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It gives us immense pleasure to cordially invite you to participate in the Two days Inter-disciplinary national conference on **"Recent Trends in Mathematical Modeling, Simulation Methods, Computations, and Physical Sciences"** (**MMSCP-2021**) organized by Department of Physics & Electronics, Mathematics and Computer Science, Hislop College, Nagpur on 8th -9th September 2021

Aims and objectives

This conference intends to provide a common platform for scientists, academicians, industrialist and researchers about recent developments and advancements in the basic sciences. Our approach is to find out the possibilities of methods and tools applicable to characterize the real time problems to understand their properties and behavior, through the discussions which will be held in this conference based on mathematical modeling, simulations and computations and physical sciences.

Indeed, there is a need to conduct groundbreaking research on a number of fundamental and applied scientific approaches using breakthroughs in physics, computer-science, and mathematics in novel ways.

As new methods of building of manufacturing products are developed, mathematical formulas and Physical models may be applied to test the structure, characterization and functional soundness of the design. Computer aided analysis and design is becoming increasingly important in this type of use. This conference will provide an opportunity in exchange ideas and identify the priority areas of future research in advancements of technology to uplift the society and industry.

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Hislop College, Nagpur is not just an institution but a byword for excellence, a synonym for quality,
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CONTENTS

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Integration through Charity

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ABSTRACT

In mathematics, Differentiation is always easy than Integration. In real life also it is easy to break down the people into different classes but very difficult to unite those classes to form a better world for people. In this paper, the method which is used to make students understand the concept of Integration through Charity, has been discussed.

Key words: Integration, Charity, Mentor.

I. INTRODUCTION

Differentiation and Integration are two important concepts in Mathematics. Differentiation means to break down a function into different parts, but Integration means to unite those parts to form the original function. Every student knows the mathematical meaning of these concepts.

In this paper, the concept of Integration has been mainly focused and a method for the students of B.Sc. Semester I to understand the concept of Integration through Charity has been discussed.

While introducing the topic Integration to the students of B.Sc. Semester I, a method has been followed which helps students in understanding the concept of integration in real life. This method also inculcates the importance of Charity among the students.

II. METHOD

In this method, students of B.Sc. Semester I are asked to bring one rupee coin on the day when the concept of Integration is to be introduced in the classroom. Then the whole class is divided into different groups in such a manner so that each group contains at least one fast learner. Each fast learner is appointed as a mentor to his respective group.

Every student from a group hand over their one-rupee coin to their respective mentor. While collecting the coins, a mentor keeps the gesture of receiving by keeping both the palms joined together which represents that the mentor is taking the responsibilities of the peers (from his group) in solving any kind of doubts in the syllabus of mathematics.

Once all the mentors collect coins from their peers, they hand over the coins to the teachers. While taking the coins from the mentors, teacher also keeps

the gesture of receiving by keeping both the palms joined together which represents that now the teacher is taking the responsibilities of the mentors in helping with the doubts which were asked to the mentors by their peers which mentors are unable to answer.

In all this process, peers get connected to the mentors and the mentors get connected to the teachers and this way whole class gets connected with the teachers. The coins that were given to the teachers are kept in a box with the same amount from teachers too and they are used in the following way in the class every day until the integration topic is complete.

During the classes on Integration, everyday a question from Integration is asked by the teachers and those who answers correct are given Five/Ten one-rupee coins as a reward. This process helps in developing the sense of earning among the students. Once the Integration topic is over, the remaining coins are given to the neediest people in the surrounding. The selection of such people is done by the representatives of whole class. This process develops a sense of care and humanity among the students and connects whole class to the neighboring society.

The students who earned the coins by giving correct answers in the class collect their coins and give it to the neediest student in the class. This process helps to develop the sense of Charity among the students.

III. RESULTS AND DISCUSSION

This method helps students to:

1. Understand the concept of Integration in real life.
2. Learn to accept the responsibilities.
3. Develop the sense of earning, humanity and charity in them.

IV. CONCLUSIONS

Knowing the meaning of Integration is not enough. Its application in real life is to be understood as well. The method used in this paper not only make students to have strong hold on integration but also understand its importance in day-to-day life. A sense of earning, humanity and charity also develops within the students which help them to create a better future and better world for all of us.

V. ACKNOWLEDGMENT

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An Analytical Study of Security and Privacy Issues of Big Data

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ABSTRACT

Due to the reasons such as the rapid growth and spread of network services, mobile devices, and online users on the Internet leading to a remarkable increase in the amount of data. Almost every industry is trying to cope with this huge data. Big data phenomenon has begun to gain importance. However, it is not only very difficult to store big data and analyze them with traditional applications, but also it has challenging privacy and security problems. For this reason, this paper discusses the big data, its ecosystem, concerns on big data and presents comparative view of big data privacy and security approaches in literature in terms of infrastructure, application, and data. By grouping these applications an overall perspective of security and privacy issues in big data is suggested.

Keywords :— Big Data, Cloud Security, Monitoring, Auditing, Key Management, Anonymization

I. INTRODUCTION

Data generation and collection quickly surpass the bounds in the digital universe of today. The data has been doubling every 2 years since 2011 [1]. It is predicted that the data will increase 300 times, from 130 exabytes in 2005 to 40,000 exabytes in 2020 [2]. As a result of this technological revolution, the big data is becoming increasingly an important issue in the sciences, governments, and enterprises. Big Data is a data set, which is difficult to capture, store, filter, share, analyse and visualize on it with current technologies [3]. Despite such difficulties, if big data is cope up, it helps to generate revenue, executive efficiency, strategic decisions, better services, defining needs, identifying new trends, and developing new products, all of which is covered in the data science [3].

In addition, data science focus on parallel and distributed processing, similarity search, graph analysis, clustering, stream processing, search ranking, association analysis, dimensionality reduction and machine learning algorithms etc. [4]. However, in this complex computation environment, traditional security and privacy mechanisms are insufficient to analyse big data. These challenges in big data consist of computation in distributed and non-relational environments, cryptography algorithms, data provenance, validation and filtering, secure data storage, granular access control, and real time monitoring [5].

By classifying the sources of problems, results become more efficient with big data. This research paper focus, classify and analyses security and privacy breaches and solutions in big data. This perspective would lead to an understanding of important research

areas and the development of new methods. In addition, the use of big data in analysis would make the systems become safer. It also represents a brief summary of big data. Also contains categorization of big data, concerning security and privacy studies in literature. The results obtained with security and privacy issues in big data are discussed here, and explains how to use big data to maintain security.

II. DEFINITION AND CHARACTERISTICS OF BIG DATA

Big data refers to large and complex datasets that typical software is inadequate for managing [2]. There are various explanations of big data via Vs. 5Vs are typically used to characterize of Big Data as volume, velocity, variety, veracity and value as shown in Fig. 1 [3]. Volume is the size of data; velocity is the high speed of data; variety indicates heterogeneous data types and sources; veracity describes consistency and trust worthy of data; and value provides outputs for gains from large data sets.

