the construction contracts followed in the construction industry for proper implementation of construction contract management.

### 1. Unit Rate/ Unit Price Contract:

In a unit price contract, the total contract price is based upon the price of all the individual “chunks” — or units — of the work. Under a unit price contract, the contractor provides the owner with a specific price for one or more tasks or a partial “segment” or a “block” of the overall work that’s required on the project. The owner then agrees to pay the contractor for the units that the contractor expends to complete the project.

So, rather than taking a look at the project as a whole and setting a price based on that finished product, a unit price contract will determine the price based on the “units” that will be required to make up that job. Often, the number of units needed won’t really be specified at the start of work.

This type of contract is normally utilized where the quantity of work cannot be established such as civil engineering construction projects where excavation of soil and rock are involved. The contractor is paid based on the units that have been put in place and verified by the owner

Here’s a list of costs that are commonly factored into unit prices:

Labor costs  
Material costs  
Overhead costs  
Profit  
Taxes  
Permit and Inspection Costs

### • Percentage Rate Contract

The percentage rate contract is almost similar to the Item Rate contract or Schedule Contract or Unit Price Contract except for the method of tendering the unites rate.

In the percentage rate contract, a department prepares a plan according to the description of items with the quantity, rate, amount, and total amount.

And the contractor performs the work as per or some percentage above or below the rate specified by the department.

#### Advantages of Percentage Rate Contract:

In this type of contract, the contractors only need to quote the percentages above, at par or below the schedule of rates furnished by the department. So there is very little scope of Mistakes in this type of contract.

In this type of contract, the comparative statement can be prepared quickly.

#### Disadvantages of Percentage Rate Contract:

Since the contractors only need to quote a certain percentage as profit, which can be done in very little time, there is a chance of forming a ring, in order to allow the work to a particular contractor at a high rate without actual competition. This leads to the drainage of Government money.

### • Cost plus Percentage Contract

This type of contract generally adopted when conditions are such that the rates of labor, material, etc. are liable to fluctuate and there is an element of uncertainty in the scope of the work. In this type of contract, there is an arrangement between the owner and the contractor by which the parties agree that

the work ordered would be completed and paid for on the basis of actual cost incurred plus a fixed percentage as overhead and profit.

**Advantages of Cost-plus percentage rate contract:**

This type of contract is suitable when the work is required to be carried out in extraordinary situations due to the fluctuations and uncertainty in the market rates of labor and materials. [5]

**Disadvantages of Cost-plus percentage rate contract:**

It is of the contractor's interest to unnecessarily increase the cost of work, by wasting materials and employing inefficient workmen, as his profit depends on the cost of work. So as a result the wastage of government money occurs.

- Lump-Sum Contract

In this type of contract, the contractor needs to quote a fixed sum for the execution of the work, complete in all aspect. This is the most common form of contract, used in any public construction work.

**Advantages of Lump-Sum Contract:**

The executing authority knows beforehand how much the work will cost.

As problem arises in making Intermediate payments, the contractor will try to complete the work as soon as possible to get early payment, which in return, results in faster execution of projects.

**Disadvantages of Lump-Sum Contract:**

As difficulty arises in making Intermediate payments, the contractor tries to complete the work as soon as possible, even with the high cost of materials and equipment, which results in drainage of government money.

- Labor Contract

In this type of contract, the contractor quotes rates for item work exclusively of the materials which are supplied by the executing authority.

**Advantages of Labor Contract:**

The materials stored by the government are thus utilized.

Difficulty in obtaining certain materials in the open market can be minimized as the materials are supplied by the government, so speedy execution of the work can be achieved.

**Disadvantages of Labor Contract:**

Theft from the store, difficulty during handling of materials, shortage of supply of material, is the matter of constant worry of a department, which also includes additional charges for storage and security.

- Material Supply Contract

In this type of contracts, the contractors are required to offer their rates for the supply of the materials, inclusive of all charges, e.g. carriage and delivery charges, local and central taxes.

**Advantages of Material Supply Contract:**

Payment in this type of contract can be made promptly, which also results in faster delivery of materials.

**Disadvantages of Material Supply Contract:**

Constant control for quality of materials is to be received, which incurs additional charges.

- EPC and Turnkey Contract

EPC Engineering, construction, and procurement is the prominent form of contracting agreement in the construction industry. The engineering and construction contractor will carry out the detailed engineering design of the project, procure all the equipment and materials necessary, and then construct to deliver a functioning facility or asset to their clients.

A turnkey contract is a business arrangement in which a project is delivered in a completed state. Rather than contracting with an owner to develop a project in stages, the developer is hired to finish the entire

project without owner input. The builder or developer is separate from the final owner or operator and the project is turned over only once it is fully operational. In effect, the developer is finishing the project and “tuning the key” to the new owner.

In EPC, the owner provides the basic engineering to the contractor and the constructor needs to perform the detailed design based on the basic design received by them from the owner. Whereas in Turnkey, the owner only provides certain technical specifications of the project and the contractor needs to prepare all basic and detailed design of the project.

- **BOT (Build, Operate, and Transfer) Contract**

A type of contract between a private company and a government body, in which the private company finances, design, construct, operate, and maintains an infrastructure project for a period of time and then transfers the ownership of the project to the government. During this period the private party is entitled to retain all revenues generated by the project and is the owner of the regarded facility.

The basic difference from the other conventional projects/ contract;

The returns are spread over a longer period

Sound financial and engineering skills are warranted

No protection against any prices variation during the implementation period,

Cost and time overrun upsets the returns.

Extension of time granted by authority does not provide much remedy.

- **Target Price Contract**

In this contract type, the actual cost of completing the project is compared with a target cost previously agreed. If the actual cost exceeds the target cost, some of the cost overrun will be borne by the contractor (pain share) and the remainder by the owner in accordance with the agreed formula. Similarly, if the actual cost is lower than the target cost, the contractor will be saving with the owner again in accordance with a previously agreed formula (gain share). Such an approach helps to align the interest of the parties since both will have an interest in working together in order to reduce the costs of the projects.

- **Measured Contract**

In this type of contract, the total cost of a work is worked out by the detailed measurement of different items of work. Except for a lump sum contract, all other contracts are measured contract.

- **Negotiated Contract**

When the work is awarded by negotiation between two parties without the call of tenders, the contract awarded to the contractor is known as a Negotiated contract.

- **Cost-plus Fixed Fee Contract**

In this type of contract, the contractor is paid the total cost of the project, plus a lump sum amount, over and above the actual cost of the work.

**Advantages of Cost-plus fixed fee contract:**

Contractors profit and overhead charges are already included, so the contractor tries to complete his work as soon as possible to receive easy payments.

**Cost-plus Sliding or Fluctuating fee scale Contract**

In this type of contract, the contractor is paid the total cost of the work, plus, an amount inversely proportional to the increase or decrease in the cost of the project.

**Advantages of Cost-plus fluctuating fee Contract:**

The contractor tries to finish his work in as low cost as possible, in order to receive high profit, as his profit completely depends on the project cost.

## **7. Conclusions:**

A contract is a legally binding agreement between two or more parties who agree to buy or sell goods and services from one another. A contract provides legal protection for all parties involved in the transaction. It outlines the rights and responsibilities of all parties and helps reduce the risk of any party forfeiting their duties per the agreement. Contracts typically include details related to the scope of work of the project, quality control, legal jurisdiction, project schedules, and payment terms. A contract is fundamental to any business transaction that involves an exchange of value. It documents the terms of the agreement in a way that is enforceable in a court of law if any party does not hold up their end of the exchange. The contractor signing the agreement with the owner has the responsibility of accomplishing the work in accordance with the contract documents. Therefore, the contract documents are addressed only to the contractor; however, owner and A/E responsibilities are also included within these “contract documents.” Contracting requirements and specifications are usually bound into the project manual. Sellers may combine different types of contracts to create one that hits all the high notes of their business exchange. Some business exchanges include a range of products and services, such as labor and equipment. In such cases, the contract needs to outline any applicable terms and agreements from more than one type of contract to cover all parts of the transaction, such as a fixed-price contract for the labor and a cost-plus contract for the equipment.

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## EXAMINE LAMINAR FLOW AND TURBULENT FLOW UNDER FLUID MECHANICS

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### **Abstract:**

This study's initial objective was to better understand how rotation affects turbulent flow in ducts. In many applications, including meteorology and oceanography, centrifugal separators, turbines, or cooling channels in rotating machinery, understanding the impact of rotation on the structures of turbulence is crucial. Experimental research on rapidly rotating duct flow is done with rotation numbers between [0, 1]. Water was employed as the working medium to do this along with reasonably high Reynolds numbers (5000–30000 dependent on the hydraulic radius). It was determined how the rotation affected the pressure drop in the duct, and appropriate scaling of this quantity were researched. Analytical and numerical analysis of the fluid laminar flow in a revolving PCR-cone was done to better understand the increased mixing and temperature homogenization. The flow field in the cone was described, and it was discovered that a strong boundary layer flow caused by Coriolis and buoyancy effects was the cause of the increased mixing.

**Key words:** Turbulence, System rotation, Coriolis, duct, laminar flow

### **Introduction:**

Since water is delivered to communities through pipes, this issue remains; however, if the water were to move without friction (low viscosity), it could be distributed with very little energy loss. A portion of the flow energy is converted into thermal energy by the viscosity, which resists the motion of one layer of water over another.

The two solutions to the differential equations for flow are either time-independent or time-dependent. In the first scenario, each point's fluid velocity remains constant across time, and the resulting flow is referred to as laminar. The flow is turbulent if the velocity fluctuates over time; in this situation, the solutions are either stationary or transient. There are numerous methods for visualizing flows [4]. The majority of them are based on the light scattering caused by tracer particles or gas bubbles. We employ the smooth or rough surface of a cylindrical water beam [5] to represent laminar flow.

One of these attempts to reduce/eliminate the organic cellulose from the flux coating of cellulose electrode (EXX10), which are predominately utilised in pipeline welding, is the tubular welding technique [6], a modified form of traditional shielded metal arc welding (SMAW) process.

### **Literature Review:**

Knowing the fluid's velocity at each point on the surface, the volume flow rate through a surface S is determined to calculate the integral:

$$\Phi = \int \mathbf{v} \cdot d\mathbf{S}.$$

When the velocity is constant over surface S, it is simple to integrate this equation:  $=vS$ . It is difficult to maintain a constant velocity on a surface, though. Instead, we can measure the flow inside the tube and

divide it by the area to get the water's average velocity. To overcome the effects of viscosity that resist the mobility of a cylindrical segment of water inside a hose, one must apply a pressure difference between its ends. If pressure is applied to the ends of a water cylinder, laminar flows will result in water velocity that is zero adjacent to the tube wall and maximal at its middle. thus, after applying pressure for a while, a stable condition is reached. The maximum speed, the speed at each point, and the relationship between flow and pressure are all proportional to the applied pressure differential. If the pressure is significantly raised, the speeds of the various water zones will change continuously in magnitude and direction, creating a turbulent flow where each point's velocity changes over time. Pressure rises cause more turbulence. The pressure difference between the ends is proportional to the water flow in laminar flow and to the square of the flow in turbulent flow.

### Laminar Flow and Turbulent Flow:

While transition flow happens in an area where the flow fluctuates between laminar and turbulent before becoming fully formed turbulent flow, laminar flow features smooth streamlines and highly organized motion. A fluid moving in an erratic manner with large velocity fluctuations is called a turbulent flow. According to Merle and David [7], the fluid flow is typically influenced by the flow velocity, fluid type, surface roughness, and surface temperature. Depending on the flow's Reynolds number, two different flow regimes are described: laminar and turbulent:

- Laminar flow is characterized by lamina or layers that do not mix with one another.
- Alternative titles for laminar flow include streamlined and viscous flow.
- In the case of turbulent flow, fluid particles are intermixed.

What would we anticipate to happen if we took a pipe of freely flowing water and injected a dye into the middle of the stream?

This

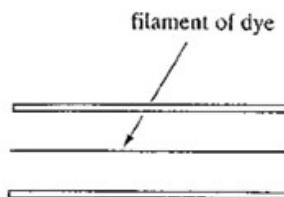


Figure: 1 Laminar

Or this

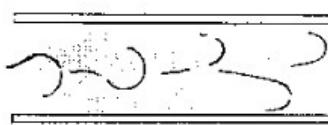


Figure: 2 Turbulent

Actually, both would occur, but at various flow rates. When the fluid is moving quickly, the top is created, and when it is moving slowly, the bottom is [2].

- Laminar flow describes the lower situation and turbulent flow the upper one.
- Laminar flow is characterized by the ordered motion of the fluid particles, which all move parallel to the pipe walls in straight lines.
- But what exactly constitutes quick and slow? And how quickly does the flow pattern alter? Why might we wish to know this information?

- In an experiment that has since become a classic in fluid mechanics, Osborne Reynolds first looked into the phenomena in the 1880s.

He used a tank arranged as above with a pipe taking water from the centre into which he injected a dye through a needle. After many experiments he saw that this expression

$$\frac{\rho u d}{\mu}$$

Where  $\rho$  = density,  $u$  = mean velocity,  $d$  = diameter and  $\nu$  = viscosity

Would help predict the change in flow type. If the value is less than about 2000 then flow is laminar, if greater than 4000 then turbulent and in between these then in the transition zone.

This value is known as the Reynolds number, Re:

$$Re = \frac{\rho u d}{\mu}$$

Laminar flow:  $Re < 2000$

Transitional flow:  $2000 < Re < 4000$

Turbulent flow:  $Re > 4000$

What are the units of this Reynolds number? We can fill in the equation with SI units:

$$\begin{aligned}\rho &= kg/m^3, & u &= m/s, & d &= m \\ \mu &= Ns/m^2 = kg/ms\end{aligned}$$

$$Re = \frac{\rho u d}{\mu} = \frac{kg \cdot m \cdot m}{m^3 \cdot s \cdot 1 \cdot kg} = 1$$

Hence, it lacks units. A non-dimensional (or dimensionless) quantity is one that has no units. Re is a non-dimensional number and is thus the Reynolds number.

### Reynolds's Number:

The dimensionless Reynolds number plays a prominent role in foreseeing the patterns in a fluid's behavior. It is referred to as Re and is used to determine whether the fluid flow is laminar or turbulent [3].

Reynold's no,  $Re = \rho VD/\mu = VD/\nu$

V=mean velocity of flow through a pipe

D = Characteristic length of the geometry

$\mu$  = dynamic viscosity of the liquid ( $N\cdot s / m^2$ )

$\nu$  = Kinematic viscosity of the liquid ( $m^2/s$ )

$D=4Ac/P$

Where,

- $Ac$  = Cross-section area of the pipe

- $P$  = Perimeter of the pipe

### Pipe

- $Re < 2000$  laminar
- $2000 < Re < 4000$  Transient
- $Re > 4000$  turbulent

### Plate

- $Re < 5 \times 10^5$  Laminar
- $Re > 5 \times 10^5$  turbulent
- [Transient is small, so neglected]

### Laminar Flow in a Pipe

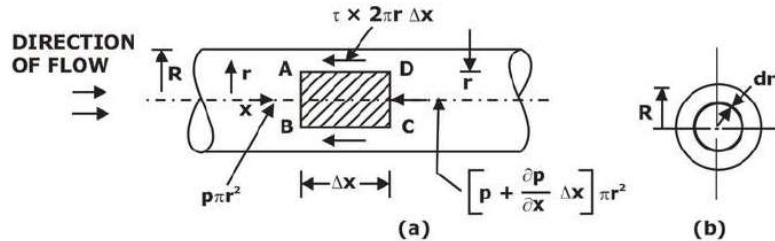


Figure: 3 shows a pipe with viscous flow

Now, the forces acting on the fluid element are:

- The pressure force,  $P\pi r^2$  on face AB.
- The pressure force on the face CD. =  $[p + (\partial p / \partial x)Ax] \pi r^2$
- The shear force,  $\tau \times 2\pi r^2 x$  on the surface of the fluid element. As there is no acceleration hence:

Net force in the x direction = 0

$\Sigma F_x = 0$  results in

$$T = -(\partial p / \partial x) x(r/2) \text{ and } T_{max} \text{ at } r=R \Rightarrow -(\partial p / \partial x) x(r/2)$$

The shear stress  $T$  varies linearly with the radius  $r$ , as illustrated in the Figure, because  $P/ax$  across a section is constant.

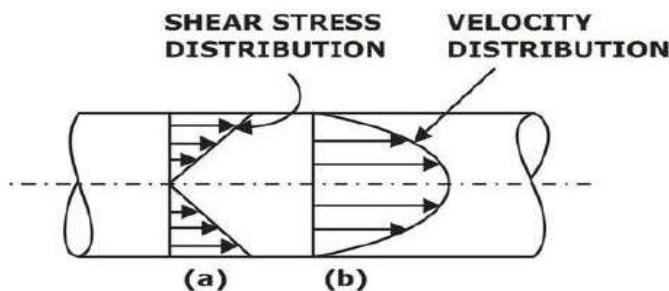


Figure: 4 Shear stress and Velocity Distribution

### Reynolds Experiments:

At various speeds, the characteristics of the dye filament were seen:

1. The dye remained in the shape of a straight, steady filament parallel to the tube's axis at low speeds: (a) the flow is laminar.
2. Dye filament displayed inconsistencies and wavy characteristics at higher velocities: (b) the flow is changing.
3. As velocity increases further, the filaments grow increasingly asymmetrical, and eventually dye diffuses throughout the entire cross section: (c) The flow is erratic.

At low speeds, flow occurs in a variety of sheets or laminae. Laminar Flow is the name of this flow. When moving at high speeds, the flow is disrupted and particle mixing occurs. Turbulent Flow is the name of the flow [1].

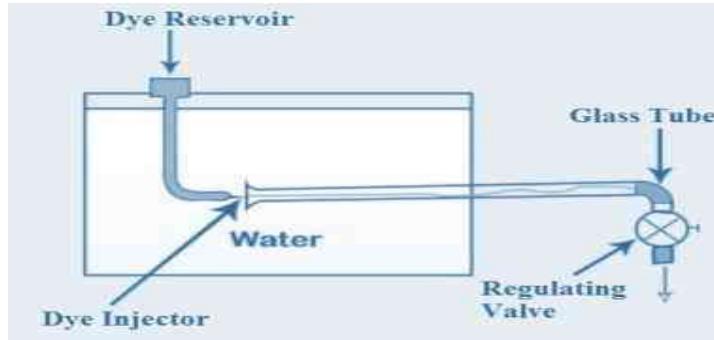


Fig 5. Reynolds Experiments

#### Types of flow and Loss of head:

Loss of head,  $h_f$  is measured in a pipe of length ( $L$ ) for various values of velocity ( $v$ ) in the pipe and  $(h_f/L)$  vs  $(v)$  is plotted in a log – log plot

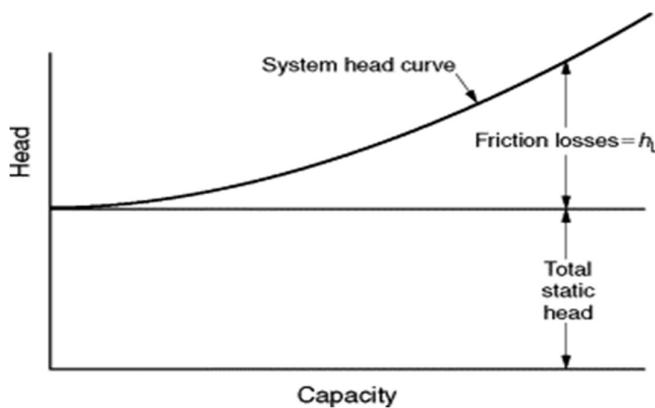


Fig 6. Types of Flow and Loss of Head

For different values of the pipe's flow velocity ( $v$ ) and  $(h_f/L)$ , the loss of head ( $h_f$ ) is measured. Vs  $(v)$  is represented as a log-log plot. Up to point (B), the curve is a straight line at low velocities.  $(h_f)$  and  $(v)$  are proportional up to point (B). Transition is seen up until point (C). The generated curve has a slope ranging from 1.75 to 2 after (C) once more.

One type of flow known as laminar flow, in which  $(h_f)$  is proportional to  $(v)$ , exists up to (B). Beyond (C), there is another flow type in which  $(h_f)$  is inversely proportional to  $(V^n)$ , where  $n$  is between 1.75 and 2. The flow in question is turbulent. However, line BC is not retraced if the velocity is decreased from a high value. The points are actually along line CA.

The matching velocity is referred to as the upper critical velocity, and Point (B) is referred to as the higher (or upper) critical point. Lower critical point (A) and lower critical velocity (corresponding velocity) are terms used to describe this situation. The Reynolds Number, which measures how much inertia force there is in relation to how much viscous force there is, determines whether a flow is laminar or turbulent.

Point (B)'s Upper Critical Reynolds Number is not known for sure.

How carefully the initial disturbance impacting the flow is avoided will determine how valuable it is. For pipe flow, the Upper Critical Reynolds Number typically hovers around 4000.

(Note: Values as high as 50,000 can be attained with the right precautions.)

Point (A) corresponds to a Lower Critical Reynolds Number that is known.

Its value for a straight pipe is around 2000. The real Critical Reynolds Number, which marks the boundary between laminar and turbulent flows, is this Reynolds number.

The Critical Reynolds Number ( $Re$  (critical) approximately 2000) is the Reynolds Number below which the flow is unmistakably laminar.

### **Laminar Flow:**

Laminar flow is defined as the flow in which the fluid particles act in an orderly manner without mixing with one another and the flow occurs in a number of sheets, layers, or laminae, each sliding over the other.

Laminar flow characteristics include:

1. Fluid particles behave in a controlled way. No mixing of the particles. Layers that flow over one another are present.
2. The amplitude and direction of the flow's velocity at a given point are almost constant.
3. In comparison to other forces, viscous force is crucial to fluid flow.
4. The Newton's Law of Viscosity is used to calculate shear stress.
5. Viscous forces swiftly dampen any disturbance.
6. Because of the No-Slip criterion, the section's velocity is not constant. The velocity gradient and, thus, the shear stress gradient are established perpendicular to the flow direction.
7. Head loss is inversely correlated with flow velocity.
8. Pipe flow has a parabolic velocity distribution.

### **Conclusion:**

The turbulence in a fluid flowing in a beam in the open air can be depicted in photographs in a very pictorial manner. The chaotic behaviour of a segment of the fluid inside the beam is demonstrated by the deformation at a particular location in its surface. The relationship between the Reynolds number and the type of flow regime observed at the water beam as well as the change from a laminar to a turbulent flow is also demonstrated with astounding clarity.

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**EXAMINE SOIL IMPROVEMENT WITH THE ADDITION OF MINERALS****Prince Chawla<sup>1</sup> Ankur Gill<sup>2</sup>,**

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**Abstract:**

In its natural form, the soil at a construction site might not always be completely adequate for sustaining structures. In this scenario, it is necessary to enhance the soil to raise its bearing capacity and lower the anticipated settlement. The performance of saturated clayey soil in situ can be improved using a variety of strategies, which are discussed in this paper along with their uses, installation procedures, appropriate soil types, and costs. The study came to the conclusion that it is urgently necessary to research the technique of removal and replacement for improving soil behaviour while taking geotechnical requirements (such as bearing capacity and settlement) and cost into account. This will help to achieve the ideal thickness of replacement layers and the most suitable material while maintaining the lowest possible total cost of foundation works.

**Key words:** Soil improvement, soil replacement, preloading, drains, stone column, chemical stabilization, jet grouting, thermal methods of soil improvement

**Introduction:**

According to Velayutham and Bhattacharyya (2000), soil is a dynamic natural body that forms as a result of pedogenic processes involving the weathering of rocks. It is composed of mineral and organic constituents, has distinct chemical, physical, mineralogical, and biological properties, and has a variable depth over the earth's surface. It also serves as a medium for plant growth. Five processes in soil enable it to sustain terrestrial life: (1) biomass productivity; (2) ecosystem repair and resilience; (3) water purification; (4) detoxification of contaminants; and (5) cycling of C, N, P, S, and H<sub>2</sub>O [1].

The main factors for choosing soil enhancement techniques over deep foundations with poor subgrade soil conditions include the presence of inadequate soil for supporting structures on construction sites, a lack of available space, and economic considerations. A number of techniques are frequently employed to reduce post-construction settlement, improve the stability of dams and embankments, raise the bearing capacity of the soil, and increase the shear strength of the soil system [3].

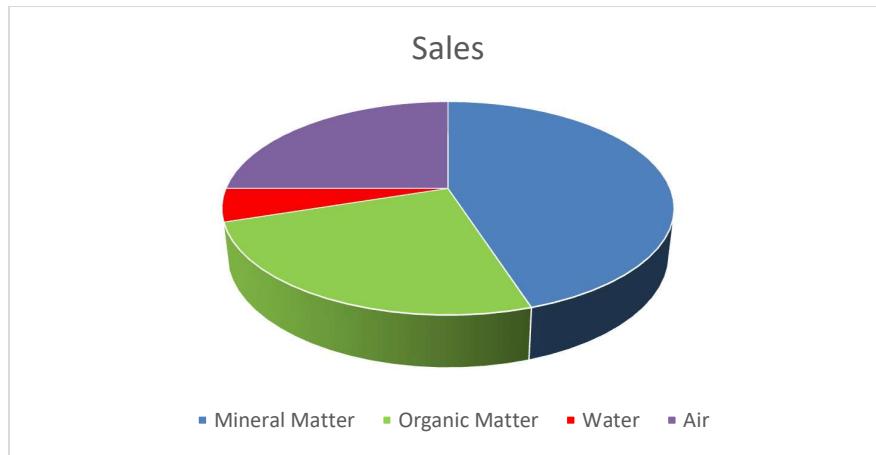
According to Chu [4], there are four basic categories into which soil improvement strategies can be subdivided:

- Admixture-free soil improvement techniques (soil replacement, preloading, sand drains, vertical drains, etc.).
- Adding admixtures or inclusions to the soil to improve it (such as stone columns or sand compaction piles).
- Enhancing soil utilising chemical stabilisation, deep mixing, jet grouting, and other grouting techniques.
- Thermal methods (heating, freezing) for improving soil

**Four major components of the soils:**

Mineral materials, organic matter, water, and air are the four main components of mineral soils (Brady,

1988). Figure 1 depicts the approximate ratios of these components in a representative silt loam surface soil that is in ideal growing conditions for plants. Be aware that this soil is composed almost equally of soils and pore space (water and air). About half of the total soil volume is solid, followed by 45% mineral stuff and 5% organic matter. The pore space is generally divided in half at the ideal wetness for plant growth; 25% of the volume is made up of water space and 25% of it is made up of air. Under normal circumstances, the ratios of air and water can change drastically and quickly depending on the weather and other variables.



**Figure1: Volume composition of a silt loam surface soil when in good condition for plant growth. The air and water in a soil are extremely variable, and their proportions determine in large degree the soil's suitability for plant growth.**

It should be stressed that the four basic elements of a typical soil exist primarily in a condition of intimate mixing. This promotes communication within and between groups and allows for a significant variation in the environment for plant growth. Subsoil volume composition is somewhat different from what was just mentioned. They contain less organic matter and have slightly fewer pores overall than topsoils. This indicates that they contain far less organic stuff and air and a higher proportion of minerals and water.

#### **Soil Improvement without Admixtures:**

This group of soil enhancement techniques is widely and frequently applied. Numerous methods, including as removal and replacement, pre-compression, vertical drainage, and soil fortification, can be used to carry it out.

##### **a) SOIL REPLACEMENT:**

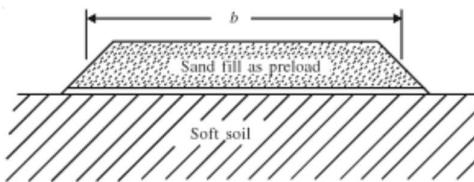
One of the earliest and simplest ways to improve the bearing soil conditions is soil replacement. Poor soil, such as organic soils and medium or soft clay, can be replaced with superior materials like sand, gravel, or crushed stone to improve the condition of the foundation. Almost any soil can be utilised for fills. However, when utilised as a replacement layer, some soils are trickier to compact than others.

Under shallow foundations, replacement soil can be used to boost soil carrying capacity and lessen consolidation settlement. As it is more affordable and causes less building delay, it has several advantages over other approaches and deep foundations. Despite the benefits of replacing soil, the thickness of the replacement soil is determined primarily on experience, which is frequently in doubt

[5]. According to P.C. Varghese [6], the area of high stress in a shallow foundation is only one to five times its width, and this area can be replaced with carefully chosen good soil.

**b) PRE COMPRESSION OR PRELOADING :**

Placing a surcharge fill on top of soil that needs to experience significant consolidation settlement prior to structure construction is the pre compression or preloading technique. The fill can be removed and construction can begin if enough consolidation has taken done. This method works well and efficiently in clayey soil in general. Due to the limited permeability of clayey soils, even under extremely large surcharge loads, the necessary consolidation takes a very long time to occur. Preloading might not be an option due to constrained building dates. Therefore, by shortening the length of the drainage pathways, sand or vertical drains may be employed to speed up the consolidation process. [7]



**Fig. 2. Soil improvement by preloading**

**c) VERTICAL DRAINS:**

Vertical drains are a special technique in which the drains are built under a surcharge load to speed up consolidation and expedite drainage of relatively impermeable soils. The drains offer a more direct route for the water to follow in order to escape the earth. As a result, it will only take a few months instead of several years to drain clay layers. Sand drains and prefabricated vertical drains are the two most used types of vertical drains [2].

**Soil Properties:**

**• Physical properties:**

The way in which a soil can be used for both agricultural and non-agricultural uses depends on its physical characteristics. The size, proportion, arrangement, and mineral makeup of the soil particles have an impact on its properties, including its infiltration rate, water-holding capacity, permeability, aeration, plasticity, and ability to supply nutrients.

The physical characteristics and chemical makeup of the small and large particles are very different. Coarse fraction, gravel, and sand act as individual particles, are mostly made of rock fragments or fundamental minerals, have a small specific surface area, and are rather unresponsive. These particles can't contain water since they have greater spaces. The silt particles fall somewhere between sand and clay in composition. They have a higher specific surface, which makes them more reactive than sands.

**• Colours:**

The first soil characteristic that people likely notice is colour. Even today, the colour of soil—such as black, red, and yellow soil—is used to define it. A soil's hue is determined by pedo-chemical interactions. For instance, differing levels of iron oxide oxidation, hydration, and diffusion in soils may result in red, yellow, or brown colour. Dark soil colours (such dark brown, etc.) may indicate poor drainage conditions, the presence of certain minerals like manganese and/or titanium, and the amount and stage of organic matter's decomposition.

- **Density:**

Larger soil particles have a higher weight-to-volume ratio than smaller ones. The various densities of the soil's constituents and their respective contributions determine the particle density of the soil. The bulk density, on the other hand, is less than the particle density since it represents the weight of dry soil per unit volume, including the pore space and soil particles. The following equation describes the relationship between the particle density (PD), bulk density (BD), and pore space (P) of soils:

$$P\% = \frac{PD - BD}{PD} \times 100$$

In most mineral soils the particle density varies within 2.5 to 2.7 and the bulk density between 1.2 and 1.8 depending on the method of determination.

- **Soil temperature:**

Solar radiation, which governs the temperature regime of soil and the growth of plants, is the primary source of heat energy for soil. The decomposition of organic materials and the mineralization of nitrogen in its organic form have been observed to increase with temperature. Thus, it is anticipated that soils with low soil temperatures will have higher levels of organic matter. The temperature of the soil has a significant impact on the germination of seeds, plant growth, and microbiological activity. In chilly soil, germination has been proven to be a slow process. The ideal temperature for germination and root growth varies depending on the crop and variety. As opposed to summer crops like cotton and sorghum, winter crops like wheat, barley, and oats need low temperatures for germination.

### **Soil improvement with different methods:**

There are several method which use for improvement of soil. These methods are given below..

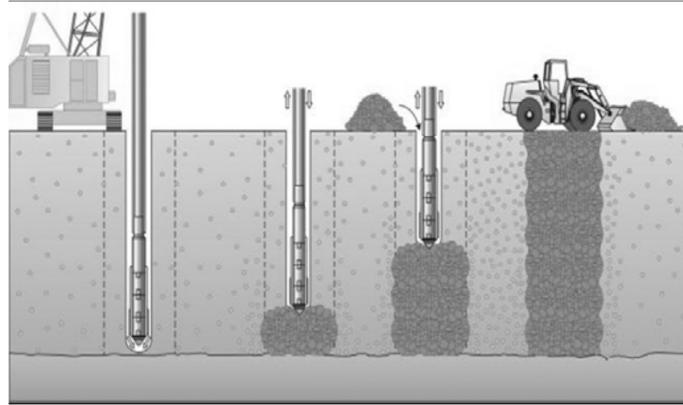
- a) **Soil improvement with admixtures or inclusions**

This type of soil enhancement is also referred to as "in-situ densification" since it densifies the existing natural soil on the construction site. Two typical methods employed in this approach are the use of stone columns and sand compaction piles.

- **Stone columns**

In cohesive soils, stone columns are frequently employed to increase shear strength, lessen excessive settlement, and hasten consolidation by condensing the horizontal drainage routes for pore-water flow [8].

Stone columns are built by boring holes through clay and into stronger ground, as seen in figure (3). Gravel is then compressed and placed within the hole. They can be set up as continuous walls, panels of columns, or separate columns [3].



**Fig. 3. Installation process of stone column**

**b) Soil improvement using stabilization with additives and grouting methods.**

By fusing the soil particles together, the soil stabilisation process is frequently used to increase soil strength and reduce its compressibility. Soil is blended with additives or grout to create the necessary stabilising action.

- **Chemical Stabilization:**

By pulverising the native soil, adding a chemical additive, and thoroughly compacting the mixture, soil stabilisation can be accomplished. Under this heading, the desired outcome of soil stabilisation is mostly dependent on chemical interactions between the addition (such as lime, cement, fly ash, or mixtures of them) and the native soil. The basic goals of soil stabilisation are to enhance soil performance, hasten settlement, boost soil strength and durability, and lessen soil compressibility [9].

- **Deep mixed columns**

The stabilisation of soils at great depths is a component of the deep mixing technique. It is an in situ ground modification technique in which a column or panel of columns is created by mechanically or rotarylly mixing a wet or dry binder (lime or cement) with in situ clayey soils. Similar to stone columns are deep mixed columns. By encouraging soil arching, which shifts the loads to stronger panels rather than in-situ soil, they lessen anticipated settling. The strength of stone columns, however, is largely dependent on the friction angle of the aggregate and confinement from nearby soils.

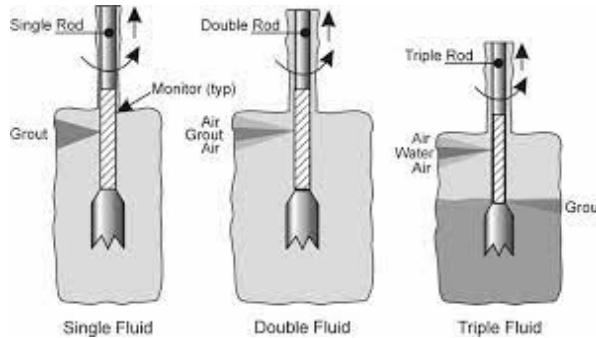
- **Jet Grouting :**

Jet grouting has demonstrated its usefulness in a variety of soils. It is a system based on erosion. Plastic clays are thought to be the least erodible and granular soils the most so. The method produces in-situ soilcrete shapes by hydraulically combining soil and grout.

Hydraulic once the rotary drill has reached the intended depth, grout, water, and occasionally air are poured into the drill rig. As a result, soilcrete, a cementitious soil matrix, is produced.

As shown in figure 4, there are three traditional jet grout systems:

- The single-fluid system
- The double-fluid system
- The triple-fluid system



**Fig.4. Jet grouting system**

c) **Soil improvement using thermal methods**

A soil's characteristics can be significantly altered by heating or freezing. Thermal stabilisations appear to be quite effective, but their usage is restricted due to their expensive cost.

- **Soil Heating**

Raj the larger the effect, the higher the heat input per mass of soil being treated. Even a slight rise in temperature has the potential to boost the strength of fine-grained soils by decreasing the electrostatic repulsion between the particles, allowing pore water to flow due to a thermal gradient, and lowering moisture content due to an increase in evaporation rate. Table 1 (1) displays how changing soil qualities are affected by temperature changes.

**TABLE 1: THE EFFECT OF TEMPERATURE INCREASE ON THE PROPERTIES OF CLAYEY SOIL**

Temperature	The effect
1000 C	Can cause drying and significant increase in clay strength
5000 C	Can cause permanent changes in the structure of clays hence decreasing its plasticity
10000 C	Can cause fusion of clay particles into a solid substance

- **Soil Freezing**

Lowering the soil's temperature causes the moisture in its pore spaces to freeze. This process is known as soil freezing. Shear strength and permeability are significantly increased as a result of pore water freezing because it functions as a cement between soil particles. Contrary to soil heating, a variety of soil types, grain sizes, and ground conditions may be suitable for soil freezing. Fundamentally, the sole prerequisite is that there is enough pore water in the soil [10]. Double walled pipes are generally installed in the soil as part of the operation. Through a closed circuit, a coolant is circulated. The coolant's temperature is maintained by a refrigeration facility.

### Conclusion:

Due to the limited availability of soil resources worldwide, intensive land usage is required to satisfy the world's demand for food and fibre. Increased agricultural activity on currently arable land raises dangers of soil and environmental damage. Understanding how land use and management affect soil quality is crucial. The bearing capacity, shear strength, and consolidation settlement of saturated medium clay can all be improved with a variety of techniques, including soil replacement, preloading with vertical drains, stone columns, stabilisation with additives, and thermal methods. Research studies that take into account all controlling criteria, such as soil bearing capacity and settling, the cost of foundation construction, and ease of execution, are unfortunately lacking. The world's soil resources are sufficient to support the needs of the current and future populations. By developing multidisciplinary and holistic approaches to natural resource management, soil scientists can play a significant role in ensuring food security and improving environmental quality.

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## HISTORY AND DEVELOPMENT IN CIVIL ENGINEERING

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### **Abstract:**

our tradition and science both mean same to protect human beings and to ameliorate but their way is different our ancestor selected the way so we Indians and all the peoples of our community of different classes even if they are illiterate or literate, rich or poor, can easily understand and that was our culture but now we think it is limitation or obstacle for us. here are numerous branches in engineering, some of them include; Civil Engineering, Computer Science Engineering, Electronics and communication, Electrical Engineering, Mechanical Engineering, Chemical Engineering, Architectural Engineering, Food Technology and much more. Civil engineering is a skill-based professional engineering field related to the plan, construction, and maintenance of the physically created and natural infrastructures, such as roadways, canals, reservoirs, bridges, airports, drainage pipes, conduits, structural elements of structures, and rail lines. It is perhaps one of the oldest Engineering fields.

**Keywords:** History, progress, applications, roads, bridge, construction

### **1. Introduction:**

Civil engineering has evolved tremendously in aspects relating to building, designing and maintaining the world's built and natural environments. Historically, the term 'civil engineering' did not exist. It is only recently that engineers whose duties were civil and non-military were categorized as civil engineers to differentiate them from military engineers. A military engineer is one who makes 'machines of war'. In ancient times the bridge, waterways, fortifications and machines of war were all projects also projects undertaken by the military engineer. Kings, Queens, Emperors or Pharaohs required these military building services from their engineers in order to build massive structures that created a powerful and imposing image of themselves. This was the ultimate form of self-promotion. The reason the 'civil' and 'military' engineers were grouped as one, was because the techniques of designing these projects were similar and one who worked on military construction projects also worked on civil projects. Also the structures such as roads, dams, buildings and bridges facilitated for the military agendas of certain rulers. Definitely, before the term civil engineer was coined, civil engineers were in existence. Millennia ago when the pyramids of the Mayan and Egyptian empires were building pyramids, the people designing and supervising the construction of the pyramids must have been an engineer. Certainly, those endowed with the responsibility of devising ways to solve the day to day problems of construction, transportation, water irrigation, city planning were engineers. The engineers of the past often worked on technical problems of their day by using mechanics, available materials and technicians of the day and often worked in areas that ranged from mechanical, military inventions to architecture, which involved the design of aesthetic structure and the overall shape and form of structures.