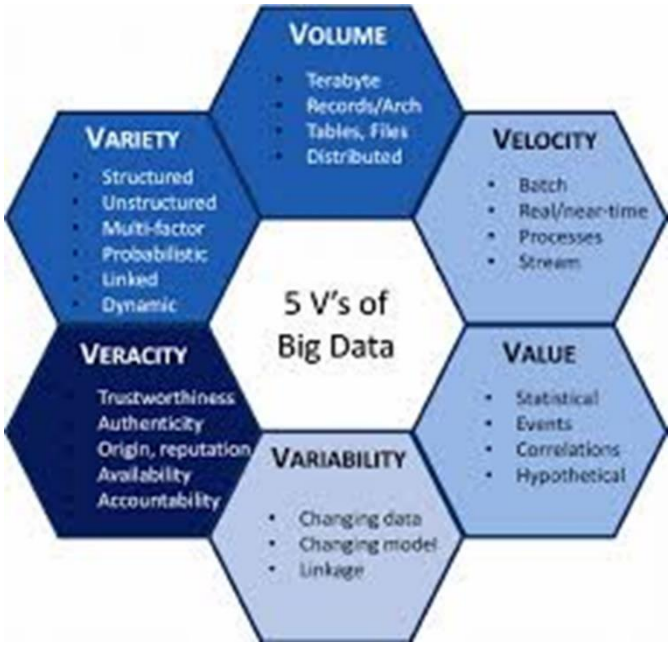

Fig. 1: 5 V's of Big Data

Big data is classified into ten categories in terms of data type, data format, data source, data consumer, data usage, data analysis, data store, data frequency, data processing propose, and data processing method as shown in

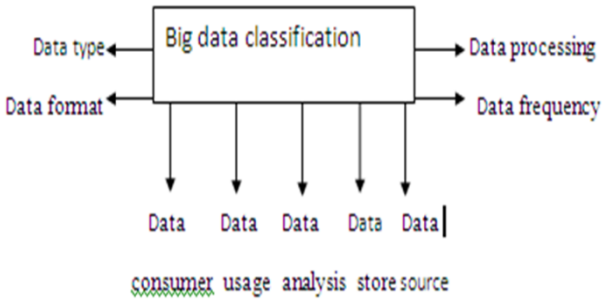

Fig 2: Big Data Classification

III. BIG DATA SECURITY AND PRIVACY APPROACHES

A. Cloud Security:

The widespread use of cloud computing for such reasons as broad network access, on-demand service, resource pooling and being elastic have made a proper environment for big data [6]. However, cloud hosts traditional threats and new attacks. Data storage on clouds is one of the main problems now a day. Therefore, some precautions must be taken by the service provider. Because of this, a secure way to handle and share big data on cloud platform has been presented [10].

It includes many security methods like authentication, encryption, decryption, and compression etc. to store big data securely. Authentication with email and password has been used for the authorized person. Data has been encrypted and compressed to prevent security issues. It also takes precautions in case of a natural disaster and uses three backup servers for this purpose. In these servers, data has been stored in an encrypted format. If something happens to the server, encrypted data has been decrypted with the secret key.

The classical encrypted technique is not enough for big data security on cloud. Consequently, new scheme to secure big data storage has been proposed [11]. This scheme uses cryptographic virtual mapping to create data path. According to the proposed scheme, big data

has been separated into many parts and each part is located in different storage providers. As a security measure, if all data encryptions are thought to be quite computational and useless, only storage path which shows critical information encryption seems enough, rather than all big data encrypts. The proposed scheme also supports some information encryption to increase the security level. To achieve availability, the scheme holds multiple copies of each part and their accessing index. Thus, if any data part is lost for some reason, information availability is successfully maintained.

B. Monitoring and Auditing:

Security monitoring is gathering and investigating network events to catch the intrusions. Security audit is a systematic measurable security policy to use different methods. These two elements play an important role in active security.

Intrusion detection and prevention procedures on the whole network traffic is quite difficult. To solve this problem, a security monitoring architecture has been developed via analyzing DNS traffic, IP flow records, and HTTP traffic and honey pot data [11]. The proposed solution includes storing and processing data in distributed sources through data correlation schemes. At this stage, three likelihood metrics have been calculated to identify whether domain name, packet or flow is malicious. According to the score obtained through this calculation, an alert occurs in detection system or process terminates by prevention system. According to performance analysis, open source big data platform on electronic payment activities of a company data, Spark and Shark produce fast and steady results than Hive and Pig. Network security systems for big data should be find abnormalities quickly and identify correct alerts from heterogeneous data. Therefore, a big data security event monitoring system model has been proposed which consists of four modules: data collection, integration, analysis, and interpretation [10]. Data collection includes security and network devices logs and event information. Data integration process is performed by data filtering and classifying. In data analysis module, correlations and association rules are determined to catch events. Finally, data interpretation provides visual and statistical outputs to knowledge database that makes decisions predict network behavior and respond events.

C. Key Management:

Key generating and sharing between servers and users is another big data security issue. However, using big data centers, quick and dynamic authentication protocols can be suggested.

In [1], a layered model has been proposed for quantum cryptography for strong keys in less complexity and Pair Hand protocol for authentication in mobile or fixed data centers. The model consists of these layers: front end, data reading, quantum key processing, quantum key management and application layers, respectively. This model has been not only increased efficiency but also reduced key search operations and passive attacks.

The big data services consist of multiple groups that need group key transfer protocols for secure communications. For this reason, novel protocol without an online key generation centre based on Diffie-Hellman key agreement and linear secret sharing scheme unlike existing protocols has been offered [5]. The protocol counter attacks via ensured key freshness, key authentication and key confidentiality reducing system overhead.

In more complex systems, conditional proxy re-encryption (CPRE) is used for secure group data sharing. Accordingly, an outsourcing CPRE scheme has been proposed in cloud environment which reduces overhead without downloading all data from the cloud, encrypting them and uploading them to the cloud in a new condition unlike CPRE [6]. When a group membership has been changed, key generation and decryption processes execute on outsourcing server and a condition value changing key has been calculated. Then it is sent to the cloud.

After that, the cloud storage uses this key to transform existing data.

D. Anonymization:

Data harvesting for analytics causes big privacy concerns. Protecting personally identifiable information (PII) is increasingly difficult because the data are shared too quickly. To eliminate privacy concerns, the agreement between the company and the individual must be determined by policies. Personal data must be anonymized (de-identified) and transferred into secure channels [7]. However, the identity of the person can be uncovered depending on the algorithms and the artificial intelligence analysis of company. The predictions made by this analysis can lead to unethical issues. In [4], PII has been removed from Intel Circuit web portal usage logs to protect users' privacy. The proposed architecture makes anonymization of sensitive fields in log data with AES symmetric key encryption and stores it in HDFS for analysis. When de-anonymization is needed, the logs are moved back and the masking areas are decrypted with the same key. Lastly, the quality of anonymization is measured by k-anonymity based metrics. With the increase of individual and organizational privacy concerns, Privacy Preserving Data Mining (PPDM) has begun to gain tremendous importance. However, these techniques affect the success of applications. To provide privacy protection, an Adaptive Utility based Anonymization (AUA) has been proposed, which depends on association mining [2]. Both native and masked data set has been tested.