## **2. Educational & Institutional history of civil engineering:**

In the 18th century, the term civil engineering was coined to incorporate all things civilian as opposed to military engineering. The first engineering school, The National School of Bridges and Highways, France, was opened in 1747. The first self-proclaimed civil engineer was John Smeaton who constructed the Eddystone [1] Lighthouse. In 1771, Smeaton and some of his colleagues formed the Smeatonian Society of Civil Engineers, a group of leaders of the profession who met informally over dinner. Though there was evidence of some technical meetings, it was little more than a social society.

In 1818, world's first engineering society, the Institution of Civil Engineers was founded in London, and in 1820 the eminent engineer Thomas Telford became its first president. The institution received a Royal Charter in 1828, formally recognizing civil engineering as a profession. Its charter defined civil engineering as: "Civil engineering is the application of physical and scientific principles, and its history is intricately linked to advances in understanding of physics and mathematics throughout history. Because civil engineering is a wide ranging profession, including several separate specialized sub-disciplines, its history is linked to knowledge of structures, material science, geography, geology, soil, hydrology, environment, mechanics and other fields."

The first private college to teach Civil Engineering in the United States was Norwich University founded in 1819 by Captain Alden Partridge. The first degree in Civil Engineering in the United States was awarded by Rensselaer Polytechnic Institute in 1835. The first such degree to be awarded to a woman was granted by Cornell University to Nora Stanton Blatch in 1905.

## **3. In Modern Era:**

Civil engineering entails the design, construction, and protection of roads, bridges and structures. The technological know-how of civil engineering consists of the whole lot from soil technological know-how to geology and different implemented fields. As such, the record of civil engineering is intently intertwined with the development in related sciences and disciplines. In the United States, it wasn't till 1819 that civil engineering turned into first taught as a field. It turned into at Norwich University that scholars ought to sign up in publications on implemented civil engineering techniques, methodologies and designs. The American Society of Civil Engineers turned into the primary country wide engineering society within side the United States. It turned into based in 1852 with participants associated with the civil engineering career placed everywhere in the international. Anyone ought to be part of and exists to this present day as a tremendous aid for civil engineers and related workers. Now, within side the contemporary-day era, the wide variety of universities within side the international that consist of civil engineering as a field has extended extraordinarily throughout the nineteenth and the 20 th centuries, indicating the significance of this field. [2]

## **4. New Technologies in Civil Engineering:**

A quantity of latest technology has once more converted civil engineering within side the cutting-edge era. From high-tech equipment and novel new substances to trying out equipment, drones, and different sciences, the civil engineering of nowadays appears pretty exceptional than it did even 50 years ago. Yet, a few technology have had oversized impacts. Take computer-aided layout as one example (CAD). CAD technology allowed engineers to apply era to layout higher buildings, streamline strategies and store time and money. From production to fabrication and erection, CAD or even CAM (computer-aided production) has converted the manner initiatives are designed and completed. Three-dimensional software program and laser-scanning gear have additionally supplied new approaches for civil engineers

to do their jobs. From green constructing designs to bridges and different huge, complicated structures, cutting-edge era lets in production to be finished quicker and with fewer errors.

### **5. Vastu Facts:**

Older homes in India had their kitchens within side the East or North Easterly route in addition to a kitchen window commencing out within side the East route. This association is practiced even these days in cutting-edge construction. The reasoning in the back of that is as follows. As with most kitchens cooking produces a number of smokes that wishes to be set free from the house and a window is the most effective form of doing so. The blowing wind takes out the acrid smoke via the window leaving the house sparkling and healthy. Furthermore, the kitchen is the important thing room of the residence that begins off evolved humming with hobby on the smash of dawn. As the day's meals receives education receives underway, the solar also rises in tandem within side the East. Opening the home windows we could the solar early morning rays grace the meals being made and enrich it with vitamins. The purpose for temple or pooja ghar is in north-east path is for clean get admission to of vitamin-D with the aid of using sunrays and desirable impact of magnetic energy. The earth is rotating and rolling in the direction of the North-East path, as a result retaining heavy weight at that path might pressure its moment. So North, North East Corner, East and the middle are the locations within side the Forward path of the Movement (just like the take care of bar of a motorbike). Keeping any heavy weight in those locations will hinder the motion and create discomforts. Avoiding heavy weight in those regions make the life non violent and prosperous. [3]

### **6. Design:**

The layout of engineering works might also additionally require the utility of layout principle from many fields—e.g., hydraulics, thermodynamics, or nuclear physics. Research in structural evaluation and the generation of substances has opened the manner for extra rational designs, new layout concepts, and extra economic system of substances. The principle of systems and the look at of substances have superior collectively as increasingly subtle strain evaluation of systems and systematic checking out has been done. Modern designers now no longer handiest have superior theories and comfortably to be had layout data, however structural designs can now be fastidiously

### **7. Construction:**

The promoting of civil engineering works can be initiated through a personal client, however maximum paintings is undertaken for huge corporations, authorities and public forums and authorities. Many of those have their very own engineering staffs, however for huge specialized tasks its miles ordinary to rent consulting engineers. The consulting engineer can be required first to adopt feasibility studies, then to endorse a scheme and quote an approximate cost. The engineer is answerable for the layout of the works, providing specifications, drawings, and felony files in enough elements to are seeking aggressive gentle prices. The engineer ought to evaluate quotations and endorse recognition of certainly considered one among them. Although now no longer a celebration to the agreement, the engineer's obligations are described in it; the team of workers ought to supervise the development and the engineer ought to certify final touch of the paintings. Actions ought to be constant with responsibility to the client; the expert agencies exercising disciplinary manage over expert conduct. The consulting engineer's senior consultant at the web website online is the resident engineer. A phenomenon of new years has been the turnkey or package deal agreement, wherein the contractor undertakes to finance, layout, specify, construct, and fee a venture in its entirety. In this case, the consulting engineer is engaged through the contractor in place of through the client. The contractor is generally an included company, which secures

the agreement on the idea of the consulting engineer's specification and well known drawings. The consulting engineer ought to conform to any versions added and ought to approve the targeted drawings.

### **8. Solar Energy and nuclear power:**

Civil engineers have usually performed an critical element in mining for coal and metals; the using of tunnels is a project not unusual place to many branches of civil engineering. In the twentieth century the layout and production of energy plant life superior with the speedy upward push in call for electric powered energy, and nuclear energy stations brought an entire new area of layout and production, concerning pre stressed concrete stress vessels for the reactor. The exploitation of oil fields and the discoveries of herbal fuel line in widespread portions have initiated a thorough alternate in fuelling production. Shipment in liquid shape from the Sahara and piping from the mattress of the North Sea had been most of the novel developments. Vast pipelines have additionally been built in Venezuela and throughout the Canadian-U.S. border. In the past due twentieth and early twenty first centuries, call for renewable power elevated as a climate-pleasant opportunity to fossil gasoline use. Civil engineers have evolved and mounted great sun and wind arrays in locations like California, the United Kingdom, and China, and innumerable smaller structures had been constructed across the world, each on land and at sea. [4]

### **9. Public health**

Drainage and liquid-waste disposal are intently related to antipollution measures and the re-use of water. The city improvement of components of water catchment regions can adjust the character of runoff, and the education and law of rivers produce modifications within side the sample of events, ensuing in floods and the want for flood prevention and control. Modern civilization has created troubles of solid-waste disposal from the manufacture of long lasting goods, together with cars and refrigerators, produced in big numbers with a restricted life, to the small package, formerly disposable, now frequently indestructible. The civil engineer performs an essential position within side the maintenance of the environment, basically thru layout of works to beautify in preference to to harm or pollute.

### **10. Programs under civil engineering:**

Civil engineering performs a essential position in cutting-edge society, overlaying many programs. Some tremendous programs of civil engineering are:

#### **1. Transportation Infrastructure**

Civil engineers play a crucial position in growing and constructing secure and green kinds of transportation, a number one region of attention in civil engineering. In addition, civil engineers use technological advances to create structures which could live to tell the tale herbal calamities at the same time as lowering environmental effects. Civil engineers additionally broaden public shipping networks to minimise carbon emissions and visitors congestion.

#### **2. Water Resource Management**

Civil engineering is crucial to the sustainable control of water resources. As the world's populace expands, so does the want for water, making sustainable water aid control greater crucial. Civil engineers plan and construct water supply, treatment, distribution, and wastewater control structures. They additionally paintions on initiatives including flood control, erosion prevention, and irrigation structures.

#### **3. Structural Design And Construction**

Structural layout and production are vital additives of civil engineering, along with the layout and production of secure and long-lasting systems including buildings, bridges, and tunnels. Civil engineers are the use of revolutionary technology and techniques to assure progressed venture execution and protection because the want for cutting-edge infrastructure grows.

#### **4. Smart Cities**

Civil engineers are the use of generation to make towns greater linked and green. For example, they're enforcing sensible visitor's lights, public transportation structures, and waste control structures to enhance each day lifestyles for residents. With those advancements, towns can grow to be greater sustainable and environmentally pleasant at the same time as offering higher offerings to their citizens. Using generation in civil engineering is assisting to create a brighter destiny for city regions worldwide.

#### **5. Disaster Resilience**

Civil engineers are centered on designing systems which can resist the effect of herbal screw ups including earthquakes, hurricanes, and floods. These calamities can motive a whole lot of harm to homes and infrastructure, main to lack of lifestyles and monetary losses. By designing better-geared up systems to address those events, civil engineers can assist lessen the chance of harm and make sure the protection of people and communities. 6. Mining Civil engineers are important in designing secure mining operations with minimum environmental effect even as maximizing aid extraction. They use their understanding to create revolutionary answers that allow the extraction of precious minerals and sources from the earth without inflicting damage to the surroundings or endangering workers.

#### **6. Aerospace**

Civil engineers are just like the superheroes of the aerospace industry, designing systems that appear to defy gravity. From airports to runways and airplane hangars, those architects of the sky use their creativity and understanding to construct structures which can resist notable quantities of pressure and pressure. They are the visionaries at the back of the breathtaking designs that make air journey possible, developing practical and delightful spaces. [5]

The civil engineering subject has gone through notable increase and improvement. As a result, civil engineering has performed a critical function in shaping our world, from historical civilizations just like the Egyptians, Greeks, and Romans to current improvements in transportation infrastructure, water aid management, and structural layout and construction. The destiny of civil engineering appears shiny with improvements in technology, including clever towns and sustainable improvement practices. With society's ever-evolving needs, civil engineering's scope keeps to expand, making it an interesting subject to take part in.

#### **11. Roads:**

Classification of Roads primarily based totally on Carriageway Road are labeled primarily based totally on carriageway or pavement are indexed below.

Un-paved Roads

Paved Roads

**Un-Paved Road:** Un-Paved roads are described because the sort of avenue which pavement is uneven, now no longer tough and now no longer easy surface. The earth roads and gravel roads are the proper instance of Unpaved Roads.

**Paved Roads:** Paved Roads is described because the sort of avenue which consist the tough pavement, Uniform and easy surface. The Concrete roads are the proper instance of Paved Roads.

Classification of roads primarily based totally on Traffic Volume Based on Volume of Traffic, the roads are labeled as Heavy, Medium, and occasional extent roads. This category of roads is at once applicable to extent of Traffics. [6]

#### **National Highway**

National Highways are the roads which connecting the capitals of huge states, foremost ports, huge business area, vacationer locations, overseas motorway, etc. Also used for defense & army interest in

crucial situation. National Highway permits site visitors to float at better pace as assessment to kingdom motorway. Also offer un-interrupted street communiqué for the duration of the country. The countrywide motorways in India are expressed within side the shape of variety together with NH-4.

### **State Highway**

State highways are the street of kingdom which connecting the National Highway, district headquarters, industrial area, vacationer locations, crucial cities, etc. inside kingdom. The float of site visitor's extent in kingdom motorway may be very much like countrywide motorway. Also the geometric layout specification and layout pace is equal examine to National Highway and State Highway.

### **Major District Road (MDR)**

Major District Roads are the street which connecting the kingdom motorway, marketplace locations, residential areas, gardens and different crucial locations inside cities. The Major District Road has decrease layout pace and geometric layout specification as examine to countrywide motorway and kingdom motorway.

### **Other District Roads (ODR)**

Other District Roads are the Rural Roads which connecting the Major district roads, Rural marketplace locations, Taluka Headquarters, School, Block improvement and different important roads. Other District Roads have low layout pace and geometric layout specification.

### **Village Roads**

Village Roads are the roads which connecting the village for institution of village with different foremost roads. The site visitors' extent of village roads may be very low, that is why the geometric layout specification is likewise decrease. The village roads serve cause of connecting peoples of villages, farms, schools, etc.

### **Classification of Roads as in line with Third 20-Year Road Development Plan**

Classification of roads in India become changed in 1/3 20 12 months street improvement plan. The roads in India become categorized into 3 corporations as in line with its priority, reason and function. These 3 corporations are noted below. [7]

- Primary System
- Secondary System
- Tertiary System Primary System

Primary System is the Networks of essential roads that are connecting the huge states, enterprise hubs, ports etc. The Priority of this gadget is excessive. Primary System consist class of roads.

- Expressway
- National Highway

### **Expressway**

Express way are the extra magnificence of street that's delivered into the 1/3 20 12 months street improvement plans. Expressway consist the advanced geometric layout specification and excessive layout speed. The visitors' extent on freeway could be very excessive. An expressway road lets in automobiles to transport very fast. Expressway is the higher magnificence of country wide motorway which consist greater lanes, very excessive layout speed, protection features, etc.

Secondary System Secondary gadget is the community of roads which connecting the freeway, country wide highways, district, cities, headquarters, etc. The Priority of secondary gadget is excessive to mild as in line with its reason and function. Secondary System encompasses classes' roads.

- State Highways
- Major District Roads Tertiary System The tertiary gadget is rural roads and those encompass classes of roads.

- Other District Roads
- Village Roads

#### Classification of Urban Roads

The Urban location roads are categorized as point out below.

- Arterial Roads
- Sub-arterial Roads
- Collector Streets
- Local Streets

#### **12. Bridges:**

All fundamental bridges are constructed with the general public's money. Therefore, bridge layout that first-class serves the general public hobby has a threefold goal: to be as green, as economical, and as stylish as is correctly viable. Efficiency is a systematic precept that places a fee on lowering substances whilst growing overall performance. Economy is a social precept that places fee on lowering the fees of production and upkeep whilst keeping performance. Finally, beauty is a symbolic or visible precept that places fee at the private expression of the fashion dressmaker without compromising overall performance or financial system. There is little war of words over what constitutes performance and financial system; however the definition of beauty has continually been controversial. Modern designers have written approximately beauty or aesthetics because the early nineteenth century, starting with the Scottish engineer Thomas Telford. Bridges in the long run belong to the overall public that is the very last arbiter of this issue, however in standard there are 3 positions taken via way of means of professionals. The first precept holds that the shape of a bridge is the province of the engineer and that splendor is completely done most effective via way of means of the addition of structure. The 2nd idea, arguing from the viewpoint of natural engineering, insists that bridges making the maximum green viable use of substances are via way of means of definition beautiful. This ultimate precept acknowledges the reality that engineers have many viable picks of approximately same performance and financial system and may consequently specific their very own aesthetic thoughts without including drastically to substances or cost.

#### **13. Conclusions:**

From the Stone Age to the contemporary-day age we've come to recognize that the man or women is reflective, curious and inventor Means explorer. In contemporary-day civil engineering technology has carried out in no way to be forgotten progresses and made dreams come authentic which changed into past of our imaginations. At present technology has exposed secrets. Even the whole lot is earlier than us however it appears that evidently there may be frame however now no longer the spirit. There is an adage "Old is Gold". Today after uncovering secrets, using contemporary-day machines we couldn't upward push civil engineering to the factor in which our ancestor had left. Despite of accomplishing to the maximum factor within side the discipline of structure nevertheless we found ourselves speechless looking the historical structures. So many queries rises even approximately the gratefulness or within side the context of firmness or energy or within side the context of lively instantiation. As the regulation is incomplete without proof in the identical manner our reminiscence is incomplete without history. If we need to apprehend technology then we want to apprehend Indian way of life due to the fact that practice is our science.

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## MATHEMATICAL REALISM

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### **Abstract:**

Realism is in a fairly clear sense the ‘natural’ position in the philosophy of mathematics, since ordinary mathematical statements make no explicit reference to human activities, beliefs or capacities. Because of the naturalness of mathematical realism, reasons for embracing antirealism typically stem from perceived problems with realism. These potential problems concern our knowledge of mathematical truth, and the connection between mathematical truth and practice. The antirealist argues that the kinds of objective facts posited by the realist would be inaccessible to us, and would bear no clear relation to the procedures we have for determining the truth of mathematical statements. In broad terms, realism is the view that mathematics is objective: independent of the lives, customs, language, and form of life of mathematicians.

**Keywords:** Platonism, Logicism, structuralism, Naturalism, Mathematics

### **1. Introduction:**

There are at least two forms of realism: realism in ontology, which concerns mathematical objects, and realism in truth value, which concerns mathematical truth. Realism in ontology is the view that mathematical objects, such as numbers, sets, functions, and geometric points exist independently of the mathematician. *Prima facie*, these mathematical objects do not occupy physical space; they exist eternally and are not created or destroyed; and they do not enter into causal relationships with either each other or with physical objects. Because Platonic forms share these features, realism in ontology is sometimes called "Platonism" or, as Geoffrey Hellman dubs it, "objects Platonism." This sort of Platonism is sometimes written with a lowercase "p," perhaps to mark some distance from Plato. For the realist in ontology, mathematical propositions are taken at face value, as statements about mathematical objects. The theorem that 101 is a prime number just is the statement that a given object, the number 101, enjoys a certain property, primeness. The sentence "101 are a prime number" has the same logical form as "Socrates is Greek." Most versions of realism in ontology have it that mathematical truth is necessary, in a deep metaphysical sense: If the subject matter of mathematics is as these realists say it is, then typical propositions about mathematical objects—the principles of pure mathematics, for example—do not suffer from the contingencies of science or ordinary statements about ordinary physical objects.[1]

Probably the most difficult problems associated with realism in ontology are in epistemology (. The realist declares that mathematics is about a realm of *prima facie* abstract, causally inert, and eternally existing objects. How can human beings ever come to know anything about these objects? How can humans have reliable, justified beliefs about such objects? The way people come to know things about physical objects typically involves some sort of casual contact between people, the knower, and the objects (e.g., seeing them). This is ruled out with mathematical objects. Presumably, most of the beliefs that mathematicians have about mathematical objects are true. Mathematicians are reliable indicators of how things are in the mathematical realm. How does one explain this reliability?

One resolution to these problems is to postulate a special faculty that humans have, an intuition that links humans to the mathematical realm. Such was Plato's own solution to the analogous problem concerning Forms.

A philosopher who is inclined this way has the task of trying to square the presence of mathematical intuition with the current scientific view of a human being as a thoroughly physical organism in a physical universe.

## 2. Mathematical Platonism

An important form of mathematical realism is mathematical Platonism, the view that mathematics is about a collection of independently existing mathematical objects. Platonism is to be distinguished from the more general thesis of realism, since the objectivity of mathematical truth does not, at least not obviously, require the existence of distinctively mathematical objects.

### History of Platonism

Platonism must be distinguished from the view of the historical Plato. Few parties to the contemporary debate about Platonism make strong exegetical claims about Plato's view, much less defend it. Although the view that we are calling 'platonism' is inspired by Plato's famous theory of abstract and eternal Forms Platonism is now defined and debated independently of its original historical inspiration. Not only is the Platonism under discussion not Plato's, Platonism as characterized above is a purely metaphysical view: it should be distinguished from other views that have substantive epistemological content. Many older characterizations of Platonism add strong epistemological claims to the effect that we have some immediate grasp of, or insight into, the realm of abstract objects. But it is useful to reserve the term 'platonism' for the purely metaphysical view described above. Many philosophers who defend Platonism in this purely metaphysical sense would reject the additional epistemological claims. Examples include philosophers attracted to the so-called indispensability argument, which seeks to give a broadly empirical defense of mathematical Platonism.

### Truth-value realism

Truth-value realism is the view that every well-formed mathematical statement has a unique and objective truth-value that is independent of whether it can be known by us and whether it follows logically from our current mathematical theories. The view also holds that most mathematical statements that are deemed to be true are in fact true. So truth-value realism is clearly a metaphysical view. But unlike Platonism it is not an ontological view. For although truth-value realism claims that mathematical statements have unique and objective truth-values. It is not committed to the distinctively Platonist idea these truth-values are to be explained in terms of an ontology of mathematical objects [2].

Mathematical Platonism clearly motivates truth-value realism by providing an account of how mathematical statements get their truth-values. But the former view does not entail the latter unless further premises are added. For even if there are mathematical objects referential and quantificational indeterminacy may deprive mathematical statements of a unique and objective truth-value. Conversely, truth-value realism does not by itself entail **existence** and thus implies neither object realism nor Platonism.

### The structure of the argument

The Fregean argument is based on two premises, the first of which concerns the semantics of the language of mathematics:

### **Classical Semantics:**

The singular terms of the language of mathematics purport to refer to mathematical objects, and its first-order quantifiers purport to range over such objects.

The word ‘purport’ needs to be explained. When a sentence S purports to refer or quantify in a certain way, this means that for S to be true, S must succeed in referring or quantifying in this way.

The second premise does not require much explanation:

### **Truth:**

Most sentences accepted as mathematical theorems are true (regardless of their syntactic and semantic structure).

Consider sentences that are accepted as mathematical theorems and that contain one or more mathematical singular terms. By **Truth**, most of these sentences are true. Let S be one such sentence. By **Classical Semantics**, the truth of S requires that its singular terms succeed in referring to mathematical objects. Hence there must be mathematical objects, as asserted by **Existence**.

### 3. Ontological commitment:

Versions of the Fregean argument are sometimes stated in terms of the notion of ontological commitment. Suppose we operate with the standard Quinean criterion of ontological commitment:

#### **Quine's Criterion.**

A first-order sentence (or collection of such sentences) is ontologically committed to such objects as must be assumed to be in the range of the variables for the sentence (or collection of sentences) to be true.

Then it follows from **Classical Semantics** that many sentences of mathematics are ontologically committed to mathematical objects. To see this, consider a typical mathematical theorem S, which involves some normal extensional occurrence of either singular terms or first-order quantifiers. By **Classical Semantics**, these expressions purport to refer to or range over mathematical objects. For S to be true, these expressions must succeed in doing what they purport to do. Consequently, for S to be true there must be mathematical objects in the range of the variables.

#### Between object realism and mathematical Platonism

Object realism says there exist abstract mathematical objects, whereas Platonism adds **Independence**, which says that mathematical objects are independent of intelligent agents and their language, thought, and practices. This final section surveys some lightweight forms of object realism that stop short of full-fledged Platonism. Such intermediate views are attracting an increasing amount of interest.

#### How to Understand Independence

A natural gloss on **Independence** is the following counterfactual conditional:

#### **Counterfactual Independence:**

Had there not been any intelligent agents, or had their language, thought, or practices been suitably different, there would still have been mathematical objects.

This counterfactual conditional is accepted by most analytic philosophers. To see why, consider the role that mathematics plays in our reasoning. We often reason about scenarios that aren't actual. Were we to build a bridge across this canyon, say, how strong would it have to be to withstand the powerful gusts of wind? Sadly, the previous bridge collapsed. Would it have done so had the steel girders been twice as thick? This form of reasoning about counterfactual scenarios is indispensable both to our everyday deliberations and to science. The permissibility of such reasoning has an important consequence. Since the truths of pure mathematics can freely be appealed to throughout our counterfactual reasoning, it

follows that these truths are counterfactually independent of us humans, and all other intelligent life for that matter. That is, had there been no intelligent life, these truths would still have remained the same.

Pure mathematics is in this respect very different from ordinary empirical truths. Had intelligent life never existed, this article would not have been written. More interestingly, pure mathematics also contrasts with various social conventions and constructions, with which it is sometimes compared. Had intelligent life never existed, there would have been no laws, contracts, or marriages—yet the mathematical truths would have remained the same.

Thus, if **Independence** is understood merely as counterfactual independence, then anyone who accepts object realism should also accept Platonism.

It is doubtful, however, that this understanding of **Independence** fully captures the intended content of the thesis. For **Independence** is meant to substantiate an analogy between mathematical objects and ordinary physical objects. Just as electrons and planets exist independently of us so do numbers and sets. And just as statements about electrons and planets are made true or false by the objects with which they are concerned and these objects' perfectly objective properties, so are statements about numbers and sets.

#### Lightweight semantic values

Assume that object realism is true. For convenience, assume also **Classical Semantics**. These assumptions ensure that the singular terms and quantifiers of mathematical language refer to and range over abstract objects. Given these assumptions, should one also be a mathematical Platonist? In other words, do the objects that mathematical sentences refer to and quantify over satisfy either version of the independence thesis?

It will be useful to restate our assumptions in more neutral terms. We can do this by invoking the notion of a semantic value, which plays an important role in semantics and the philosophy of language. In these fields it is widely assumed that each expression makes some definite contribution to the truth-value of sentences in which the expression occurs. This contribution is known as the semantic value of the expression. It is widely assumed that (at least in extensional contexts) the semantic value of a singular term is just its referent.

#### 4. Logicism

Another strategy for epistemology comes from logicism, the view that mathematical truth is a species of logical truth. The epistemology for mathematics is thus the epistemology for logic. The most detailed developments are those of Gottlob Frege (1884, 1893) and Alfred North Whitehead and Bertrand Russell (1910). Of those, Frege was a realist in ontology, at least for arithmetic and analysis. So for Frege, logic has ontology—there are "logical objects." Numbers are constructed out of logical objects. In attempting to define the natural numbers and the general notion of natural number, Frege (1884, §63) proposed the following principle, which has become known as "Hume's principle":

Two concepts are equinumerous if they can be put in one-to-one correspondence. Frege showed how to define equinumerosity without invoking natural numbers. In the end, he balked at taking Hume's principle as the ultimate foundation for arithmetic, and went on to provide an explicit definition of the natural numbers in terms of concepts and their extensions. The number two, for example, is the extension (or collection) of all concepts that hold of exactly two elements. Unfortunately, the inconsistency in Frege's theory of extensions, as shown by Russell's paradox, marked a tragic end to Frege's logicist program.

Variations of Frege's approach are vigorously pursued in the early twenty-first century, in the work of

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Crispin Wright, beginning with (1983), and others such as Bob Hale (1987) and Neil Tennant (1997). The idea is to bypass the treatment of extensions and to work with Hume's principle, or something like it, directly. On this neo-Fregean approach, Hume's principle is taken to be an explanation of the concept of "number." It is an implicit definition, true by stipulation. Frege's own technical development shows that the Peano postulates can be derived from Hume's principle in a standard, higher-order logic. Indeed, the only essential use that Frege made of extensions was to derive Hume's principle—everything else concerning numbers follows from that. [5]

### Hypothetical-deductive approach

Another popular strategy for epistemology comes from an overarching hypothetical-deductive approach. The argument begins with the observation that virtually all of science is formulated in mathematical terms. One cannot believe in the truth of physics, say, without also accepting the mathematics that occurs in it. Thus, mathematics is confirmed to the extent that science is. In short, because mathematics is indispensable for science, and because science is well-confirmed and (approximately) true, one can conclude that mathematics is well-confirmed and true as well. This "indispensability argument" is attributed to W. W. O. Quine; a clear articulation is found in Hilary Putnam's *Philosophy of Logic*.

## 5. Structuralism

According to structuralism, the subject matter of arithmetic, for example, is the pattern common to any infinite system of objects that has a distinguished initial object, which plays the role of zero, and a successor relation or operation that satisfies the induction principle. The Arabic numerals exemplify this natural number structure, as does an infinite sequence of distinct moments of time, an infinite sequence of discrete points in space, and so on. Similarly, real analysis is about the real number structure, set theory is about the set-theoretic-hierarchy structure, and topology is about topological structures. According to the ante rem version of this view, the natural number structure, for example, exists independently of whether it has instances in the physical world, or any other world for that matter. This is an ontological realism. The number six, for example, is a place in the natural number structure the seventh place (if one begins with zero). Because, on the view in question, the structure exists objectively, then so do its places. Structuralisms have proposed various epistemological strategies, ranging from pattern recognition, linguistic abstraction, implicit definition (much like neo-logicism), and postulation via indispensability. One line, shared with the full-blooded Platonism articulated, holds that the realm of structures is so robust that every coherent axiomatization is true of at least one structure. So the sticky problem concerning knowledge of mathematical objects reduces to knowledge of the coherence of an axiomatization.

### Naturalism

Unfortunately, the word "naturalism" has become something of a term of art, and it is hard to find a common theme that underlies every view that goes by that name. Perhaps most of them share certain deference to the natural sciences. Quine characterizes naturalism as "the abandonment of first philosophy" and "the recognition that it is within science itself ... that reality is to be identified and described" The idea is to see philosophy as continuous with the sciences, not prior to them in any epistemological or foundational sense.

### Quinean naturalism

The naturalist accepts the existence of the theoretical entities, such as forces and electrons that occur in the most up-to-date scientific theories. Current science describes the world in such terms, and it runs

against the theme of naturalism to reject them on philosophical grounds, adopting some sort of instrumentalism or constructive empiricism. When it comes to mathematics, however, naturalists differ. As seen with the aforementioned indispensability argument, Quine himself accepts mathematics to the extent—but only to the extent—that it is needed in science. It is impossible to do physics, or just about any other science for that matter, without invoking real analysis. So the theorems of real analysis are confirmed to the extent that the various scientific theories are confirmed, and these theories are the best ones available. So Quine accepts the truth of real analysis. Moreover, some of the traditional, Platonic themes have naturalistic counterparts. For example, the eternity of mathematical objects corresponds to the fact that mathematical assertions are not inflected with tense.

Naturalized epistemology is the application of Quinean naturalism to the study of knowledge. The philosopher sees the human knower as a thoroughly natural being within the physical universe. Any faculty that the philosopher invokes to explain knowledge must involve only natural processes amenable to ordinary scientific scrutiny.

This theme exacerbates the epistemic problems with realism. Platonic apprehension of a detached mathematical universe is ruled out from the start, as a nonnatural process. The challenge to the ontological realist is to show how a physical being in a physical universe can come to know about abstracta such as mathematical objects. There may be no refutation of realism in ontology, but there is a deep challenge to it. The advocate of indispensability cites the role of mathematics in science. The idea is that mathematics is known the same way that science is. However, it is not enough to leave it at that. The advocate of realism in ontology should delimit the exact role that mathematics plays in science. How, for example, is it possible for a casually isolated realm of abstracta to shed light on the interactions of physical matter? An answer to this would go a long way toward solving the epistemological puzzles.

Notice that, at best, the indispensability argument delivers the truth of the principles of real analysis. If one assumes that science is objective, then there is realism in truth-value. It is not clear that the Quinean naturalist is also committed to realism in ontology, despite Quine's own tendencies in that direction. This depends on whether naturalism requires the philosopher to accept the pronouncements of mathematical science at face value. Quine famously calls for regimentation of ordinary and scientific discourse, to clean up the ontological commitments. One can see some of the aforementioned nominalistic programs in this spirit. Some of them show (or try to show) how mathematics can be true without presupposing the existence of distinctively mathematical objects (Hellman 1989). And this truth is all that is needed in science, or so the argument goes.

Other nominalists take issue with the indispensability argument itself. They show how science could proceed without mathematics, or at least without mathematics as it is standardly understood. This is also perhaps in the spirit of naturalism.

Quine's own realism extends to real analysis, functional analysis, and perhaps a bit more. But it stops there. Quine does not accept the truth of the higher reaches of set theory unless and until it finds application in science. In fact, Quine goes so far as to recommend the adoption of a restrictive axiom in set theory ( $V=L$ ), because it simplifies higher-set theory, noting that simplicity is a criterion of theory acceptance in science. This is despite most set-theorists' rejection of this axiom. It is ironic that Quine, the naturalist, feels comfortable dictating something to mathematicians on philosophical grounds. [4]

## 6. Mathematical Realism vs. Mathematical Formalism

Differences in perspectives in philosophy of mathematics can be in part calibrated by attitudes towards these new infinities. Hilbert's view put him squarely in opposition to another prominent thinker, L. E. J. Brouwer, leading to an infamous philosophical rivalry.

Hilbert saw mathematics as a sort of game, dealing purely in the manipulation of symbols according to certain rules, a view known as formalism. This view does not necessarily forbid interpretations of this 'formula game' as in-this-or-that-way connected to reality, but, in its basic form, it requires rather less commitment to problematic mathematical 'entities' than older forms of mathematical realism, such as Platonism (the view dating, naturally, back to Plato, which holds that mathematical objects like '1' and 'circle' really exist as persisting objects in a way that is independent of us and our understanding of them). Brouwer understood mathematics in a third way radically different from both of these perspectives [3].

One of Hilbert's better-known theorems, and the kernel of a point of profound disagreement between him and Brouwer, is his so-called Basis Theorem. The finer details are irrelevant: what was interesting to philosophers, and objectionable to Brouwer, was the way in which Hilbert proved it. Hilbert's Basis Theorem is an existence theorem – it takes the form 'there is at least one X'. Mathematicians, when tasked with showing that 'there is at least one X', can take one of two approaches: they must either show how to find such an X, or show that it is impossible that there is no such X. Proofs of the first kind are called constructive, and proofs of the second kind are called non-constructive. Hilbert's proof of the Basis Theorem was non-constructive. Brouwer took issue: he founded and passionately defended an approach to mathematical philosophy known as intuitionism.

## 7. Intuitionism and Constructivism

The intuitionist refuses to consider mathematical objects as things that were not constructed by the activity of the mind. To Brouwer, non-constructive proof techniques of the kind used by Hilbert were seriously problematic. The broader school of mathematical philosophy that rejects these non-constructive proofs is known as constructivism. Constructivists frequently reject the existence of the actual infinite in mathematics, which as an independent view is known as finalism (along with its rather fringe cousin, ultra finalism, which rejects even finite objects that are 'too large to reasonably construct'). Hilbert and Brouwer thus offered not only different perspectives on the reality and validity of mathematical objects, but radically different ways of doing mathematics.

Both spawned new study in mathematical logic itself: intuitionist logic studies logical systems without the law of the excluded middle and is to this day an active field of research. More notoriously, however, the early formalist approach of Hilbert had as an optimistic goal the creation of an axiomatic system (axioms being initial statements always assumed true) from which all mathematics could be derived, and which was it free of contradictions. These notions – respectively called completeness and consistency in mathematical logic – both seemed to be perfectly sensible things to ask of your chosen mathematical foundations.

In 1900, Hilbert published a list of 23 problems he deemed to be at the cutting edge of then-contemporary mathematics. Second on the list was to show that his axioms of arithmetic were consistent. This system of axioms offered the usual basic arithmetic structures we are familiar with – numbers, addition, subtraction, etc. – and, it was hoped, were also powerful enough to formalize the rest of mathematics.

### **8. Conclusion:**

Both mathematics and philosophy have changed an awful lot in not very long at all. Old concerns still guide inquiry: philosophers of mathematics need to determine what kind of existence is granted to objects like ‘1’ and ‘circle’, and what kind of truth to statements like ‘ $1+1 = 2$ ’. But modern mathematics asks philosophers new and disturbing questions, and points to objects whose nature is even harder to pin down. This question have conjured such varied and seemingly incompatible answers that the philosophy of mathematics can seem like a strange sport in which one picks a side and defends it religiously against all the other. Mathematical realism is the view that the truths of mathematics are objective, which is to say that they are true independently of any human activities, beliefs or capacities. As the realist sees it, mathematics is the study of a body of necessary and unchanging facts, which it is the mathematician’s task to discover, not to create. These forms the subject matter of mathematical discourse: a mathematical statement is true just in case it accurately describes the mathematical facts.

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## MECHANICAL DESIGN AND PRODUCT DEVELOPMENT

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### **Abstract:**

Product development is the process through which a mechanical product is realized from just an idea into a fully detailed entity ready for production. Product development involves a great number of human and material resources, as the result the phase of machine manufacture is implemented as a certain serial production. Hence, the problem of optimization arises, which generally focuses on overall reducing of production costs and on timely transition to manufacturing a completely new product. Product development is an interdisciplinary activity requiring contributions from nearly all the functions of a firm. The team is situated within a firm. In fact, for profit manufacturing company is the most common institutional setting for product development, but other settings are possible. Product development teams sometimes work within consulting firms, universities, government agencies, and nonprofit organizations.

**Keywords:** Product, design, functions, testing, phase, benefits

### **1. Introduction:**

A product is something sold by an enterprise to its customers. Product development is the set of activities beginning with the perception of a market opportunity and ending in the production, sale, and delivery of a product. Although much of the material is useful in the development of any product, we explicitly focus on products that are engineered, discrete, and physical. Product development refers to the complete process of taking a product to market. It also covers renewing an existing product and introducing an old product to a new market. This includes identifying market needs, conceptualizing the product, building the product roadmap, launching the product, and collecting feedback.

### **2. Specific dimensions for product development:**

**Product quality:** How good is the product resulting from the development effort? Does it satisfy customer needs? Is it robust and reliable? Product quality is ultimately reflected in market share and the price that customers are willing to pay.

**Product cost:** What is the manufacturing cost of the product? This cost includes spending on capital equipment and tooling as well as the incremental cost of producing each unit of the product. Product cost determines how much profit accrues to the firm for a particular sales volume and a particular sales price.

**Development time:** How quickly did the team complete the product development effort? Development time determines how responsive the firm can be to competitive forces and to technological developments, as well as how quickly the firm receives the economic returns from the team's efforts.

**Development cost:** How much did the firm have to spend to develop the product? Development cost is usually a significant fraction of the investment required to achieve the profits.

**Development capability:** Are the team and the firm better able to develop future products as a result of their experience with a product development project? Development capability is an asset the firm can use to develop products more effectively and economically in the future.

### 3. Difficulties in product development:

**Ideation:** The first checkpoint in product development is idea generation. As easy as it sounds, some companies often hit idea roadblocks when making decisions. Sometimes, these obstacles result from a lack of actionable Intel on the potential product and the consumer. Other times, ideation can stall due to bureaucracy and disjointed workflows.

**Dynamics:** Technologies improve, customer preferences evolve, competitors introduce new products, and the macroeconomic environment shifts. Decision making in an environment of constant change is a formidable task.

**Details:** The choice between using screws or snap-fits on the enclosure of a computer can have economic implications of millions of dollars. Developing a product of even modest complexity may require thousands of such decisions.

**Time pressure:** Any one of these difficulties would be easily manageable by itself given plenty of time, but product development decisions must usually be made quickly and without complete information.

**Economics:** Developing, producing, and marketing a new product requires a large investment. To earn a reasonable return on this investment, the resulting product must be both appealing to customers and relatively inexpensive to produce.

**Market viability:** Market research will give you information about the competition and the audience. Don't create a product because all your competitors are doing the same thing. Even if you want to go down the same route, focus on novelties to attract users. [1]

**Team diversity:** Successful development requires many different skills and talents. As a result, development teams involve people with a wide range of different training, experience, perspectives, and personalities.

**Team spirit:** Product development teams are often highly motivated, cooperative groups. The team members may be collocated so they can focus their collective energy on creating the product. This situation can result in lasting camaraderie among team members.