IV. SECURITY AND PRIVACY IN BIG DATA

Seeking new ways to take advantage of big data, organizations need secure mechanisms and regulations to guarantee their systems. It is thought that the traditional techniques are ineffective in big data security and privacy issues. Nevertheless, open source or new technologies (if they are not well understood) also host unknown back doors and default credentials [4]. Therefore, confidentiality, integrity and availability of information must be carefully considered.

A. Security:

Diversity of data sources, data formats, streaming of data and infrastructures may cause unique security vulnerabilities. The Cloud Security Alliance has divided security and privacy challenges in big data into four categories; infrastructure security, data privacy, data management, integrity, and reactive security [5]. Infrastructure security consists of secure distributed programming and security practices in non-relational data stores. Data privacy refers to privacy preserving analytics, encrypted data centre and granular access control. Data management involves secure data storage and transaction logs, auditing and data provenance. In addition, integrity and reactive security include validation, filtering and real time monitoring. On the basis of these proposed issues, authorization and authentication mechanisms must be constituted for both users and applications, and encryption and data masking must be implemented for both data rest and stream.

B. Privacy:

The development of systems and applications has led to the sources such as databases of big companies, internet and telecommunication under cover of protecting US citizens [2]. Many big data projects like this indicate the violation of people's privacy. The increasing privacy's concern in big data include knowing new and secret facts about people, combining their personal information with other data sets, adding value to their organizations with collected data from unaware people, treating illiterate people by predictive analysis of social media, tagging discriminated people by law enforcement, conflicting laws in different countries, lastly exchanging datasets between organizations [2]. To cope with such complex issues, laws and regulations must be enforced with clear-cut boundaries in terms of unauthorized

access, data sharing, misuse, and reproduction of personal information termination of the individual control about collection and usage of PII. According to the latest news, National Security Agency (NSA) eaves dropped personal data from heterogeneous data

V. BIG DATA ANALYTICS FOR SECURITY

Big data analytics aims to obtain beneficial information from large scale and complicated data [3]. The increase of stored or streamed data and development of analysis systems has led to using these activities in information security. The anomaly detection, intrusion detection, fraud detection, advanced persistent threats (APT) detection, and forensics from big data has been accomplished by examining the logs, system events, network traffic, website traffic, security information and event management (SIEM) alerts, cyber attack patterns, business processes and other information sources. To detect these attacks, large volume and variety of data is accumulating and associate with network history. The advantageous uses of big data, such as performing without deletion of logs after a certain period, running complex queries on large and unstructured datasets, and facilitating human-computer interactions via visual interfaces, for security is becoming quicker and cheaper than traditional methods [11].

There is no need to delete the cancelled accounts or old logs as they can be used for the purpose of forensics later. In addition, real time and agile decision support applications, automatic defense and risk reduction systems, prediction of attack, determining of zero-day attack duration and tracking of attackers can be developed by analyzing suspicious and malicious patterns from information security data [10].

VI. ANALYSIS

Table 1.: Analysis of Cloud Security Approach and Techniques for Challenges

Cloud Security challenges	Cloud Security approach	Cloud Security techniques
Physical security	1. Data location 2.Server storage 3.Network	1.CCTV 2.Security guards 3.Protective barriers
Organisational	1.Resource planning 2.Organisational change management	1.Software 2.Platform 3.Infrastructure as a service via a cloud
Data security	1.Identify access management 2.Availability and backup 3.Data privacy and security	1.Authentication with email and password
Technological	1.Application development 2.Portability 3.Lack of interoperability standards	1.Store 1. 2.Filter 2. 3.Share 3. 4.Analyse 4. 5.Virtualise
Auditing	1.Legal challenges 2.Business continuity 3.Disaster recovery	1.DNS traffic 2.IP flow records 3.HTTP traffic

VII. CONCLUSION

Big data needs extra requirements for security and privacy in data gathering, storing, analyzing, and transferring. In this paper, we examined studies on big data security and privacy, comparatively. According to the literature, network traffic should be encrypted with suitable standards; access to devices

should be checked; employees should be authorized to access systems; analysis should be done on anonymised data; communication should be made for the secure channel to prevent leakage, and network should be monitored for threats.

Big data privacy, safety and security are the biggest issues to be discussed more in the future, so new techniques, technologies and solutions need to be developed in terms of human-computer interactions or existing technologies should be improved for accurate results. It is hoped that this study would help understand the big data and its ecosystem better and develop better systems, tools, structures and solutions not only for today but also for the future.

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Application of Microcontroller: Biomedical Waste Management System with Sensors

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ABSTRACT

In India, the collection of medical waste is becoming an issue. Unwanted dumping of waste on the outskirts of towns and cities creates inconvenience and these overflowing landfills are impossible to manage. Hospitals brings about huge amount of likely hazardous wastes. Most of the waste separations at present are done by junk dealers. Currently, the separation of harmful hospital wastes and containers containing disposed of pus, needles, glucose drip bottles, plastic papers, and bandages are segregated by hand thereby leading to adverse lifelong health effects like tuberculosis, cancer, and infections. This may lead to a decreased standard of living, decreased longevity, and also after-effects to a generation of children born to such affected parents. Developing a mechanized system to save the lives of many people and making the world a cleaner and greener place is the noble objective of the proposed system. For self-acting segregation process of the biomedical waste that is generated in the hospital, a self-regulating waste segregator is suggested. An automated waste segregator at the hospital and medical clinic can be used employing sensors like proximity sensor, moisture sensor, gas sensor, an ultrasonic sensor used to detect and segregator the types of waste. On noting of medical waste, the motor for conveyor belt is switched on. The waste will be passed to the sensing unit and the Classifier unit. This is implemented with five steps capturing an input image, pre-processing, Median filtering, contrast enhancement, and segmentation. After the segregation process, it will be dumped into the respective waste bin. Medical waste segregation is done automatically to avoid diseases that spreading in hospitals and to reduce the manual process. The advantages of the garbage separation system are to improve the results in better minimize raw materials wastage and reduce manufacturing costs. These benefits are also categorized as to improved garbage management system. Prime Minister Modi's mission of Swachh Bharat Abhiyan can also be successfully implemented by using this proposed system.

Keywords: Biomedical, Waste Management, AC-DC Motor, Microcontroller, Sensors, waste.

I. INTRODUCTION

Hospital waste transport and waste handling is a time-consuming, hazardous and infectious process as the staff is exposed to be in contact with medical and biohazardous waste. The value of the waste generated isn't realized unless it's recycled completely. Several advancements in technology have also allowed the waste to be processed into useful units like Waste to Energy, where the waste is often wont to generate

synthetic gas (syngas) made from carbon monoxide gas and hydrogen. The gas is then burnt to supply electricity and steam; Waste to Fuel, where the waste is often utilized to get bio-fuels. The biomedical waste collected from the hospital should not be stored for 24 hours. For this purpose, we need to ensure regular and safe disposal of waste to help the hospital maintain a clean environment for the patients, staff, and visitors. This is done by conveyer belt transport of trash from the smart bins in which RTOS methodology is implemented. This project consists of a smart bin for the collection of trash and a conveyer belt for the disposal of trash. The bin described here uses an Infrared Sensors fitted on the upper edge of a dustbin and are interfaced with an Arduino microcontroller. The IR sensors are used for waste level detection in a bin. At the point when the dustbin fills up, it sends the signal to the Arduino-based conveyer belt and the process of segregation starts. When the waste is divided into wet, dry, and metallic, it provides a higher potential of recovery and is consequently recycled and reused. The wet waste fraction is usually converted either into compost or methane gas or both. Compost can replace the demand for chemical fertilizers, and biogas is often used as a source of energy. Although there is large-scale industrial waste segregation present, it's always far better to segregate the waste at the source itself. The advantages of doing so are that a better quality of the composition is reserve for recycling which indicates that more value might be retrieve from the waste. The danger for junk dealers is reduced. Also, the segregated waste might be directly sent to the recycling and processing plant rather than sending it to the segregation plant to then to a processing plant.

II. RELATED WORK

The main concept of smart waste management is to handle all the waste in the hospital and monitoring all the processes. A smart waste bin consists of a smart sensor, smart communication, and sensing units. The smart bin is composed of sensor nodes mounted on it for data collection and transmission. The sensors are placed into two different paths. The first path is the level sensor to monitoring the level of waste-bin. The other path is a smart load cell sensor to calculate the weight of waste. The system can collect accurate data in real-time which can be used further as an input to a management system. With load cell calibration approach, simplifies the calibration process so it can be attached to commonly used waste-bin without change or modification. Also, there is a buzzer and some LED for the display of levels of dust in the bin. Three LEDs indicate three different levels of the height of the waste in the bin. The green one indicates that the bin is empty and the red one indicates the bin is full. When the bin is full the buzzer that is equipped, beeps three times so that no more waste is disposed into the bin. In this way, the overflowing bins can be controlled. Once the bin is full, then it sends a signal to the microcontroller which in turn initiates the Automatic Waste Segregation (AWS) process and actuates the conveyer belt.

An automatic waste segregator is meant to distinguish the waste into three main categories namely; metallic, organic, and plastic, thereby making waste management easy. The AWS uses an inductive proximity sensor mechanism to spot metallic items and resistive sensors to differentiate between wet and dry waste. Here, we use a conveyer belt, ultrasonic sensor, image processing, human-machine interface. The conveyer belt segregator differentiates the waste into two types as degradable and nondegradable waste by using the ultrasonic sensor. The foremost important equipment is image processing, obtained by the camera which captures the image of waste and then the image processing will compare it with the predetermined pictures. Thus, directing the wastes to

their respective waste collector bins. This mechanism will help us eliminate the wastes separately and thus even distinguish the recyclable and non-recyclable waste. An efficient alert system is developed for garbage clearance by giving a warning to the hospital management system for fast cleaning of the dustbin with proper verification.

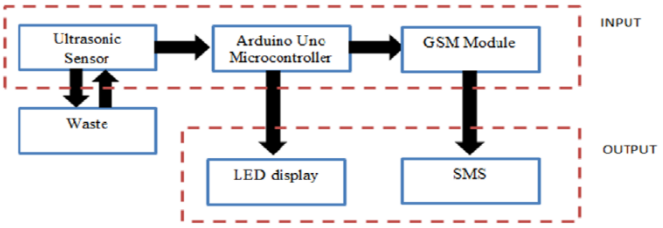
III. PROPOSED WORK

Segregations Process

In this proposed system we are implementing sensor-based waste detection. The Concept is to make a garbage segregator which can identify the type of waste and put them in bins accordingly and automatically. Implementing our project at the hospital or medical level will reduce the expenditure on waste disposal, manual effort.

When the waste enters the conveyer belt motor activates and therefore the conveyer belt starts moving. The microcontroller, motors, and all the sensors are switched on. The waste is sensed by the inductive proximity sensor to detect if it's a metal or no. If the waste is metal waste then the conveyer belt is turned off and the motor for running metal is turned on and therefore the waste is pushed into the metal waste bin. Also, counter 1 is incremented (keeps a count of the variety of metal is kept on when it comes in touch with the moisture wastes dumped). If not a metallic waste, the conveyor sensor decides whether the waste may be wet waste or dry waste by monitoring the moisture content of the waste. If the waste has some humidity it's detected as wet waste and therefore the conveyer belt is switched off and the motor for controlling wet waste is switched on and the waste is pushed into the wet waste bin. Also, counter 2 is incremented. If it's not a wet waste the conveyer belt is kept on then the waste is dropped into the dry waste bin placed at the top of the conveyer belt. Thus, segregation process is completed.

Waist Collector Bin



The block diagram of waste collection and the disposable system is shown in Fig.1 consists of two modules. Sensing and Classifier Unit and Disposal Unit. The sensing unit and Classifier unit are implemented with five steps capturing the input image, pre-processing, Median filtering, contrast enhancement, and segmentation. The categories considered here are cotton, bottles, syringe, papers, and others. The classification of waste is based on features extracted from Gray Level Co-occurrence Matrix (GLCM) algorithm. After the segregation process, it will be automated to the Disposal Unit consisting of Arduino, relay, buzzer, GSM, UART, and motors. The waste bin is monitored by an IR sensor, a Water sensor, a gas sensor, and an ultrasonic sensor to identify the status. Medical waste segregation is done automatically to avoid diseases that spreading in hospitals and to reduce the manual process.

The algorithm of this proposed system is given through a sequence of steps

Step 1 : The input image captured by the camera

Step 2 : The sensing and Classifier unit processes the image and classifies the waste.

Step 3 : The waste is detected by the system.

Step 4 : If the system detected the waste like plastic, motor 1 will run and it falls to its respective bin.

Step 5 : If the system detected the waste as cotton, motor 2 will run and it falls to its respective bin.

Step 6 : If the system detects waste other than plastic and cotton, motor 3 will run and it falls to its respective bin.

Step 7 : After the detection process the system will be stopped.

IV. CONCLUSION

Implementation of this technique at an area level like Hospitals can reduce the burden on the local authorities. The automated waste segregator is an efficient and economic waste collection system with a minimum amount of human intervention and also causes no hazard to human life. Employing a conveyer belt makes the system much more accurate, cost-effective, and also easier to put in and use at a domestic level. Segregating these wastes at a domestic level also will be time-saving. While implementing our system we found many problems just like the sensing range of the inductive proximity sensor, the accuracy of the moisture sensor, adjusting the range of IR sensors, and a few more, but using some modifications we tried the make the system as reliable as possible but not completely perfect.

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Development of Virtual Experiment on Digital Modulation Using Virtual Intelligent SoftLab

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ABSTRACT

The scope of this paper includes development and implementation of virtual lab for Digital Modulation. The study of Digital Modulation is important in Electronics, Computer Science and Engineering Streams. The Digital Modulation experiment can be easily performed using the concept of virtual Intelligent SoftLab (VIS) model. The virtual experiment described here will help students to perform it anytime and anywhere 24x7. The screen shows the Characteristics of Digital Modulation and generates the related outputs for the given inputs. There is a facility for change of Input values using virtual instruments and observed the outputs with virtual Instrument. In this paper we check the characteristics of Pulse-Amplitude Modulation (PAM), Pulse-Width Modulation (PWM) and Pulse- Position Modulation (PPM) using virtual instruments. The effect of Digital Modulation is visible on the screen.

Keywords: SoftLab, Digital Modulation, PAM, PPM, PWM, Virtual Lab etc.