**Product engineering issues:** Product managers can solve these problems by establishing a clear review cycle that features members of interdepartmental teams. Besides, they can also try to identify other non-dependent initiatives and work on them while the gridlock is resolved.

**Hiring delays:** Poor recruitment policies can slow down a product's launch timeline significantly. For instance, on boarding new designers to work on a prototype can slow down the design process. And since most companies are not ready for teleworking, they will struggle to train new hires and meet deadlines.

The problem of an optimal design project of the product viewed generally is to have the following solution sequence.

1. Calculation of an optimal operational life of the component on the basis of economically substantiated lifetime of the machine.
2. In terms of the uniform strength criterion calculation of the range of optimal forms of the product from certain material, subjected to either concentrated or distributed force or thermal loads.
3. According to the principle of uniform strength determination of the optimal structure of material for a particular form of the product.

4. Synthesis of the range of optimal solutions for form and variants of projects with optimal distribution of physical and mechanical properties of product material according to uniform strength.

#### 4. The Product Development Process

A product development process is the sequence of steps or activities that an enterprise employs to conceive, design, and commercialize a product. Many of these steps and activities are intellectual and organizational rather than physical. Some organizations define and follow a precise and detailed development process, while others may not even be able to describe their process. Furthermore, every organization employs a process at least slightly different from that of every other organization.

##### Idea Generation

The new product development process begins with idea generation, where you brainstorm an idea (or ideas) that will help you solve an existing customer problem in a new and innovative way. As you're coming up with ideas that will help you solve customer needs, it's important to have a robust understanding of your target market and the pain points they have that you want to solve. [2]

The concept development process includes the following activities:

**Identifying customer needs:** The goal of this activity is to understand customers' needs and to effectively communicate them to the development team. The output of this step is a set of carefully constructed customer need statements, organized in a hierarchical list, with importance weightings for many or all of the needs. Special attention is paid to the identification of latent needs, which are difficult for customers to articulate and unaddressed by existing products.

**Establishing target specifications:** Specifications provide a precise description of what a product has to do. They are the translation of the customer needs into technical terms.

##### Research:

**Market research** to understand the current sentiment in your industry and if there are any holes that your product will fit into and if there will even be demand for it.

**Competitor analysis** to understand if customers think there are things your competitors' products or services lack that you can incorporate into your product to better fit your target market's needs.

##### Gather Raw Data from Customers

Consistent with our basic philosophy of creating a high-quality information channel directly from the customer, gathering data involves contact with customers and experience with the use environment of the product. Three methods are commonly used:

**Interviews:** One or more development team members discuss needs with a single customer. Interviews are usually conducted in the customer's environment and typically last one to two hours.

**Focus groups:** A moderator facilitates a two-hour discussion with a group of 8 to 12 customers. Focus groups are typically conducted in a special room equipped with a transparent mirror allowing several members of the development team to observe the group. In most cases, the moderator is a professional market researcher, but a member of the development team sometimes moderates.

**Observing the product in use:** Watch customers use an existing product or perform a task for which a new product is intended can reveal important details about customer needs. For example, watching a consumer replace an existing thermostat may reveal a mismatch in shapes between the new and old products causing unsightly discontinuities in the wall surface. Observation may be completely passive, without any direct interaction with the customer, or may involve working side by side with a customer, allowing members of the development team to develop firsthand experience using the product.

### Planning:

The next stage is planning, where you formulate a final product idea/definition based on your initial idea and research and begin coming up with your plans to bring it to life. When you define your final product, you'll want to begin planning for what you'll need in order to create it. For example, if you're creating a physical product, you'll need to source the necessary materials or find production partners that will assist in manufacturing.

Planning also involves coming up with a marketing strategy that will help you effectively market when your product is completed, pricing models that make sense for your product, and that your customers will pay.

**A customer-focused product:** Because concepts are explicitly evaluated against customer-oriented criteria, the selected concept is likely to be focused on the customer.

**A competitive design:** By benchmarking concepts with respect to existing designs, designers push the design to match or exceed their competitors' performance along key dimensions.

**Better product-process coordination:** Explicit evaluation of the product with respect to manufacturing criteria improves the product's manufacturability and helps to match the product with the process capabilities of the firm.

**Reduced time to product introduction:** A structured method becomes a common language among design engineers, manufacturing engineers, industrial designers, marketers, and project managers, resulting in decreased ambiguity, faster communication, and fewer false starts.

**Effective group decision making:** Within the development team, organizational philosophy and guidelines, willingness of members to participate, and team member experience may constrain the concept selection process. A structured method encourages decision making based on objective criteria and minimizes the likelihood that arbitrary or personal factors influence the product concept. [3]

**Documentation of the decision process:** A structured method results in a readily understood archive of the rationale behind concept decisions. This record is useful for assimilating new team members and for quickly assessing the impact of changes in the customer needs or in the available alternatives.

### Prototyping:

The prototyping phase is when you come up with a sample product that is a mockup of what will be created during mass production. This prototype is often referred to as a minimum viable product (MVP), which is a basic version of your tool, still similar to your final product that will help you get a sense of how it functions and identify any areas that need to be improved.

### Testing:

Before launching your product you need to test it to ensure it will work as advertised and effectively solve your customer needs. So, during this stage, you'll share your prototypes with target audiences and ask for actionable feedback on how the product works.

### Choose a Survey Format

The following formats are commonly used in concept testing:

**Face-to-face interaction:** In this format, an interviewer interacts directly with the respondent. Face-to-face interactions can take the form of intercepts.

**Telephone:** Telephone interviews may be prearranged and targeted at very specific individuals (e.g., pediatric dentists) or may be “cold calls” of consumers from a target population.

**Postal mail:** In mail surveys, concept-testing materials are sent and respondents are asked to return a completed form. Postal surveys are somewhat slower than other methods and suffer from relatively poor response rates. Some kind of incentive—often cash or a gift—is sometimes offered to increase response.

**Electronic mail:** Electronic mail surveys are very similar to postal mail surveys, except that (as of this writing) respondents seem slightly more likely to reply than via postal mail. With the proliferation of unwanted e-mail, this tendency may not persist. Many electronic mail users react extremely negatively to unsolicited commercial correspondence. We therefore recommend that electronic mail surveys be used only when respondents are likely to perceive a benefit to their participation, or when the team has already established some kind of positive relationship with the target population.

**Internet:** Using the Internet, a team may create a virtual concept-testing site in which survey participants can observe concepts and provide responses. An electronic mail message is usually used to recruit respondents to visit the test site.

### Measure Customer Response

Most concept test surveys first communicate the product concept and then measure customer response. When a concept test is performed early in the concept development phase, customer response is usually measured by asking the respondent to choose from two or more alternative concepts. Additional questions focus on why respondents react the way they do and on how the product concepts could be improved. Concept tests also generally attempt to measure purchase intent. The most commonly used purchase-intent scale has five response categories:

- Definitely would buy.
- Probably would buy.
- Might or might not buy.
- Probably would not buy.
- Definitely would not buy.

Changes in product if required

**Upgrade:** As technological capabilities or user needs evolve, some products can accommodate this evolution through upgrades. Examples include changing the processor board in a computer printer or replacing a pump in a cooling system with a more powerful model.

**Add-ons:** Many products are sold by a manufacturer as a basic unit, to which the user adds components, often produced by third parties, as needed. This type of change is common in the personal computer industry (e.g., third-party mass storage devices may be added to a basic computer).

**Adaptation:** Some long-lived products may be used in several different use environments, requiring adaptation. For example, machine tools may need to be converted from 220-volt to 110-volt power. Some engines can be converted from a gasoline to a propane fuel supply.

**Wear:** Physical elements of a product may deteriorate with use, necessitating replacement of the worn components to extend the useful life of the product. For example, many razors allow dull blades to be replaced, tires on vehicles can usually be replaced, most rotational bearings can be replaced, and many appliance motors can be replaced.

**Consumption:** Some products consume materials, which can then be easily replenished. For example, copiers and printers frequently contain print cartridges, cameras take film cartridges, glue guns consume glue sticks, torches have gas cartridges, and watches contain batteries, all of which are generally replaceable.

**Flexibility in use:** Some products can be configured by the user to provide different capabilities. For example, many cameras can be used with different lens and flash options, some boats can be used with several awning options, and fishing rods may accommodate several rod-reel configurations.

**Reuse:** In creating subsequent products, the firm may wish to change only a few functional elements while retaining the rest of the product intact. For example, consumer electronics manufacturers may

wish to update a product line by changing only the user interface and enclosure while retaining the inner workings from a previous model. [4]

**Economic analysis:** The team, often with the support of a financial analyst, builds an economic model for the new product. This model is used to justify continuation of the overall development program and to resolve specific trade-offs between, for example, development costs and manufacturing costs. Economic analysis is shown as one of the ongoing activities in the concept development phase. An early economic analysis will almost always be performed before the project even begins, and this analysis is updated as more information becomes available.

#### Commercialization:

The final stage of your new product development process is commercialization, where you introduce your products to market. This is the culmination of your brainstorming, research, iteration, where your audiences can finally make use of what you created. You'll enact your marketing plans to make your audiences aware of your new product, and enact campaigns that will entice them to become customers. Although this is the final stage, many businesses launch their products and, over time, return to make improvements to their products based on customer feedback and market changes to ensure they're always providing the best possible customer experience.

#### Marketing the Concept over Product:

The idea here is simple: talk about the concept and the product's intent instead of endlessly boasting about the product features. In short, answer how the product will make the customer's life easier.

They chose to market their unique selling point instead of marketing and promoting the entire product. That unique selling point was inbound marketing.

They started to create awareness around inbound marketing and instantly became a recognized leader in the software product industry. Sometimes the right marketing is all a product needs for the magnet effect.

#### Having a Brand Voice

A unique mindset and a unique voice always gain an all-ears audience. This is where the marketing team plays a significant role. They need to establish an effective communication style that represents the brand in the best manner.

#### Conducting Intriguing Webinars

Webinars are one way to attract quality leads. Conduct webinars that talk about how the new product will benefit the audience and describe the features that are being introduced.

Webinars can also help promote find ability and discoverability:

**Find ability:** It is easy to find and use features that the customer is aware of.

**Discoverability:** It is easy to find and use features that the customer has no knowledge about.

## 5. Benefits:

The following points list how small manufacturers can directly benefit from product development activities:

### Bottom-line Benefits

1. Increase revenue - new products provide you with new revenue streams.
2. Redesign of existing products can decrease costs and so increase margins. The driver for this could be in response to competition.

3. Reduced defects and better quality, partially through better designed production and assembly methods. But also due to a more robust design process.
4. More sales, through wider distribution.
5. Increase market share.

### **Improved Competitiveness Benefits**

- Innovate to develop new products or product variants, to beat competition in regional, national and global markets.
- Deliver more innovative products to customers, better meeting their needs, through improved functionality, customization and interpersonal services.
- Respond quickly and produce niche products where there are few or no competitors.
- Stay one step ahead of the competition.
- Take advantage of new technology improvements.
- Respond to market changes, such as customer preferences or new legislation.
- New product launches attract customer interest at exhibitions and industry launches.

### **6. Conclusions:**

When you complete your new product development process, you'll have brought your brainstorming ideas to fruition, and created a real product or service that solves a customer need. If you find success, you'll have created a valuable strategy to replicate that will help you continuously innovate and create new products, giving customers the delightful experiences they desire. Any mechanical engineering product maintenance can be stated: to minimize the cooperative costs of consumer and manufacturer a product with certain structure and of certain quality is to be utilized within its economically substantiated lifetime, the latter depends on the values of input expenditure on purchasing and current costs on service of this product. The phase of engineering design of a mechanical engineering product is to focus primarily on providing its economically substantiated lifetime and needed current expenditure on maintenance. Here, the methods of machine design are to foresee obtaining equal operating life for all its components. A structure is thought of as an optimal one which is designed on the basis of uniform strength, wear and other particular objective functions providing a uniform distribution of service properties. When developing an engineering design of the machine it is necessary to search for the most optimal form of the components, units and the machine as the whole, as well as for optimal distribution of physical and mechanical properties of the construction material. A perfect product can be designed by simultaneous optimizing form and material only. These principles of design enable forced restriction of product lifetime by the value of economically substantiated lifetime. Then, a consumer will face a problem of purchasing a new, more up to date machine, and a manufacturer will be able to plan volumes and development outlooks of the manufacture through constant relations with the users.

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## A PROPOSED ALGORITHM TO ANALYZE SENTIMENT IN PUNJABI TEXT

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### **Abstract:**

Sentiment Analysis is to identify and classify the opinions/emotions/sentiments in written text. Till date, English Language includes most of the research work in this area. In this paper, we proposed a method to analyze polarity (negative and positive) of the reviews written in Punjabi language by identification of features of the product. The key feature of the proposed method is that it calculates the sentiment score of the review by finding the properties and attributes of the object. Our approach proves good performance on the testing data.

**Keywords:** Sentiment analysis, Punjabi language, NLP, Opinion, Feature analysis

### **I. Introduction**

In today's environment, companies have overloaded data as a customer feedback, but for human it is impossible to analyses the data manually without any sort of bias or error. This feedback is the key point for improvement in quality and policies of any company. Sentiment analysis (SA) is the only method to automate for identifying the positive, negative or neutral aspects of such large data [1].

#### **1.1 Sentiment Analysis (SA)**

Sentiment analysis is an area of study for examining opinions given in content in a few social media sites [2]. SA helps data analysts within corporate and large enterprises to find public opinion, monitor brand and product response, conduct market research and finding customer experiences.

SA is a text analysis process that finds polarity (i.e. positive, negative or neutral) within the text, whether a whole paragraph, sentence, clause or document. In other words, it is a process of automation for finding opinion from the text. It is also defined as “emotional artificial intelligence” or “opinion mining”. It is a part of natural language processing (NLP). It is concerned with the voice from the client e.g. reviews on the web-blogs and online social networks. It determines the emotional or passionate response in communication or in the reviews. Reviews are basically of two types [3] i.e. regular reviews e.g. “ਰਾਮ ਮਿਹਨਤੀ ਹੈ” and comparative reviews e.g. “ਰਾਮ ਇੰਨਾ ਮਿਹਨਤੀ ਨਹੀਂ ਹੈ ਜਿੰਨਾ ਸ਼ਾਮ ਹੈ”. Reviewer, object, feature and sentiment are the basic components of a review as shown in Figure 1.

## A REVIEW: TEXT MINING TECHNIQUES AND ITS APPLICATIONS

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### Abstract:

In an effort to extract useful information from unstructured texts, text mining has developed into an engaging research area. Unstructured texts that are extremely information-rich cannot simply be used by computers for more processing. To extract this priceless information through text mining, precise processing methods, algorithms, and techniques are therefore essential. The main concept of text mining and a comparison of its methodologies are covered in this paper.

**Keywords:** Text Mining, Big Data, Pre-processing, Extraction

### Introduction:

Text mining could be a technique to search out significant patterns from the on the market text documents. Text mining, conjointly remarked as text data processing, is that the method of etymologizing high-quality data from text. 'High quality' in text mining typically refers to some combination of connectedness, novelty, and powerfulness [1]. High-quality data is often derived through the production of patterns and trends extracted or evaluated through the means that like applied math pattern learning. Text mining typically includes the method of structuring the input text (usually parsing, together with the addition of some derived linguistic options and also the removal of others, and ulterior insertion into a database), etymologizing patterns inside the structured knowledge, and at last analysis and interpretation of the output [2].

### Stages of Text Mining Method:

Text mining methods have been utilized in the versatile applications, ranging from the data retrieval to the natural language processing applications. The Text mining application requires the multiple steps to be executed in the particular arrangement, which is shown in the following steps:

- **Data Retrieval** systems establish the documents in a very assortment that match a user's question. The foremost acknowledge IR systems are search engines like google that establish those documents on the globe wide net that are relevant to a collection of given words.
- **Natural Language Process (NLP)** is one amongst the oldest and most troublesome issues within the field of computing. It's the analysis of human language in order that computers will perceive natural languages as humans do. This is usually done using the annotation documents with data like sentence boundaries, part-of-speech tags, parsing results, which might then be browse by the data extraction tools.
- **Data Methoding (DM)** is that the process of characteristic patterns in massive sets of knowledge. The aim is to uncover antecedently unknown, helpful information. Once employed in text mining, DM is applied to the facts generated by the data extraction section and places the

## **ADVANCES IN THE DESIGN AND CONSTRUCTION OF TALL BUILDINGS**

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### **Abstract:**

The design and construction of tall buildings have undergone significant advancements in recent years, driven by technological innovation, sustainability imperatives, and urbanization trends. This paper provides a comprehensive overview of these advances, highlighting key trends and breakthroughs that have transformed the way tall structures are conceived and realized. It explores the evolution of architectural and structural design approaches for tall buildings. It discusses the shift from conventional materials to high-performance materials like carbon fiber composites and advanced concrete mixes, enabling architects and engineers to create taller and more aesthetically striking skyscrapers. Furthermore, it delves into the importance of parametric design, computational tools, and digital modeling in optimizing structural efficiency and occupant comfort. It delves into sustainable practices in tall building design and construction. It examines the integration of renewable energy sources, green facades, and advanced HVAC systems to reduce energy consumption and minimize the ecological footprint of tall structures. Additionally, it explores the implementation of smart building technologies that enhance energy management, occupant well-being, and overall operational efficiency. In the last it will address the challenges and innovations in construction methods for tall buildings. It discusses the use of modular construction, prefabrication, and advanced construction machinery to improve project timelines and reduce costs. Moreover, it highlights the importance of safety measures and risk mitigation strategies, particularly in the context of extreme weather events and seismic zones. The integration of cutting-edge technologies, sustainable practices, and innovative construction methods has not only redefined the aesthetics of skylines but also raised the bar for efficiency, safety, and environmental responsibility in the vertical urban environment.

**Keywords:** Tall buildings, Skyscrapers, Architectural design, Structural design, High-performance materials, Parametric design, Computational tools, Digital modeling, Sustainability

### **Introduction:**

The relentless march of urbanization and the ever-growing global population have paved the way for an unprecedented era of vertical growth in our cities. As urban centers continue to expand, the demand for taller and more innovative structures has escalated, giving rise to a fascinating realm of architectural and engineering possibilities. The design and construction of tall buildings, often referred to as skyscrapers has shown in Fig.1, have evolved significantly in recent years, propelled by a confluence of technological advancements, sustainability imperatives, and the relentless pursuit of architectural excellence [1]. This paper serves as a comprehensive exploration of the remarkable advances that have redefined the landscape of tall building design and construction. Skyscrapers, once emblematic of sheer height and audacious ambition, now embody a sophisticated interplay of aesthetics, functionality, and environmental responsibility. The journey through the realm of tall buildings begins with an examination of architectural and structural design methodologies that have transitioned from conventional paradigms to cutting-edge approaches [2]. Modern tall buildings now employ high-

## AN ANALYSIS OF SOFTWARE SECURITY USING A CRYPTOGRAPHIC LICENSE KEY

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### **Abstract:**

Software Security was created to safeguard users' personal information. Usually, the programme coordinates with Internet use to limit or regulate the quantity of information made accessible to third parties. The software has different filtering and encryption options. Most retail software is only licensed for use on one computer or by a single person at a time. Instead of owning the software, you purchase a license to use it. It is legal to produce backup copies of the programme, but illegal to distribute those copies to friends and coworkers. This study looked into license file generators that use the system's MAC address to protect against software application piracy.

**Keywords:** Software security, Cryptography, Piracy, License

### **Introduction:**

Software [1] is a set of instructions, data or programs used to operate computers and execute specific tasks. It is the opposite of hardware, which describes the physical aspects of a computer. Software is a generic term used to refer to applications, scripts and programs that run on a device. It can be thought of as the variable part of a computer, while hardware is the invariable part.

### **Categories of Computer Software:**

Software [2] is often divided into two categories. Systems software includes the operating system and all the utilities that enable the computer to function. Applications software includes programs that do real work for users. For example, word processors, spreadsheets, and database management systems fall under the category of applications software.