I. INTRODUCTION

The concept of VIS (Virtual Intelligent SoftLab) Model is an experiment is to provide a virtual platform for all learners to perform the experiment with the virtual platform with the software. The effort is towards the working procedure in a traditional laboratory and its environment in the virtual workbench. Virtual experiments are designed and organized in such a manner as to give a real feel of performing the real experiment. During the experiment, the learner and the teacher can save and edit the desired data for his/her analysis. Apart from these the focus is also aims to implant a maximum number of learning components in virtual experiments. Virtualizations of experiments could be largely classified, based on the form data used for performing the experiment. The Soft Lab idea facilitates us to link the physical laboratory experiment with its theoretical simulation model within an integrated and interactive environment. The goal for each instance of a SoftLab laboratory is to create a software environment where experimental research, simulation and education with each other. As a part of the SoftLab project, we have explained the various issues involved in the design, development and execution of SoftLab model for Electronics, Computer science and engineering learners. This model describes how the SoftLab philosophy was used to design and executed. The VIS

Model addresses us to challenge of solving the experiments using virtual platform. Such systems require a wide range of expertise plus a flexible and different array of equipment. The SoftLab framework VIS Model provides the infrastructure and facilities that provide the needs for basic research.

SoftLab is such a flexible laboratory work on every environment. Its goal is to simulate a laboratory space having a well-equipped virtual environment with all instruments and a variety of materials. Using SoftLab a student may be guided by an instructor to perform a virtual experiment, or the student might also consider of one on his own platform. The computer screen is the laboratory room for learner to perform their experiments. The experimental possibilities open to the student certainly are limited by the ability of the developers to maximize flexibility in a practicable way [1].

II. EXPERIMENTS ON DIGITAL MODULATION

Pulse Modulation is widely used in digital communication. In this type of modulation, the information to be transmitted is converted into pulses of various sizes and shapes and then transmitted to appropriate stations. The process of converting data into pulses can be carried out in a variety of ways. Three of the most common types of modulation are discussed here [3].

A. Pulse-amplitude modulation

In Pulse Amplitude Modulation (PAM), the data control is based on the height of the pulse. In PAM is the successive sample values of the analog signal are used to change the amplitudes of a corresponding sequence of pulses for constant duration occurring at the sampling rate [4]. The screen shot for studying the Pulse-Amplitude Modulation is shown in fig 1.

B. Pulse-width modulation

Pulse-Width Modulation (PWM), also known as Pulse Duration Modulation (PDM), is a digital modulation technique. The width of a pulse carrier is made to vary in accordance with the modulation voltage. The leading edge of the carrier pulse remains fixed and the occurrence of the trailing edge of the pulse varies. In Pulse Width Modulation (PWM), the pulse width is proportional to the data value. In PWM the pulses representing successive sample values have constant amplitudes but vary in time duration in direct proportion to the sample value. The pulse duration can be changed comparative to fix leading or trailing time edges or a fixed pulse center. In the time-division multiplexing, the maximum pulse duration may be limited to a fraction of the time between different samples. The experimental Pulse-width-modulation is shown in fig 1.

C. Pulse-position modulation

In Pulse Position Modulation (PPM), is the process in which the position of the pulse with respect to a reference pulse is proportional to the data value? PPM encodes the sample values by varying the position of a pulse of constant duration relative to its nominal time of occurrence. The experimental Pulse-Modulation results are shown in fig 1.

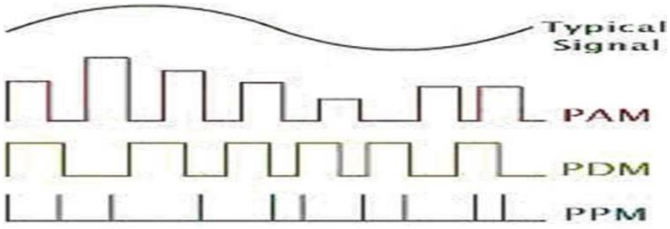


Fig 1: Pulse Modulation Results

III. TOOLS AND TECHNOLOGY

Visual Basic is an event-driven programming language and integrated development environment given by Microsoft for its COM programming model. VB is also considered as relatively easy to learn same as other programming languages because of its special graphical features. Visual Basic was derived from BASIC and enables use of graphics user interface, access to database and creation of ActiveX controls

and objects. A programmer can put together the component provided with Visual Basic itself to develop an application. This language not only allows programmers to create simple GUI applications, but can also develop complex applications for learners. Programming in VB is a combination of visually arranging Component or control on a form, specifying attributes and actions of those components. Visual Basic can create executables (EXE files), ActiveX control or DLL files, but it is primarily used to develop Windows applications. The beauty of this model is that it does not require the Database to manage data [4].

IV. VIS MODEL

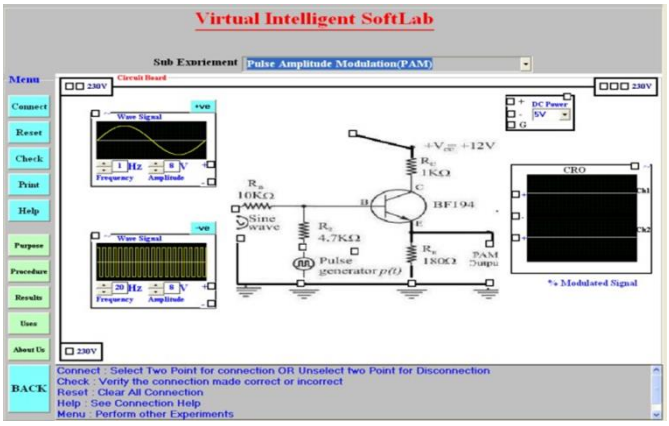
We have constructed the programs in Visual Basic such that all the blocks in the model can be fully visualized on the screen. This model can demonstrate the activities of digital modulation for learners. Inputs accepted throw software and virtual output will observe on the screen. In an experiment we can provide different input values and observe desire outputs. This model provides circuit connection facility to user to made connection properly, check circuit diagrams otherwise the result not generated.

A. Design Specification

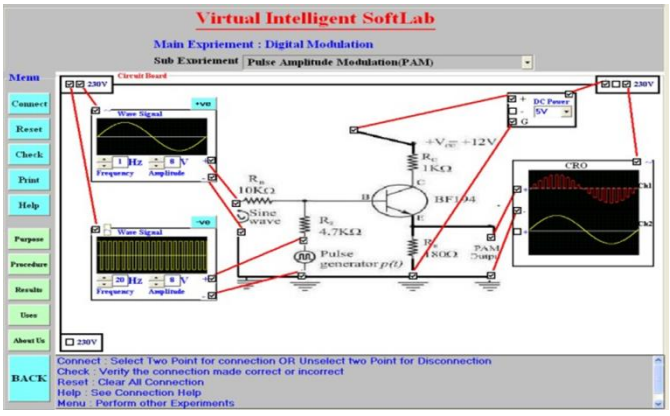
A program is constructed for conduct of pulse modulation experiment in VIS such that all the blocks in the VIS model can be fully visualized on the screen. This model also can demonstrate the activities of Pulse Amplitude Modulation including circuit connection visually. Inputs are accepted through virtual carrier signal generator and modulating signal generator generates Modulated virtual output which is observable on screen. In this experiment, we can provide different amplitude and frequency values for modulating signal and observe modulated signal on the screen. This model provides circuit connection facility to user so that the user can practice circuit connection also. The screen shot for studying the Pulse-Amplitude Modulation, Pulse-Width Modulation and Pulse-Position Modulation is shown in fig 2.

Procedure:

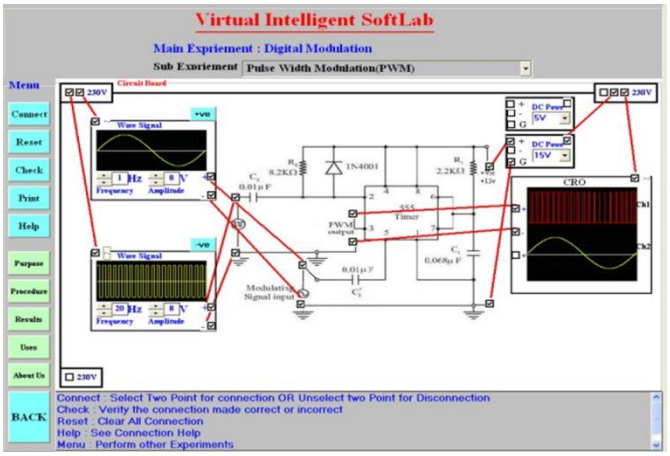
1. Connect the circuit as shown in the fig 2.
2. Set the sine wave generator frequency and amplitude.
3. Change the Amplitude, frequency and observe the resultant waveforms.



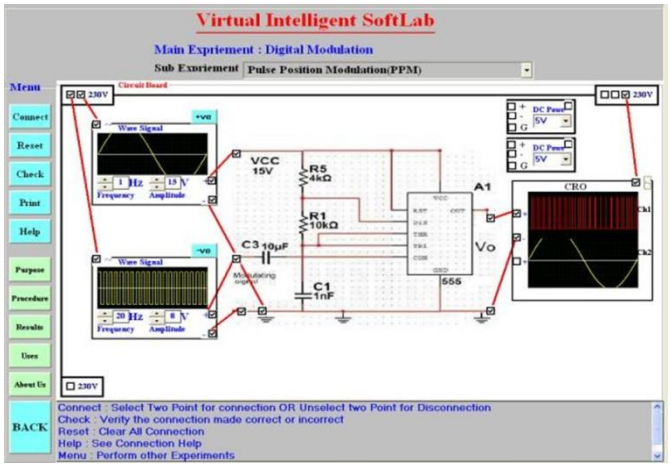
Before Connection



Pulse Amplitude Modulation (PAM)



Pulse Width Modulation (PWM)



Pulse Position Modulation (PPM)

Fig 2: VIS Experiment on Digital Modulation

B. Implementations

Once the VIS is ready then we implement the circuits using then following steps. The Circuit Connection Steps are

- Connect AC socket to DC Converter device
- Connect DC power supply to IC VCC pin
- Connect Ground Socket to IC Ground Pin
- Connect Output IC pin to Output switches
- Connect Input IC pin to Input switches

Experiment Implementation Steps are

- Made connection to selection two switches using mouse
- Click on Check Button to verify the connection
- Click on Reset Button if the connection are WRONG
- Click on Help Button if you need Connection HELP
- Click on Menu Button if you want to perform other Experiments

V. RESULT

Virtual outputs are totally animated with the combination of software and observed actual outputs virtually.

VI. CONCLUSIONS

SoftLab will help the faculty of Electronics, Computer Science and Engineering students to perform and practice experiments to improve their understanding of the subject. The design and implementation of the VIS model is more effective and realistic as necessary variable inputs and outputs are visible on the monitor screen. This model created for the client based system, can be converted into a client - server based application system. This virtual experiment provides practice for students for the "touch & feel‟ part they have already performed in the laboratory.

VII. ACKNOWLEDGEMENT

We are very much thankful to Dr. P. K. Butey, Dr. P. B. Dahikar and Dr. D. A. Deshpande for his valuable inputs, constant guidance and his extensive support an encouragement for this work. We also thanks for his kind support.

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Ear: An Overview on Essence of Analytics & R Programming

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ABSTRACT

R, an open-source programming language and much in use due to it simplicity. R is extremely well known language that are used by many organizations' to en-vision and analyse information. Data-analysis is path toward investigating the piece of measurements information for learning purposes. Libraries/Packages are rolling significant part in R-programming. It has constitute set of different measurable algos and ML ideas which empower user to make reproducible research and make enlightening products.

Keywords : Data Analytics, R, R-Libraries, R-Scope, Big-Data

I. INTRODUCTION

A re-designated version of S-tool, was made by Ross-Ihaka and Robert-Gentleman at the Bell Labs Auckland University, New-Zealand. R thus get name using credit of initial of two authors .S was made by John Chambers. It is at present evolved by the R core group of development, in which John Chambers act as member-part. The project was consider in the year-1992, where the initial variant released in 1995 and the beta variant in 2000. In my paper there are six section. The various sections are in following way:

- Section1- About R, its Advantages and Disadvantages
- Section2- Environment
- Section3- Libraries
- Section4-Comparisons of R with other languages
- Section5- Scope of R
- Section6-Conclusion
- Section7- References used.

II. R

A free-open source which utilizes IDE as R-Studio.
Features:

- Easy-to-learn and most powerful data-analytic programming language.
- Create the unique & beautiful data visualizations.
- Compiles code & runs on Unix-platforms & similar platforms like Window's & Mac-OS.
- Uses Console where scripts get in implementation stage.

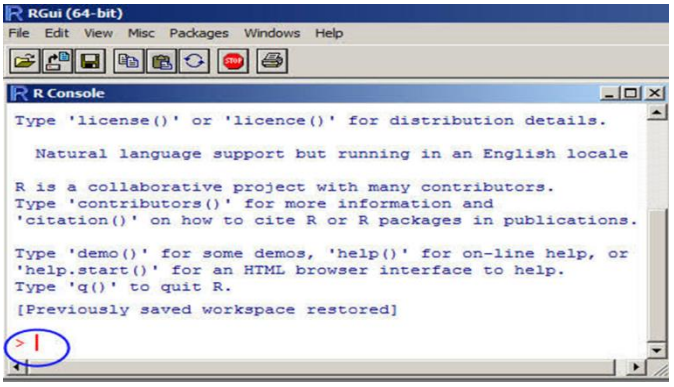


Fig 1.R-GUI

III. ADVANTAGES

- Available for anyone to use.
- Does not have any license-restrictions, hence can be run at any of software platform.
- Import tools from various unique software's.
- Around 4800 packages are available from multiple repositories.
- Active user-groups where queries is answered in a short-span of time.
- It produces visuals in pdf, png, jpg and svg formats.