### **System software:**

System software provides the basic functions for computer usage and helps run the computer hardware and system. It includes a combination of the following:

- device drivers
- operating systems
- servers
- utilities
- window systems

System software is responsible for managing a variety of independent hardware components, so that  
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## DESIGN OF SECURE DIGITAL COMMUNICATION SYSTEMS

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### **Abstract:**

With the ever-increasing growth of multimedia applications, security is an important issue in communication and storage of images, and encryption is one the ways to ensure security. Convolution Codes have been in use to provide reliable data communication over various communication networks. The recent high increase of mobile communication services that require both bandwidth intensive and interactive Real Time Applications impose an increased demand for fast and reliable wireless communication networks. In this paper, we will discuss the Encryption of information using combination of convolution method and trellis generator.

**Keywords:** Communication system, Convolution code, Trellis generator, Encryption

### **Introduction:**

In open networked systems, information is being received and misused by adversaries by means of facilitating attacks at various levels in the communication. The encryption standards such as DES (Data Encryption Standard), AES (Advanced Encryption Standard), and EES (Escrowed Encryption Standard) are used in Government and public domains. With today's advanced technologies these standards seem not to be as secure and fast as one would like. High throughput encryption and decryption are becoming increasingly important in the area of high speed networking. With the ever-increasing growth of multimedia applications, security is an important issue in communication and storage of images, and encryption is one the ways to ensure security. Image encryption has applications in internet communication, multimedia systems, medical imaging, telemedicine, and military communication. There already exist several image encryption methods. They include SCAN-based methods, chaos-based methods, tree structure-based methods, and other miscellaneous methods. However, each of them has its strength and weakness in terms of security level, speed, and resulting stream size metrics. We hence proposed the new encryption method to overcome these problems.

Communication is a major impact in today's business. The communication devices transmit large amount of data with high security. In business, the amount approximately worth over \$1 trillion is being transacted every week on the Net. But, unfortunately, the cyber-crimes are nearly 97% and such crimes are undetected. The security is still remains a risky one. At present, various types of cryptographic the algorithms provide high security in information, computer and network-related activities. These algorithms are required to protect the data, integrity and authenticity from various attacks [1].

### **Security Requirements:**

The identified stand-alone security requirements are the following:

## E-MAIL TRACKING IDENTIFICATION USING MACHINE LEARNING

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### **Abstract:**

A technique for tracking email delivery to the intended recipient is email tracking. To determine the precise time and date that an email was received or accessed, as well as the recipient's IP address, the majority of tracking technologies use some kind of digitally time-stamped record.

When the sender wishes to know if the intended recipient opened the email or clicked any links, email tracking is helpful. Email tracking, however, cannot be regarded as a 100 percent reliable indication that a message was opened or read by the recipient due to the limitations of the technology.

The majority of email marketing tools offer tracking capabilities, sometimes in aggregate (for example, click-through rate) and occasionally on a per-user basis.

**Keywords:** Email, Cookies, Tracking, HTTP, SMTP

### **Introduction:**

Electronic mail, most commonly called as email or email since around 1993, it is used for exchanging the digital messages from an author to one or more recipient. The email is used generating for any electronic document transmission. An internet email message consists of the message envelope, the message header and the message body. A method for monitoring the email delivery to intended recipient is called as email tracking [1]. Tracking is used for observing the moves of object or person and timely of respective location data to a model. Most of tracking technologies use some form of digitally time stamped record to reveal the exact time and date of an email was received or opened, as well as the IP address of the recipient. Now a day's sending an email is the easiest way of communication. But after sending an email, usually you don't know whether your email has been delivered successfully or not and read by the recipient. Email tracking service notifies that you when the email you send gets read. Email tracking is useful for the sender when he wants to know if the intended recipient received the mail actually or if they clicked on the links. Most of the email marketing software provides tracking features as, sometimes in aggregate (i.e. click through rate) and sometimes on an individual basis. An Email tracking mechanism is widely for all organizations and they are monitoring their email servers mail traffics and transaction reports. It also provides security and confidentiality about the entire organization of mail is only the possible way to share the confidential information across the organization. Email tracking is important because it has some reasons: - to take an action against spammers and abusive email senders to find its sources. Uncovering the persons or names behind the dubious emails will help users prevent communications from them in the future. It also stops these online threaten from creating more trouble in the internet.

### **E-Mail Architecture:**

E-mail system [2] is an integration of several hardware and software components, services and protocols which provide interoperability between its users and among the components along the path of transfer. The e-mail architecture shown in figure 1 below specifies the relationship between its logical

## GEOSYNTHETIC MATERIALS USED IN ROAD CONSTRUCTION: APPLICATIONS AND FUTURE PROSPECTS

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### Abstract:

Geosynthetic materials have gained significant recognition in the field of road construction due to their versatile applications and the potential they offer to enhance the performance, durability, and sustainability of road infrastructure. This abstract provides an overview of the applications and future prospects of geosynthetic materials in road construction. Geosynthetic materials, including geotextiles, geogrids, geomembranes, and geocomposites, have been utilized in various capacities to address common challenges in road construction. Geotextiles, for instance, have found applications in reinforcement, separation, and filtration functions, helping to improve soil stability and prevent the intrusion of fines into the road structure. Geogrids play a pivotal role in soil reinforcement and subgrade stabilization, particularly in areas with weak soils. Geomembranes offer effective solutions for preventing water infiltration and ensuring the integrity of road embankments. Geocomposites, combining multiple geosynthetic functions, have emerged as versatile solutions for optimizing road construction projects. The applications of geosynthetic materials extend beyond conventional road construction practices. These materials are integral in the construction of mechanically stabilized earth (MSE) walls, bridge abutments, and retaining structures, contributing to cost-effective and environmentally friendly alternatives. Moreover, geosynthetic-reinforced pavements are gaining traction, allowing for thinner road sections and reduced construction time while maintaining performance. The future prospects of geosynthetic materials in road construction are promising. As sustainability becomes a paramount concern, geosynthetics offer environmentally friendly solutions by reducing the need for virgin materials, minimizing construction waste, and extending the service life of roads.

**Keywords:** Geosynthetic materials, Road construction, Geotextiles, Geogrids, Geomembranes, Geocomposites, Soil stabilization, Reinforcement, Sustainability, Mechanically stabilized earth (MSE) walls, Bridge abutments

### Introduction:

The development and maintenance of road infrastructure play a vital role in the socio-economic growth of nations. As populations expand, traffic volumes increase, and environmental concerns heighten, the demand for efficient, durable, and sustainable road systems has never been greater. In response to these challenges, geosynthetic materials have emerged as indispensable components in modern road construction practices, offering innovative solutions to address a myriad of engineering and environmental challenges [1]. Geosynthetic materials are synthetic products manufactured specifically for use in civil engineering and construction projects has shown in Fig. 1. They encompass a diverse range of materials, including geotextiles, geogrids, geomembranes, and geocomposites, each engineered to serve distinct functions in the road construction process. The utilization of geosynthetics in road construction is driven by their exceptional versatility, cost-effectiveness, and environmental benefits.

## GSM BASED WIRELESS ELECTRONIC NOTICE BOARD

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### **Abstract:**

The notice board is the most common and essential piece of equipment in any university, school, or public area like a bus or train station or a park. However, it can be challenging to update different instruction notes on a daily basis. This project's primary goal is to create a wireless notice board that shows messages sent from a user's mobile device. A SIM installed in a GSM modem at the receiving unit receives messages sent by users. The level shifter IC and microcontroller were connected via the GSM modem. The microcontroller then posts the message on an electronic notice board after receiving it from the GSM. The notice board is a microcontroller-interfaced LCD display that receives regulated power from the main 230 volt AC supply.

**Keyword:** Microcontroller, SIM, GSM, LCD

### **Introduction:**

Communication is, by any measure, the fastest growing segment of the communications. As such it has captured the attention of the media and the imagination of the public. Cellular systems have experienced exponential growth over the last decade and there are currently around two billion users worldwide. Indeed cellular phones have become a critical business tool and part of everyday life in most developed countries and are rapidly supplanting antiquated wire line systems in developing countries. In addition wireless local area network currently supplements or replaces wired networks in many homes, businesses and campuses.

Many new applications including wireless sensor networks, automated highways and factories, smart homes and appliances, and remote telemedicine, are emerging from research ideas to concrete systems.

### **History of Wireless Communications:**

The first wireless networks were developed in the Pre-industrial age. These systems are transmitted the information over line of sight distance using smoke signals, torch signaling, flashing mirrors, signal flares, or semaphore flags. Any elaborated set of signal combinations was developed to convey complex messages with these rudimentary signals. Observation stations were built on hilltops and along roads to relay these messages over large distances. These early communication networks were replaced first by the telegraph network and later by the telephone. In 1895, a few decades after the telephone was invented, Marconi demonstrated the first radio transmission.

The first network based on packet radio, ALOHANET, was developed at the University of Hawaii in 1971. This network enabled computer sites at seven campuses spread out over four islands to communicate with a central computer on Oahu via radio transmission. The network architecture used a star topology with a central computer at its hub. The U.S military was extremely interested in the combination of packet data and broadcast radio inherent to ALOHANET. Throughout the 1970's and early 1980's the Defense Advanced Research Projects Agency (DARPA) invested significant resources to develop networks using packet radios for tactical communications in the battlefield. Packet radio

## IMPORTANCE OF CIRCLE IN LIFE CYCLE

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### **Abstract:**

There would be no spheres without rings, when a wheel is rolled in the sand through one revolution, what length is traced out? This length is the distance around the circle and is called the circumference of the circle. Clearly, the larger the radius of the circle, the greater the circumference, One of the fundamental lessons in geometry is the circle. The various applications of circles in our day-to-day activities demonstrate how crucial they are. We come across many things that are circular in shape every day; for instance, the sun, moon, planets, and even the tiniest atom all have circular shapes. In the real world, circles can be found in both the natural world and human-made creations. A circle is a geometric shape in the two-dimensional plane that is created by connecting an endless number of points that are all equally spaced apart from a fixed point. The fixed point in this case is referred to as the circle's centre, and the radius is the separation between the border points and the centre.

**Keywords:** Math Circles, Math, Pi, Geometry, Real World

### **1. Introduction:**

The circle is a familiar shape and it has a host of geometric properties that can be proved using the traditional Euclidean format. But it is sometimes useful to work in co-ordinates and this requires us to know the standard equation of a circle, how to interpret that equation and how to find the equation of a tangent to a circle.

A circle is a two-dimensional shape consisting of all points on a plane that are equally spaced from a fixed point. The radius of a circle is the specified distance from the center. The radius of a circle is twice its diameter. The geometric shape with the highest area-to-perimeter ratio is the circle. To determine the distance, measure the area and circumference of the circle. In our daily life, we often see round shapes. In the real world, circles are found both in nature and in man-made structures.[1] I use circles from the tip of the pen to the shape of the planet. The properties of a circle such as radius, diameter, circumference, and area are practical. If we know the radius of the circle, we can calculate all other parameters. In fact, you can compare the radius of a circle to two circular objects to compare their relative sizes. Circles are part of geometry, and without geometry there would be no evolution. In life, there is a circle around us, but we are not aware of it even though it is right in front of us. This creates a circle.

### **2. History of Circle:**

The word ‘circle’ is derived from a Greek word that means ‘hoop’ or ‘ring.’ In geometry, a circle is defined as a closed two-dimensional figure in which the set of all points in the plane are equidistant from a particular point called the "center." This area has a long history. Because there was no concept of three-dimensional shapes, people believed that the moon, sun, and other planets were circular. Mathematicians studied circles and helped develop calculus and astronomy. 1700 BC In the 4th century BC, the Lindo Papyrus proposed a method for finding the area of a circle. At this point, the value of Pi was not accurate. In 300 BC Euclid explained the properties of circles in his writings. Finally, in 1880

## **IMPORTANCE OF MATHEMATICS IN ENTREPRENEURSHIP**

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### **Abstract:**

Today, some entrepreneurs often brag about their "instincts" and claim success in business. Ultimately, if your business is to move beyond the startup stage, you need to support your intuition by having numbers at your fingertips. Today, entrepreneurial activity is no longer just based on the use of analog off-the-shelf invoices and balance sheets; Online and electronic business transactions that require knowledge of actuarial science. Mathematics is a very useful subject in nature value. It's so fundamental to so many things we do that its part of the language we speak today. Mathematics is a big part of that heritage of humanity. Mathematics as a subject has contributed more to the growth of modern civilization than any other known subject theme. The uniqueness of mathematics comes from the fact that it takes into account the cultures of all ethnicities and tribes. Mathematics is In fact, it is critical to the success of any business skill and will continue to be used in science, technology, Entrepreneurship to achieve the position it needs to occupy in our current civilization. Mathematics is essential for all knowledge, but business education that does not include mathematics may have a flawed foundation.

**Keywords:** Entrepreneur, Entrepreneurship, relation with mathematics, knowledge, focus, business strategy

### **1. Introduction:**

The key to success in mathematics is concentration. Time is of the essence for entrepreneurs, so they need to develop their mathematical skills efficiently. As important as it is, entrepreneurs can't afford to waste time considering high school math concepts. Therefore, focus on the most important areas of mathematics. Adhere to the concepts most commonly used in everyday business and take a college course that specializes in teaching business mathematics to entrepreneurs. A typical mathematics course begins by envisioning the applications of mathematics. The impact on product manufacturing and distribution is already known. That's also what I'm assuming Mathematics is all about symbolic manipulation and technical design. Actually it is the best mathematics relies on creativity. Mathematics is a means of expression; Explore creative ideas. The only source of creativity must be the idea of human capital Imagination and creativity, also known as entrepreneurship. Entrepreneurship everywhere Success creates a unique demand for your product or service in the minds of those who fail. You don't know what they want until it's shown to you. Therefore, mathematics must be considered Comes with entrepreneurial training.

### **2. Mathematics knowledge is important for business success:**

Mathematics is an essential part of any business. Without this, owners cannot determine whether they made a profit or a loss at the end of the year. It also helps you keep records, price your products, and create a budget. Here we have emphasized the importance of mathematics in business. [1]

### **Decision making:**

## **INNOVATIVE APPROACHES TO URBAN DRAINAGE AND FLOOD CONTROL**

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### **Abstract:**

Urbanization and climate change have significantly increased the frequency and severity of flooding events in urban areas worldwide, posing a growing threat to infrastructure, public safety, and the environment. Traditional drainage and flood control methods have often proven inadequate in managing these challenges. This abstract explores innovative approaches to urban drainage and flood control that embrace sustainable and resilient strategies to mitigate flooding risks while enhancing urban livability. This paper reviews a range of innovative techniques and technologies that are transforming the way cities manage stormwater and mitigate flood risks. These approaches include green infrastructure solutions, such as permeable pavements, green roofs, and urban wetlands, which harness natural processes to absorb and manage excess rainwater. Additionally, advanced sensor networks and real-time data analytics are enabling smarter, more adaptive stormwater management systems that can respond in real-time to changing weather conditions. Furthermore, the integration of nature-based solutions into urban planning and design is emphasized as a means to create more resilient, flood-resistant urban landscapes. Examples of such solutions include waterfront parks that serve as flood buffers and multi-functional green spaces that enhance urban aesthetics while providing flood protection. The paper also discusses the role of community engagement and public-private partnerships in implementing innovative flood control strategies. Public education and awareness campaigns can empower residents to participate in flood risk reduction efforts, while collaboration between government agencies, private sector stakeholders, and research institutions can facilitate the development and implementation of cutting-edge flood control technologies.

**Keywords:** Urban Drainage, Flood Control, Stormwater Management, Green Infrastructure, Resilience, Sustainable Cities, Climate Change Adaptation, Nature-Based Solutions, Smart Drainage Systems, Community Engagement

### **Introduction:**

Urbanization and climate change have ushered in a new era of challenges for cities around the world, and one of the most pressing among them is the increased risk of flooding. As populations continue to concentrate in urban areas and climate patterns become increasingly unpredictable, urban drainage and flood control have emerged as critical aspects of city planning and resilience. Traditional methods for managing stormwater and mitigating flood risks have often fallen short in the face of these evolving challenges [1]. Consequently, innovative approaches to urban drainage and flood control have taken center stage in urban development discourse. The magnitude of the issue cannot be overstated. Urban flooding, exacerbated by factors such as impermeable surfaces, outdated drainage systems, and intense rainfall events, has led to devastating consequences, including property damage, public safety concerns, and disruptions to daily life. Moreover, as climate change intensifies, the frequency and severity of extreme weather events, including heavy rainfall and storms, are on the rise, making flood control an

## REVIEW ON OPTICAL WAVEGUIDES

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### **Abstract:**

To satisfy the projected future needs for ultrafast and ultrahigh bandwidth communication and computing, optical technologies are required. Optoelectronic conversions, which have power consumption and speed and bandwidth limitations, can be overcome by all optical information processing. The optical waveguide, which enables low-loss light propagation and is thus utilised to connect components and devices, is the fundamental component of an optical device/circuit. Review of optical waveguides and their uses is provided in this paper.

**Keywords:** Optical waveguides, Refraction, Snell's law, Total internal reflection

### **Introduction:**

The transmission of light via a dielectric wave guide structure was proposed and investigated at the beginning of the twentieth century. The transport dielectric rod typically of silica glass with a refractive index of around 1.5, surrounded by air, proved to be an impractical wave guide due to its unsupported structure and the excessive losses at any discontinuities of the glass-air interface. To overcome all these problems idea of clad dielectric rod was introduced.

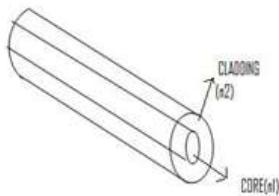


Fig. 1: Optical fiber wave guide

The figure 1 shows the optical fiber wave guide showing the core of refractive index  $n_1$ , surrounded by the cladding of slightly lower refractive index  $n_2$ . Progress in glass refining techniques led to fabrication of fibers of low loss and dimensions approximating to those of human hair. In order to appreciate the transmission mechanism of optical fiber fibers, it is necessary to consider the optical wave guiding of a cylindrical glass fiber. Such a fiber acts as an open optical wave guide, which may be analyzed utilizing ray theory.

An optical waveguide is a spatially inhomogeneous structure for guiding light, i.e. for restricting the spatial region in which light can propagate. Usually, a waveguide contains a region of

## REVIEW PAPER ON IMAGE FUSION TECHNIQUES

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### **Abstract:**

The technique of blending two images or more than two images which produces outcome as the composite fused image. The obtained fused image is the upgraded version of original images because it has all the salient information. The present applications make majority usage of this fused image to speed up their processing tasks in their respective fields. Recent real-time applications which require image fusion are remote sensing applications, medical applications, surveillance application, photography applications etc. The broad categorization of image fusion techniques are Non-transform domain or spatial domain and Transform domain or frequency domain. This paper initiates with the introduction of image fusion. Further sections elaborate the taxonomy of image fusion techniques.

**Keywords:** Image Fusion, Fusion Methods, Spatial Domain Fusion, Transform Domain Fusion

### **Introduction:**

In many situations a single image cannot describe the scene accurately, because the scene is usually taken using more than one sensor. Only a single image is more appropriate for human or machine processing, therefore it is significant to fuse all the images from different sensors to form a single image with all relevant information.

With the spreading of image processing, image fusion has been a significant subject in several associated areas such as computer vision, remote sensing, object detection, medical imaging, and image classification [1]. The term fusion refers into a method extracting of information that is gained in several areas. Data fusion deals with data and information from different sources to achieve enhanced information for decision making. Data fusion can be defined as a multidisciplinary field that contains several domains. The objective of data fusion is joining related information from two or more data to form a single data that is more accurate than the separate data.

There are some terms related to data fusion like data combination, decision fusion, data aggregation, multisensory data fusion [2]. Image fusion can be defined as a manner of mixing the information from a set of images to form one image and produce a fused image that is more complete and informative than the original images. The purpose of image fusion is constructing a fused image output that supplies the information which is more reliable and more suitable. The general definition of image fusion is the blending of two or more various images to form a new image by implementing a suitable algorithm [3]. The goal of image fusion increases corresponding information from various sources into one new image. The term fusion means extracting the information in different domains. A good fusion is getting on information from the original images and the resulted image without any changeability [4].

The fusion algorithm must satisfy the following requirements:

- It keeps on important features of the original image without loss of detail infused image.

## SOCIAL ADVERTISING: SUCCESSFUL PLATFORM

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### **Abstract:**

Social advertising and marketing is a cross-area new location of social technological know-how that research a way to enhance the general lifestyles fine of humans via adopting advertising and marketing techniques and abilities without aiming at making profits. Although the simple standards are identical, the standards of social advertising and marketing fluctuate from business advertising and marketing in diverse perspectives. It may be very essential that social entrepreneurs turn out to be privy to those variations and imposing social advertising and marketing strategy alternatively. Lots of humans count on that social advertising and marketing applications require a variety of investment, the utility of highly-priced advertising and marketing research, and finances for a marketing and marketing or advertising and marketing agency. While this will be actual for large scale applications, tough work and resourcefulness can successfully marketplace public fitness intervention merchandise or conduct alternate to any centered public, The effectiveness of social advertising and marketing is predicated closely on strategies from advertising and marketing that are used to steer customers to buy merchandise and services. In addition to diverse sorts of marketing and marketing, different techniques like marketplace segmentation, product design, etc. may be valuable. Paralleling tons mainstream advertising and marketing, the number one awareness of social advertising and marketing is upon the consumer theories and techniques into their social advertising and marketing practice.

**Keywords:** Marketing, social advertising, Product, Price, Place, Promotion, Partnerships, Policy

### **1. Introduction:**

Social advertising, occasionally recognized as “advertising for correct,” is a method that promotes advantageous societal transformation via way of means of specializing in influencing individuals' movements or methods of existence in preference to simply promoting an object or service. Its emphasis on network engagement is wonderful from industrial advertising, advertising thru inexperienced or sustainable practices, and advertising thru social media. The purpose of such advertising is to regulate people's behaviors for the extra correct of society – to the individual's income and advantage of society as a whole – via way of means of the use of the principles of industrial advertising and the social sciences. It is utilized by a huge kind of nonprofit groups and charities, in addition to via way of means of authorities groups, emergency services, and agencies. Likewise, a few examples are motorway protection alliances, policemen, firefighters, and paramedic groups. Social entrepreneurs additionally cope with campaigns for charitable reasons of an industrial brand's product or business. [1]

**2. Changing a Behavior**— social entrepreneurs have as their bottom-line the conduct extrude of agencies of humans, now no longer simply adjustments in understanding or attitude. This is much like commercial quarter entrepreneurs who cognizance on humans shopping for their items and services – information that attention of the product isn't enough to make a sale. In social advertising, extrude agents normally need goal audiences to do certainly consider one among 4 things:

(a) Be given a brand new conduct (e.g., recycling),

## THE BENEFITS & CHALLENGES OF GLOBALIZATION IN INDIAN BUSINESS SECTOR

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### **Abstract:**

Today, globalization offers incredible benefits to businesses. The benefits of globalization for businesses include a larger customer base, increased revenue streams, and a more diverse workforce. However, globalization also brings some formidable challenges, such as environmental degradation, regulatory compliance issues, and labor exploitation. However, it is important to remember that the challenges of globalization can be overcome. Global changes in the world, changes in politics, economics, business activities, etc. Developments in technology, transportation, and communication have made this necessary. In the fight for survival, companies change strategies and cross borders. Limited markets, competitive pressures and demand for cheaper resources The dynamics of postmodernism forcing business leaders to change their focus From traditional goals to alternatives for business success and global expansion A market aimed at gaining competitive advantage. Global economic exchange is as old as society organized shape. From the Industrial Revolution to today, irreversible global changes have occurred. Economic integration; the reason is simple, because there are no borders between companies and profits. Unique cultural characteristics that result in more or less mutual benefits from specific collaborations once recognized a business connection is established immediately.

**Keywords:** Globalization, internationalization, business, global markets

### **1. Introduction:**

Globalization is not new to many people or societies. We've been connected for years. But globalization has taken off the different forms of the past and the current economic situations are new. The world has never experienced such intense globalization. The speed with which society changes and integrates, there is no single all-encompassing definition of globalization. In fact, it has become a rough headline for many. Global exchange leading to expansion of cultural influence Expanding economic and business relationships beyond borders in the world; Globalization is essential for economists the emergence of global markets. For historians, it's an era. Sociologists see this in globalization; Celebrating diversity and the convergence of social preferences issues of lifestyle and social values. For political scientists, it is this indicates a gradual erosion of national sovereignty, but expert research only partially explains the phenomenon. Of From an interdisciplinary perspective, globalization can be treated as a phenomenon. Philosophies and processes that impact people just as deeply, as with all previous events; several factors were involved in this phenomenon. This study focuses on four aspects that promote the growth of globalization, which is one of the main drivers of globalization. Namely, trade, finance, communication, and transportation, Globalization is such an integral part of the modern world that most of us are unaware of the benefits it brings to our daily lives. For example, easy access to different cuisines or new technology being developed in a country half a world away. Globalization improves our lives, but it also comes with some challenges as companies begin to grow and expand across borders. [1] There is no denying that there are cultural differences around the world. These differences create hurdles for

## THE GROWTH OF SHOPPING MALLS IN INDIA

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### **Abstract:**

Malls are an integral part of a community, providing a one-stop shop for all consumer needs, from shopping and dining to entertainment and special events. In recent years, malls have evolved from shopping destinations to entertainment destinations. In addition, today's shopping centers respond to customer needs by providing ongoing engagement, activities, and niche campaigns that appeal to each target group visiting the shopping center. Simply put, the shopping center has something for the whole family, regardless of age or gender. India's retail market is the fifth largest in the world and as an emerging market it is the most attractive target. Urbanization and development of cities is bringing about a complete revolution in mall culture in India. With the development of shopping centers, the retail sector is becoming more organized. Retail industry's share of GDP is about 10%, which is equivalent to \$600 billion. Due to economic development and changes in consumer culture, malls in India have experienced remarkable growth, replacing traditional department stores and retail stores. There is a wide range of shops, restaurants and entertainment facilities. Satisfaction and loyalty, such as perceived value and service quality, were not analyzed in this study. The purpose of the study is the impact of shopping center services on customer satisfaction.

**Keywords:** Economy, shopping malls, retailing, customer satisfaction, modernization, Indian market

### **1. Introduction:**

The first complexes, with numerous shops, restaurants, and entertainment areas connected by walkways, often housed in covered buildings and first appeared in the United States in the 1950s. The proliferation of these commercial projects, often accompanied by large parking lots located on the outskirts of cities, initially capitalized on the increased demand for consumer goods and services and the mobility brought about by the rapid development of car ownership. This was made possible by improvements in These "shopping malls" or "shopping arcades" came to Europe in the 1960s and began to decline in rich countries, but began to rapidly develop in some Asian countries in the 1990s, where they It is commonly known as such. "".

### **2. Introduction of Shopping mall in India**

The first shopping center was opened in his 1999 year. However, the desire of traders to offer their customers a diverse commercial area is not new and can be observed in the example of the bazaar, a more or less closed market where goods and services are sold. The main commercial form for a long time, they however failed to respond to a rapidly emerging consumer practice in India — "shopping" [1]. The shopping malls, with the particularity to be covered, climate controlled and lighted, designed to host a variety of stores, were heavily promoted from the 2000's onwards by a set of large groups perceiving a growing demand for this type of "modern" infrastructure. As an outcome of this "mall mania", recent estimates find evidence of 873 operational malls of all sizes, including 40 very large complexes, i.e. larger than 50,000 sq. metres6, which are generally found in large cities (more than 2 million inhabitants). These "mega malls", requiring large investments, remain rare in India, and the most

## **“ENLIGHTENING THE FUTURE OF ENGINES: THE REVOLUTIONARY LASER IGNITION SYSTEM FOR INTERNAL COMBUSTION ENGINES”**

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### **Abstract:**

In order to meet the strict emission standards being imposed globally and to continue the pursuit of better engine performance, automotive engineers are being forced to investigate and develop new combustion technologies. A promising alternate igniting method for spark ignition engines is the laser. Potential benefits of laser ignition over traditional spark plug ignition. Since there are no spark electrodes in a laser ignition system, there is no energy loss to the electrodes, which are also not subject to erosion. Experimental research was done on the likelihood of ignition and minimal ignition energy (MIE) of premixed gasoline-air mixtures at various equivalency ratios. The outcome was contrasted to spark ignition. The mixture had a starting pressure of 0.1 MP and a starting temperature of 363 K. According to the research, within the flammable range, the likelihood rises as the ignition energy rises, and for both laser and spark ignition, the distribution of MIE with equivalence ratios has a U-shape.

### **Keywords:**

Laser Ignition System, Internal Combustion Engine, Fuel, Emissions, and spark

### **Introduction:**

For a system to operate properly in technical equipment like an internal combustion engine, reliable ignition is necessary. In spite of economic and environmental obstacles, fuel consumption and exhaust emissions from motor vehicles have both dropped. The most effective engines at the time for lowering fuel use and exhaust pollutants are those with direct fuel injection. Unfortunately, the classic spark plug ignition only allows for one ignition location to be chosen due to significant damage when compared to contemporary spray-guided combustion methods. The use of a laser to ignite the fuel/air mixture has a lot of potential, according to gas engine R&D engineers. Laser ignition is particularly effective at meeting the thermodynamic requirements of a high compression ratio and high power density. Additionally, the gas flow within the combustion chamber can be impacted by the spark plug electrodes. Pollutant production and the degree of fuel conversion are both significantly influenced by ignition. This can be accomplished with reliability using a laser ignition method [1].

### **Need and Invention:**

Energy shortages and environmental issues have gotten progressively worse with the growth of industry and the economy. The internal combustion engine and the car industry face formidable and practical obstacles. One of the efficient solutions to the challenges listed above is lean burn. However, due to ignition-related issues including the sluggish flame initiation and propagation as well as potential misfiring, existing engines cannot be operated sufficiently lean. Future spark ignition engines

## A REVIEW OF ROUTING PROTOCOLS IN WIRELESS SENSOR NETWORK

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**Abstract:**

Modern wireless communication networks now benefit from the addition of wireless sensor networks (WSNs). When data transfer paths are chosen optimally, energy consumption is reduced, extending the network lifetime of wireless sensor networks. Numerous protocols for data distribution, power management, and routing have been created especially for wireless sensor networks (WSNs), where energy awareness is a crucial design consideration. WSN routing methods can vary based on the application and network architecture because a standard WSN communication stack has not yet been agreed upon. More recent routing methods are needed to meet the demands of pervasive and ubiquitous computing. The four categories used in this study to categorize WSN Routing Protocols are: network structure, protocol operation, routing path formation, and communication initiator. Additionally, the homogeneity and heterogeneity of sensor nodes, as well as the clustered and non-clustered criteria among both, have been used to categorize routing systems.

**Keywords:** Wireless sensor networks, nodes, energy-aware routing, routing protocols, network structure

**Introduction:**

Wireless sensor network (WSN) comprises of large number of tiny and moderately low-priced computational nodes that transmit the valuable collected information to the base station (BS) for applicable processing. Figure 1 shows a typical structure of WSN. From last decade, wireless sensor networks (WSNs) have mesmerized extensive attention from academic research as well as from academic research. The major factor behind most of the research efforts in the field of WSNs is because it helps to resolve most of the real life problems like security, human safety, health care, and defense sector [1–8]. In WSNs, a number of research directions are available which includes corporeal design, routing strategy, procedures for power management, security issues, and sensing capability of sensor nodes [3]. Lifetime of the sensor nodes is the utmost issue for WSNs, because sensor nodes have very limited power resources [4–6]. Routing protocol plays a major role in the lifetime of the sensor nodes. Routing in WSN is not similar to other wireless networks because of various unique properties of sensor node like energy constraints, processing accomplishments, transmission of collected information from multiple nodes to a single base station, improbability of global address and random deployment of sensor nodes, etc. In order to accommodate these types of properties, different types of routing protocols were developed. The ultimate goal of these routing protocols is to achieve energy efficiency and maximize the overall network lifetime.

**A SURVEY ON FRAMEWORKS AND TECHNIQUES OF IMAGE MINING**

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**Abstract:**

These days, images are important in every aspect of business, including satellite imagery, commercial imagery, and medical imagery. A subfield of data mining called image mining is concerned with the process of discovering new information about digital photos. The fascinating topic of image mining extends classic data mining from structured to unstructured data, including image data. Image mining techniques are now necessary due to the increase in the quantity of photos and image databases. A set of analytical methods called "image mining" look through a lot of picture data. This study aims to provide an overview of the many categories of frameworks that are used to demonstrate image mining techniques and approaches for image mining applications.

**Keywords:** Image mining, image indexing and retrieval, object recognition, image classification, image clustering, association rule mining

**Introduction:**

Advances in image acquisition and storage technology have led to tremendous growth in significantly large and detailed image databases [1]. The World Wide Web is regarded as the largest global image repository. An extremely large number of image data such as satellite images, medical images, and digital photographs are generated every day. These images, if analyzed, can reveal useful information to the human users.

Unfortunately, there is a lack of effective tools for searching and finding useful patterns from these images. Image mining systems that can automatically extract semantically meaningful information (knowledge) from image data are increasingly in demand. The fundamental challenge in image mining is to determine how low-level, pixel representation contained in a raw image or image sequence can be efficiently and effectively processed to identify high-level spatial objects and relationships. In other words, image mining deals with the extraction of implicit knowledge, image data relationship, or other patterns not explicitly stored in the image databases. It is an interdisciplinary endeavor that essentially draws upon expertise in computer vision, image processing, image retrieval, data mining, machine learning, database, and artificial intelligence [2]. While some of the individual fields in themselves may be quite matured, image mining, to date, is just a growing research focus and is still at an experimental stage. The main obstacle to rapid progress in image mining research is the lack of understanding of the research issues involved in image mining. Many researchers have the wrong impression that image mining is just a simple extension of data mining applications; while others view image mining as another name for pattern recognition. In this paper, we attempt to identify the unique research issues in image mining. This will be followed by a review of what are currently happening in the field of image mining, particularly, image mining frameworks, state-of-the-art techniques and systems. We will also identify possible research directions to bring image mining research to a new height.

**Research Issues in Image Mining:**

## **AN OVERVIEW OF GRID COMPUTING**

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### **Abstract:**

These days, internet technology is far too commonplace, and people's perceptions of utilising computers and the internet have changed as a result of the low cost and great performance of network and computer technology. Conceptually, grid computing differs from electric grids. With an electric grid, all we have to do is connect to the infrastructure's outlets; we don't need to know how or where our electricity comes from. Thanks to grid computing, it is now possible to use a vast virtual network of distributed computers to share computer power and data storage over the internet. This essay provides an overview of the definition of a grid, as well as its benefits, drawbacks, and uses.

**Keywords:** Grid Computing, Grid Architecture, Virtual Organizations, Data, Computing

### **Introduction:**

Grid computing is a type of distributed computing which allows sharing of computer resources through Internet. It not only allows us to share files but also most of the software and hardware resources. "Grid is the future Internet" is the prime mantra of the present researchers and so whole world follows Grid. Grid applications are usually scientific with large number of users and dynamic resources. Because of the dynamic nature of Grid systems, it allows participants to join or leave the system at any time.

Grid computing combines computers from multiple administrative domains to reach a common goal to solve a single task. Grids can be primarily classified [1] into various types, depending on nature of their emphasis- computation, data, application service, interaction, knowledge, and utility. Accordingly, Grids are proposed as the emerging cyber infrastructure to power utility computing applications. Computational Grids aggregate computational power of globally distributed computers (e.g., TeraGrid, ChinaGrid, and APACGrid).

### **Grid Architecture:**

Ian Foster et al., presents [2] the various layers of the Grid architecture by using Hourglass model [3]. The narrow neck of the hourglass defines a small set of core abstractions and protocols, onto which many different high-level behaviors can be mapped, and which themselves can be mapped onto many different underlying technologies. While the base of the model conveys the different underlying technologies, the top of model shows high-level behaviors that translate into services and user applications. The fabric layer provides the resources to which the shared access is controlled by the grid protocols. The resources normally include physical and logical entities. Physical entities are

## BUILDING INTEGRATED WITH SOLAR ENERGY

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### **Abstract:**

The world of architecture is in the midst of a revolution, a seismic shift in the development of energy infrastructure. Building energy-efficient buildings is becoming increasingly important around the world. Energy regulations in the United States and Europe aim to reduce overall energy consumption in buildings. Passive solar design is the first step towards climate-friendly and sustainable building design. With the introduction of modern construction techniques in the country, the construction sector adopted uniform designs and construction techniques, thereby ignoring the local climate. Housing generally refers to a shelter or building intended as a residence or residence for people. "Home" includes many different types of dwellings, from simple huts and nomadic dwellings to high-rise apartments. The major obstacles to meeting this demand are raising energy costs and other climate changes. Passive solar buildings aim to maintain indoor thermal comfort during the daily and annual solar cycle while reducing the need for active heating and cooling systems. Passive solar buildings are part of green building plans. The scientific basis for the design of passive solar buildings has been developed based on a combination of climatology, thermodynamics (especially heat transfer) and human thermal comfort (buildings occupied by humans). Particular attention is paid to the location and location of the dwelling, the prevailing climate, design and construction, solar orientation, arrangement of glazing and shading elements, and incorporation of thermal mass. These considerations apply to any building, but achieving the ideal solution requires careful integration of these principles.

**Keywords:** Buildings, Insulation, Solar energy, Ventilation, climate, orientation, glazing, design

### **1. Introduction**

To address the significant challenges faced by the European Commission's construction sector, which accounts for around 40% of energy consumption and 36% of greenhouse gas emissions, the scientific community is working with policy makers to develop innovative technologies. We are continually working to provide and introduce the following solutions, advanced practices or regulations. In recent years, new requirements have been phased into building regulations to ensure the gradual decarbonization of the building sector and increased energy efficiency. The Energy Performance of Buildings Directive (EPBD), revised in 2010, sets out requirements aimed at achieving environmental and energy efficiency goals by introducing near-zero energy building performance (nZEB) in new and existing buildings has been introduced. Particular attention was paid to the public buildings sector regarding energy efficiency measures, drivers and obstacles and their optimal calculation. The facade of a building usually plays an important role as an interface between the surrounding environment and the interior atmosphere. With the integration of renewable energy (especially solar), the building's

## **DESIGN OF TOOL-ASSISTED MESSAGE MAPPING PROCESS OF HL7**

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### **Abstract:**

In the new network-centric healthcare IT environment, standardization of information representation, organization and dissemination is the first step towards achieving semantic interoperability among heterogeneous systems. In this paper, we discuss roadblocks encountered in a real-world project to integrate two disparate healthcare systems based on HL7 v3 standards.

### **Introduction:**

The ability of systems built upon heterogeneous information models to exchange vital clinical, financial and administrative information is pivotal to the success of healthcare organizations in providing quality services. Shifting towards an integrated healthcare environment through ventures such as Electronic Health Record (EHR) requires leveraging the new messaging and terminology standards such as Health Level 7 (HL7) and SNOMED CT1.

While the new HL7 version 3 (v3) has been hailed over its predecessors for being a "true" standard offering precision and unambiguity, the worldwide healthcare community has so far been reluctant to adopt it mainly due to its overwhelming complexity. We have experienced these real challenges in our project to integrate a Clinical Decision Support System (namely Vascular Tracker, VT) developed by the COMPETE2 group, with a Cardiac Rehab Center (CRC) in a different location based on HL7 v3 standards.