IV. DISADVANTAGES

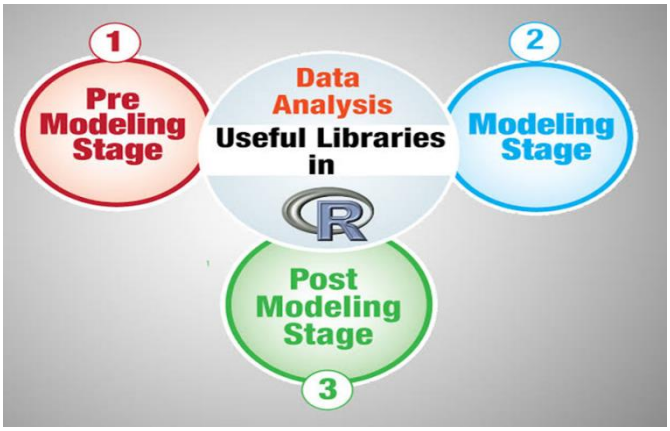
- Very less visuals on memory management. Almost utilizes full of disk space.
- Best suited for people with data-oriented problems only.
- Cannot be used as back-end server for computations.
- Less-Secure.

V. AS AN ENVIRONMENT

R- Environment is suited for computing statistical data & Computer Visual-graphics. A set of software facilities having Manipulative data, computation of data & data-in visual-graphical format.
An environment of R is area where we can ware objects, variables, functions.

- **Basics:** It includes essential properties of an environment where we can establish our own current circumstance.
- **Names-Values Binding:** It depicts the principles that names ought to follow just as shows a few minor departures from restricting a name-value.
- **Explicit-Environment:** Conditions have reference semantics due to this, they are likewise helpful information structures by their own doing.

VI. LIBRARIES



A) Pre-Modeling Stage:

- ggplot2: model to make exquisite Data Visualizations Using the Grammar of Graphics. In vision of ''The Grammar of Graphics'' as per our information 'ggplot2' map factors to feel and it deals with the subtleties.
- RRF: RRF means "Regularized Random Forest". This library depends on Random Forest bundle which is utilized for Feature- determination.
- Plyr: models data change to perform a few tasks like information Split-ting, Applying and consolidating of information.

B) Modeling Stage:

- Car: package used in Continuous-Regression, as companion to Applied-Regression.
- Carat: utilized for grouping and Regression-training.
- Forecast: Functions are utilized for Time Series and Linear-Models.

C) Post-Modeling Stage:

- Comparison: utilized for computing and assessing proportions from multivariate ceaseless perceptions.
- ACD: utilized for Categorical-information investigation with complete or in-missing reactions.
- PROC: utilized to envision & break down ROC bends in R & S+. Also used to think about recipient working trademark.

D) Other Libraries:

RCPP: Assists with further developing execution. It gives consistent incorporation in the mid-of R & C++ by offering R works just like C++ classes.

VII. COMPARISON WITH OTHER LANGUAGES

R Programming	Python	Java
•It was stably released in 2014.	•It was stably released in 1996.	•It was stably released in 1995.
•It has more functions and packages.	•It has less functions and packages.	•It has large number of inbuilt functions and packages.
•It is an interpreter base language	•It is an interpreter base language	•It is interpreter and compiled based language.
•It is statistical design and graphics programming language.	•It is general purpose language.	•It is general purpose programming language designed for web applications .
•It is difficult to learn and understand.	•It is easy to understand.	•It is easy to learn and understand.

Fig2: R Comparison with other languages

VIII. SCOPE OF R WITH LIST OF ATTRIBUTES

1. **Cost/Availability:** Being R as an open-source tool, it can be freely downloaded anywhere.
2. **Ease-of-learning:** R has quite a ease of learning curve. Codes can be implemented with ease of structure /syntax which facilitate easy learning in users.
3. **Data Handling:** R has power to compute everything and has good data-handling capabilities & options for parallel -computations.
4. **Graphical tendencies:** possess advanced graphical tendency when it is in considerate purely to statistical-tools. Large amount of packages are available to facilitate advanced graphical-capabilities.

IX. BIG DATA-ANALYTICS

Huge information includes the right portrayal and capacity of huge volumes of information in organized and unstructured structure on a solitary Personal Computer. This information helps in maintaining the everyday business activity. It holds the tremendous measure of information as well as keeps the associations' information unblemished for helpful business matters. It is worried about an advancing term of portraying any measure of voluminous organized, semi-organized and un-organized information that can be done in for valuable data handling. An organization profit value is not designated by the data that is stored which is true for old/traditional databases, warehouses, and new technologies like big data -Hadoop. Data once stored in appropriate manner can be analyze to create immense value in it.

X. R SCOPE IN DATA ANALYTICS

R act as an open source software platform for statistical computing and analysis. On a large scale due to its open-source nature, R is speedily adopted by statistics departments in universities around the world, attracted by its extensible nature as a platform for academic research. It's available free of cost. R builds this process very easily and anyone can produce an R package to CRAN that stands for Comprehensive R Archive Network and make it available to everyone. An extensive open-source interactive ide has been created by R Studio for the R language, further boosting the productivity of R users everywhere.

XI. CONCLUSION

R-is one of popular language, easy in terms of learning which avails visual-graphics & statistics developments. Libraries play as main actor in R-Studio & environment. CRAN let users to browse packages with respect to topics which they want & it also offers tools sets where package of interest can be installed in an auto-mode. Due to miscellaneous features of R, it has multiple applications & used in almost every-field.

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Application of Fuzzy Logic Technique for Oil Drilling Problem

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ABSTRACT

In this research paper, we studied a Decision making for Oil Drilling Problem using Fuzzy Logic Technique. In this problem, a geological engineer who has been asked by the chief executive officer (CEO) of a large oil firm to help make a decision about whether to drill the natural gas in a particular geographic region of northwestern new maxico. The first attempt at the decision process that there are only two states of nature regarding the existence of natural gas in the region. The CEO provides the utility matrix table. Further, CEO has asked you to collect new information by taking eight geographical boring samples from the region being considered the drilling. You have a natural gas expert examine the results of these eight tests; get the expert opinion about the conditional probabilities in the form of matrix.

For drilling problem, we have used two methods: Conditional probabilities for imperfect information & Conditional Probabilities of perfect information. From this method, we have calculated the expected utility, prior probabilities, conditional and unconditional probabilities of perfect and imperfect information and value of information is calculated. This totally fuzzy information and we have studied the value of fuzzy information which is less than the perfect and less than the imperfect information.

The problem of Oil Drilling Problem for Fuzzy logic technique is solved using the MATLAB programming software. This paper is totally based on software implementation of MATLAB.

Keywords : Oil drilling, Decision Making, Perfect, Imperfect Information And Uncertainty.

I. INTRODUCTION

1.1 Fuzzy Logic

The real world is complex , complexity arises from uncertainty in the form of ambiguity.“ as the complexity of the system increases , our ability to make precise and yet significant statements about its behavior diminishes until a threshold is reached beyond which precision and significance (or relevance) become almost mutually exclusive characteristics.” These are the words of the LOTFI ZADEH who introduced fuzzy logic in 1965. “ The closer looks at a real world problem , the fuzzier becomes its solution”, observed Dr. Zadeh who published his seminal work “FUZZY SETS” in the journal or information and control.

When there is imprecision (more uncertainty) and inadequate data the fuzzy logic technique is useful.