These standards are sufficiently comprehensive to cover the breadth and depth of the medical domain information. However, organization of the information models into a multi-level, domain-based hierarchy offers a challenging environment for non domain-expert IT personnel. Furthermore, creating semantic maps between legacy data and HL7 v3 messages currently requires a thorough understanding of HL7 information architecture as well as standard clinical terminology systems such as SNOMED CT [3] and LOINC3. To the best of our knowledge, there is no open-source tool to support design and implementation of HL7 v3 compliant integration. As such, message workflow design typically involves wading through pages of HL7 documentation using primitive text search tools.

The real-world challenges that we faced during the aforementioned project served as our motivation to drive this research. Our overall goal is to develop solutions that reduce the overwhelming complexity of the HL7 v3 compliant integration projects, and consequently a wider adoption of the HL7 v3 standards.

In this paper, we propose a Tool-Assisted Message Mapping Process (TAMMP) to support the message

## EFFECTS OF SOIL EROSION

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### **Abstract:**

Soil erosion is the main cause of soil degradation due to physical, chemical and biological factors. Affects soil quality and leads to potential damage to the soil matrix which effects on soil matrix environment. Physical soil erosion involves loss of structural integrity, resulting in the formation of a crust. Compaction and reduced permeability cause rapid fluctuations in soil temperature; increased surface flooding and land degradation. Chemical soil erosion is the loss of organic matter or matter. Soil examples include nutrients, soil salinity, acidification, soil degradation, and loss of fertility deterioration. Nutrient loss reduces the soil's ability to support plant growth and agricultural production. Increases stomach acidity. Biological soil erosion involves the removal of soil organic matter and the reduction of soil organic matter. Bio diversity, reduced ability of soil to store and absorb carbon, release of plant nutrients, etc. and greenhouse gas emissions. During rain/heavy rain/storm Sediment deposited on dams and embankments is detached, causing damage and erosion of the soil through spray erosion and river erosion reservoir by transporting fertile soil. As a result, soil organisms migrate toward soil graveyards. It occurs due to the transport mechanism separation, transport, and deposition mechanisms of polymeric substances Precipitation erosion index. Soil erosion and socio-economic factors interact. Soil and water loss destroys land resources that cause non-point source pollution and affect the recycling and use of water resources; it can degrade the aquatic environment and even cause natural disasters such as collapses, landslides, and debris flow. Soil erosion affects the socio-economic development of a region. On the other hand, both economically and socially, Development has sharply increased people's demand for exploitation and utilization of natural resources, which has increased soil and water losses. On the other hand, economically and socially this development has promoted and enabled people's understanding of soil erosion and soil and water conservation. Encourage people to consciously change their production and lifestyle to ensure they have enough resources to invest in land and land save water and reduce soil erosion.

**Keywords:** Erosion, soil degradation, run-off, consequences, soil conservation, development, socio-economic development

### **1. INTRODUCTION:**

The delicate outer layer of the earth that supports all life is called soil. It is one of the most valuable resources to humans and is made up of innumerable species that interact to form a dynamic and complex ecosystem. The conversion of forests and grasslands into farm fields and pastures is encouraged by the rise in the demand for agricultural commodities. Natural vegetation cannot always hold onto the soil during the transition to agriculture, and many of these plants—like coffee, cotton, soybeans, palm oil, and wheat—can actually exacerbate soil erosion beyond what the soil can

## EMBANKMENT DAMS: ITS TYPES AND ESTIMATION OF SEEPAGE

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### **Abstract:**

Approximately half of all embankment dam failures are attributed to internal erosion. Internal erosion is a broad term that describes various mechanisms in which the erosive forces of moving water erode soil from within or beneath an embankment. While there are different categories of internal erosion, assessing the likelihood of internal erosion in general requires intricate knowledge of a structure's history, design, and the physics of seepage through an embankment. Often times, the documentation regarding a structure's history and original design is in a state of disarray, or altogether lost, making it difficult for today's engineers to adequately assess a structure. However, knowledge of the historical evolution of the profession understands of seepage and embankment design combined with the date a structure was constructed is often times enough information to make inferences regarding how an embankment was designed and what elements may not have been considered as part of the original design. This paper is intended to provide the reader with this information through a historical review of embankment seepage design. An overview of seepage design is provided beginning with the empirical designs constructed prior to 1900 through the modern designs of today. In particular, the evolution of analytical techniques (creep ratio, flow net, electric analogy, and finite element analysis) is discussed as a parallel to the evolution of the profession's understanding of failure mechanisms (piping, concentrated leak erosion, suffusion, structural uplift).

**Keywords:** Embankment, Dams, Earth dams, Seepage, Breach, Temperature

### **Introduction:**

In general, embankment dams or fill-type dams are used to describe dams made of soil and rock components. Compared to concrete dams, embankment dam construction has a significantly longer history. It is obvious that certain earth dams were built in the eastern countries, which were the cradles of ancient cultures, roughly 3,000 years ago. Dams that are taller than 15 meters are referred regarded as "high dams" in the standard manual provided by the International Commission on Large Dams (ICOLD), which has roughly 63 member countries as of this writing. More than 70% of the approximately 14,000 high dams that have been registered so far are embankment dams. A recent assessment on the building of high dams also indicated that only roughly 20% of the 1,000 high dams built in the last two years were concrete dams, with the remaining 80% being embankment dams. Thus, it is clear that building embankment dams rather than concrete dams has been increasingly popular recently. When building embankment dams, two key advantages and traits stand out. 1. Concrete dams need a solid rock foundation, whereas the dam foundation does not need to be subjected to strict conditions. Even on the alluvial deposit and pervious foundations, embankment dams can be built. 2. Building embankment dams has a financial benefit; that is, the project can be designed outside of a city

## **IMPACT OF TECHNOLOGY ON COMMUNICATION TECHNIQUES**

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### **Abstract:**

Most facets of life have been transformed by technology, including cultural norms, values, and beliefs. People have been affected by it in a variety of social, political, and economic contexts, including business, sports, human relations, governance, institutional development, and human engagement. As a result of the ongoing, widespread adoption of technology and its precursors in the aforementioned fields, social systems are evolving globally, and information and communication technology (ICT) is beginning to define the scope and potential ramifications of this evolution. The new catalyst for human relations is social media, thanks to its widespread growth and acceptance as a means of communication for companies and social groups. Due to its global nature, it has a wider audience and enables real-time communication between individuals all over the world. Social media's pervasive support of modern life has led to the creation of highly distributed, interactive communication systems that connect the various social players' functions. This pattern indicates that technological systems are becoming more and more integrated into daily life. Examining these communication forms' effects on people's lives, relationships, and general well-being is crucial as they become more and more common. They have a plethora of potential advantages, including making it easier and faster for people to stay in touch with friends and family who live in other country.

**Keywords:** Communications, ICT, broadband, Social media; Relationships; Social connectedness

### **1. INTRODUCTION:**

The effect of communications technology (CT) on subjective well-being has been the subject of some research, i.e. e. on how people view their level of satisfaction with life and their state of well-being. Nonetheless, there are numerous dimensions to well-being, including relationships, accomplishment, health, and standard of living. The individual dimensions exhibit greater malleability compared to the aggregate measure, and are more prone to be influenced by variables like technology utilization. Consequently, a great deal of research has concentrated on how CT affects more specialized facets of health. [1] Most of the earlier research has specifically concentrated on how it affects relationships. This is because CT appears to have an impact on relationships in particular because it is a social technology by nature. The mediating variables of time spent with friends and the caliber of those friendships were how instant messaging affected well-being. Numerous studies looking at CTs and relationships have been conducted. But not all of them are in agreement; some studies have produced highly disparate—even contradictory—results.

### **2. History:**

## **INDIAN YOUTH NEED MORE GUIDANCE AND CAREER COUNSELING**

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### **Abstract:**

Adolescence is a time of identity formation and self-exploration, with a focus on people, society, and education. And their career can develop their views. It can be stressful and confusing. In light of changing expectations for young people as members of society, rapidly changing education, Expert advice can change rapidly. This requires a new approach we must address the concerns of young people and young people and we must take into account the voices of young people are central to the development of these approaches. Career counselors are needed to help students make informed career decisions. However, most research institutes in India do not give much importance to it. Like Western countries, India also needs highly educated professionals with a wealth of job and career knowledge. The lack of qualified career counselors is due to fewer educational institutions offering this course. They are aware of changing skill requirements and strive to pursue higher education, obtain additional training, and enroll in skill development programs. At the same time, various factors hinder their ambitions and prevent them from effectively adapting to the changing world of work. The findings can inform policies and strategic actions to ensure a smooth transition from education to employment for India's youth. The education sector in India and around the world has been severely affected by this pandemic it has A global lockdown was implemented, which had a very negative impact on students' lives. about 32 million students have had their schools relocated and all educational activities in India have come to a halt all School and university exams, including entrance exams, have been postponed student Around the world, we are facing new challenges as classroom learning transitions to e-courses and e-learning. Students from very poor backgrounds cannot attend E-classes. It worked like this Incentive to evolve your institution and choose a different technology platform previously used. The education industry struggled to survive with a different perspective. Manage crises and digitize challenges to eliminate pandemic threats. Career guidance plays a key role in supporting product markets Educational system to achieve goals. Because career choice is definitely part of it the most important decision you will make in your life. Ironically, such important decisions are often made they are created quite early in a person's life, sometimes without much thought in addition. Careers should be chosen with great care, consideration, and planning. The individual they have different natural abilities and skills, which make them different aptitudes for different types of jobs. The purpose of career counseling is to optimally match talent and occupation for both parties advantage.

**Keywords:** Career orientation, colleges, skills, students, career guidance, Life Learning

### **1. Introduction:**

Career counseling helps you understand your interests, ambitions, skills, qualifications, it helps us understand product markets and education systems and connect them to our actions. Get to know yourself. Overall, career counseling attempts to teach us how to plan and make decisions about work and study. During career counseling, you will receive information about the product market about making educational opportunities more accessible through organization and systemization. Be available

## M-COMMERCE: AN OVERVIEW

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### **Abstract:**

Many mobile services have experienced fast growth as a result of advancements in wireless technology. This involves modifications to the online shopper's purchasing habits. Previously, consumers used online or in-store shopping platforms, or electronic commerce (e-commerce). These days, as more people utilise smartphones and mobile applications, mobile commerce, or m-commerce, is becoming more and more popular with consumers. Because m-commerce is expanding, it is essential to make sure that the applications are very user-friendly and easy to use. As a result, it's critical to properly design the app's interface. In order to pinpoint the gaps in theory and practise as well as potential future research areas, this paper evaluates the literature on m-commerce and applications using an appropriate classification scheme.

**Keywords:** Mobile commerce, Benefits, Demerits, Challenges, E-commerce, Scope

### **INTRODUCTION**

M-commerce [1] can be defined as “any transaction having a monetary value that can be conducted through mobile communication network or Wi-Fi network”. Businesses to consumer transaction conducted from mobile devices are also known as m commerce.

Presently mobile phones are not use for sending messages or calling but it is also used for many other sectors. It is used to buy tickets, paying insurance premium, buying gifts and recharging mobile accounts. All big companies in India Started using mobile for doing business, Financial sector, telecom sector, Banking and real estate one some of the sector using mobile commerce. M-commerce is rapidly overtaking E-commerce as the facto mode for online transactions. Myntra, the leading fashion retailer in India, has already announced its plans to become a mobile only market place by the end of the year. Snapdeal declared that 65% of their orders come from mobile. And by the end of the year Flipkart is the largest ecommerce company in India. E-commerce merchants are left with no choice but to embrace mobile in India. M-commerce has several major advantages over its fixed counterparts because of its specific inbuilt characteristics such as personalization, flexibility, and distribution. Mobile commerce promises exceptional business, market potential and greater efficiency. M-commerce can be a huge success for the Indian market but this requires a complete ecosystem, partners must be synchronized so that the best benefits go to consumers and their confidence is assured. Mobile commerce adoption has increased significantly in the country due to multiple factors such as enhanced 3G Penetration and availability of affordable smart phones. India is expected to have close to 165 million mobile internet users by march 2014, up from 87.1 million in December 2012 as more people are accessing the web through mobile devices and tablets. It is being said that, in the next three years mobile commerce will constitute more than 25 percent of the total traffic in e-retailing. mobile

## PROGRESS OF NUCLEAR POWER

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### **Abstract:**

Nuclear power is one of the few commercially tested sources virtually free energy greenhouse gas emissions of. It automatically becomes interesting to climate experts. But the future of nuclear power is not yet clear. In fact only a few other subjects can brag about having them a literature as polarizing as that on the future of nuclear energy. With some notable exceptions, these views are primarily ideological; they range from unconditional support to an egalitarian normative perspective their opposition is decisive. Nuclear fission will remain an essential part of the world's low-carbon power generation for decades to come. There is a breakthrough opportunity in developing a new generation of nuclear reactors, which could shorten the lifetime of nuclear waste from the current hundreds of thousands of years to hundreds of years. Achieving this development requires research into fourth generation nuclear reactors. Fast reactors require significant research and development efforts in many areas, from materials science to safety demonstration, to achieve their intended goals. Fusion provides a long-term vision for efficient energy production. The fusion option for a nuclear reactor for efficient production of electricity has been set out in a focused European program including the international project of ITER after which a fusion electricity DEMO reactor is envisaged.

**Keywords:** Nuclear power, nuclear waste, Reactor, Projects, electricity, fusion, India

### **1. Introduction:**

The role of nuclear energy in other countries will become important Variants vary from US version nuclear resource bases, availability of alternative "fuels"; Technical capabilities and power generation scale system. However, the United States does not have its own oil resources. One, domestic coal, oil and gas resources still in need are much larger. It is more abundant than most countries in the world. USSR. Canada, Additionally, China has large amounts of fossil fuel resources, which could delay large-scale projects participation in nuclear energy. This is not the case in most other countries in the world. Companies with the least resources and therefore the highest potential Western Europe, Japan, South Korea, and Brazil rely on nuclear power. Most developed countries suffer from energy shortages,[1] Construction of light water reactors or equivalent national light water reactors, development of liquid metal breeder reactors, and Develop and implement fuel recycling to reduce dependence about imported uranium. Developing countries have much lower energy requirements than other countries. Energy consumption growth rate is the same in developed countries Standards and targets generally higher than developed countries grow despite limited energy resources from one point in the world from this point of view, the rate of expansion of energy supply is highly dependent on this nuclear technology and nuclear fuel availability. That's true, because Restrictions on alternative fuels, especially fossil fuel supplies fuel. Therefore, there is a desire to limit the transfer of nuclear technology. Concerns about the destruction of nuclear weapons are in direct conflict with: We want to avoid international wars due to the depletion of fossil fuels.

### **2. Demand of electricity:**

## REVIEW OF IMAGE SEGMENTATION TECHNIQUES

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### Abstract:

One of the most crucial steps in the image processing process is image segmentation. The process of splitting or partitioning an image into what are known as segments is known as image segmentation. Since it is inefficient to process the entire image for these kinds of applications, it is mostly helpful for image compression and object recognition applications. In order to separate the portions of a picture for additional processing, image segmentation is utilised. Many image segmentation algorithms are available that divide a picture into multiple segments according to certain properties such as colour, texture, and pixel intensity value. These methods are all grouped according on the segmentation approach that was applied. This study reviews and discusses the different image segmentation approaches.

**Keywords:** Image segmentation; similarity detection; edge detection; fuzzy clustering; thresholding

### Introduction:

Image segmentation is one of the most important processes of digital image processing. Image segmentation is the method that subdivides an image into meaningful segments, having similar properties, attributes and features. It is used to locate the objects and boundaries such as lines and curves in images. It means, each and every pixel of an image is assigned with a label such that same labels of image pixels share common visual characteristics. The main aim of segmentation is to make the image's representation as simple as easy to understand by reducing the information of an image into meaningful way. Basically image segmentation is classified into two types: Local segmentation that referred to the specific region or part of the image and Global segmentation that concerned with the segmentation of the whole image (consisting of large number of pixels) [1].



Fig. 1: Original image and segmented image

The process of image segmentation is subdividing an image into the constituent parts and each sub-part depends upon the problem being solved.[2] In image processing, image engineering presents the

**ROLE OF TIME MANAGEMENT IN STUDENT'S LIFE****Muzafar Ahmed Ganai<sup>1</sup> Richa Verma<sup>2</sup>,**

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**Abstract:**

Time management is considered a comprehensive process carried out through management functions having a positive impact on society is highly dependent on individual talents and skills simultaneously and individually. However, to achieve this, all of this must be limited to a specific period of time adapting people to current and future situations. It is important to point out this is reflected in the fact that companies are now able to manage their time more effectively. Achieve your goals correctly at the right time. Time management is a very valuable topic because it is a key element to success at every level of life. That is why the term time management is strongly associated with administrative tasks despite him importantly; it is never easy to manage your time independently while considering your specific qualifications. Therefore, many personal skills are required. Not to mention utilizing available resources to contribute to society at the same time, the individual's needs and the ability to adapt to current and future circumstances. Time management is very important and can actually affect an individual's overall performance and achievements. Students these days always say that they don't have enough time to complete all the assignments given to them. Additionally, the flexibility and freedom of the university environment can derail students without time management skills. Therefore, the purpose of this study is to find out the relationship between time management and students' academic performance.

**Keywords:** General time management, Academic achievement, Student, Knowledge, Performance

**1. Introduction**

Time is believed to be not definitively definite and products that can be used. This will help you plan your time to organize. Human resources and their functions can be controlled by the association it either improves over time or changes over time. However, this is a major resource that cannot be modified, controlled, or saved. The key to progress in life is time itself. Efficiently handle this asset that everyone has equally and pay for it gives due importance to planning through proper time management. Knowledge, information, and skills needed now Delegates further expand on the need for time management of the path to success. In public service leads through strong and powerful means productive work only possible through time management appropriate. Humble times make people feel better from the beginning. As a basic training to properly plan and monitor your time. Under developing nations where learners face many academic and administrative problems during scholarly struggle have dramatic stories for the analyst to uncover significantly more intriguing outcomes. Different researchers conducted studies in which they sought out effect of time management on academic achievements of students. In universities either related to regular or distance learning programs, properly schedule should be appropriately arranged, executed and controlled for better outcomes.[1] Focusing time also facilitates to maintain financially efficient instructive arrangements and policies. Considering this reality, specific accentuation has been paid in the competitive academic world to time tackling problems by assessing learners` mentalities and practices identified with time and its administration the primary achievement of distance and regular students is managing time effectively. Mismanagement troubles scholars Learner

## **VIDEO SEGMENTATION TECHNIQUE: A REVIEW**

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### **Abstract:**

A lot of storage space and sophisticated video processing techniques are needed these days due to the daily production and storing of more video data due to the advancements in multimedia technology. The method of video segmentation involves taking meaningful sections of the video and using those segments to create several types of video processing-based algorithms, such as those for surveillance, video retrieval, recommendation, and searching. Although there has been a lot of development in this field, academics are still working because of the unpredictable complexity of movies, which can be affected by object movement and camera movements. This paper addresses state-of-the-art methods for video segmentation and their applications because the field of study is still developing.

**Keywords:** Clustering, Motion Detection, Object tracking, Thresholding, Video Segmentation

### **Introduction**

Segmentation can be specified that it is a process of partitioning data into groups of potential subsets that share almost identical characteristics. It has become a technique for semantic content extraction and plays an essential role in pattern recognition, digital multimedia processing and computer vision.

### **Image Segmentation**

Image segmentation is an important but challenging problem. It is a necessary first step in image analysis. Because it is used in high-level image interpretation and understanding such as robot vision, object recognition, geographical imaging and medical imaging. In general, image segmentation is a process of partitioning an image into non-overlapped, consistent regions that are uniform with respect to some characteristics like intensity, color, tone or texture, and more. There are different techniques for image segmentation e.g. thresholding, clustering, classifications, artificial neural networks (ANNs), region growing, edge detection etc [1].

### **Clustering**

Clustering is defined as the classification of similar objects into different groups, or more accurately, the dividing of a data set into subsets (clusters), so that in each subset (ideally) the data share some common trait – often proximity according to some defined distance measure. Many schemes of clustering are categorized based on their special characteristic, such as the hard clustering scheme and the soft (fuzzy) clustering scheme. The conventional hard clustering scheme restricts each point of the