Secondly, the cost of information increases with precision. But the cost of fuzzy information is far less than the perfect or imperfect information. Thus, there are two – fold advantages of the fuzzy logic technique: Understanding of complex systems becomes easier and analysis makes the system costs effective. He used the linguistic variable and further suggested that set membership function is the key to decision making when there is uncertainty.

The attention currently being paid to fuzzy logic is most likely the result of present popular consumer products such as washing machine, cameras, elevators, air conditioners, rice cookers, automobile, dishwashers etc. The nature of uncertainty in a problem is a very important point that engineers should ponder prior to their.

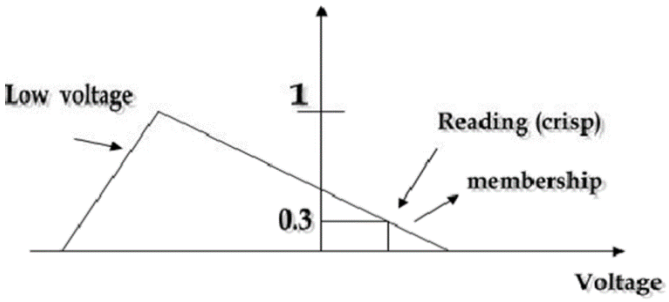

Fig.1.2 Fuzzy sets and crisp reading

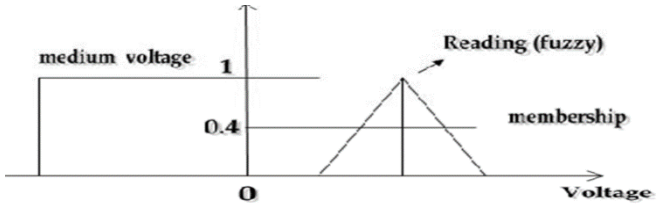

Fig. 1.3 Fuzzy set and fuzzy reading

1.2 Fuzzificaion

Fuzzification is the process of making a crisp quantity fuzzy. We do this by simply recognizing that many of the quantities that we consider to be crisp and deterministic are actually not deterministic at all. They carry considerable uncertainty. If the form of uncertainty happens to arise because of imprecision, ambiguity or vagueness then the variable is probably fuzzy and can be represented by a membership function.

In the real world such as, digital voltmeter generates crisp data, but these data are subject to experimental error. The below fig 1.1 shows one possible range of errors for a typical voltage reading and associated membership function that might represent such imprecision

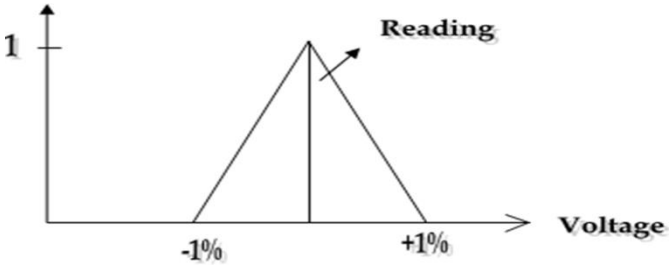

Fig 1.1 Membership function of crisp voltage reading

1.3 Defuzzification

It is the conversion of fuzzy quantity to a precise quantity. The output of a fuzzy process can be the logical union of two or more fuzzy membership functions defined on the universe of discourse of the output variable.

Fig 1. 4 Block diagram of Fuzzy to Crisp Conversion

1.4 Oil drilling concept

A geological engineer who has been asked by the chief executive officer (CEO) of a large oil firm to help make a decision about whether to drill the natural gas in a particular geographic region of northwestern new maxico. The first attempt at the decision process that there are only two states of nature regarding the existence of natural gas in the region. The CEO provides the utility matrix table. Further, CEO has asked you to collect new information by taking eight geographical boring samples from the region being considered the drilling. You have a natural gas expert examine the results of

these eight tests; get the expert opinion about the conditional probabilities in the form of matrix.

II. METHODOLOGY

For solving the oil drilling problem using fuzzy logic technique number of methods are available like Fuzzy Sets, Fuzzy relation, Cartesian product, alpha- cut, Non-transitive ranking methods etc. For oil drilling problem, we have two methods:

1) Conditional probabilities for imperfect information
2) Conditional probabilities of perfect information

From this method, we have calculated expected utility, maximum expected utility, prior probabilities, conditional and unconditional probabilities of perfect and imperfect information and value of the information calculated. This is totally fuzzy information which is less than the perfect and less than the imperfect information.

2.1. Nontransitive Ranking Method

When we compare objects that are fuzzy, ambiguous, or vague, we may well encounter a situation where there is a contradiction in the classical notions of ordinal ranking and transitivity in the ranking. To accommodate this form of nontransitive ranking, we introduce a special notion of relativity.

Let x and y be variables defined on universe X. We define a pairwise function fy(x) as the membership value of x with respect to y

And we define another pairwise function

fx(y) as the membership value of y with respect to x then the relativity function is given by

$f(x/y) = fy(x)/ \max[fy(x),fx(y)]$ (1)

is a measurement of the membership value of choosing x over y. The relativity function f(x/y) can be through of as the membership of preferring variable x over variable y.

To develop the genarl case for many variables, define variables x1,x2,------, xi,xi+1, ……,xn. All defined on universe X, and let these variables be collected in a set A i.e A= {x1,x2,……,xi-1,xi, xi+1, ……,xn}. We then define a set identical to set a except this new set will be missing one element xi, and this set will be termed A'. The relativity function then becomes

$f(xi/A') = f(xi/ \{x1,x2,……,xi-1,xi, xi+1, ……,xn\})$

$= \min\{f(xi/x1), f(xi/x2),……, f(xi/xi-1), f(xi/xi+1), ……,f(xi/xn)\}$ (2)

Which is fuzzy measurement of choosing xi over all elements in the set A'. The expression in equ(2) involves the logical intersection of several variables; hence the minimum function is used. Since the relativity function of the variable with repsect to itself is identity.

$f(xi/xi)=1$ (3)

then

$f(xi/A') = f(xi/A)$ (4)

We can now form a matrix of relativity values. f(xi/xj), where i,j=1,2, n, and where xi and

xj are defined on a universe X. This matrix will be square and of order n, and will be termed the c matrix (c for comaprision). The c matrix can be use to rank many different fuzzy sets.

To determine the overall rnking, we need to find the smallest value in each of the rows of the C matrix; that is,

$Ci' = \min f(xi/X), i= 1,2,……,n.$ (5) Where Ci' is the membership ranking value for the ith variable.

III. EXPERIMENTAL WORK

Program:-

```
% s1 = there is natural gas
% s2=there is no natural gas
% prior probabilities for each state is p=inline('s1=0.5')
p=inline('s2=0.5')
syms ps1 ps2 uji s1 s2 a1 a2 px1 px2 ps1=0.5
ps2=0.5
% probabilities sum to unity
% There are two alternatives
```

% a1=drill for gas
% a2= do not drill for gas
% The CEO provides the utility matrix is given by U=[uji s1 s2;a1 4 -2;a2 -1 2]
u11=4 u12=-2 u21=-1 u22=2
% utility matrix for this situation U1=[4 -2;-1 2]
% the expected utility matrix is E1=ps1*u11+ps2*u12 E2=ps1*u21+ps2*u22
% maximum utility (E=E(u*)) E=max(E1,E2)

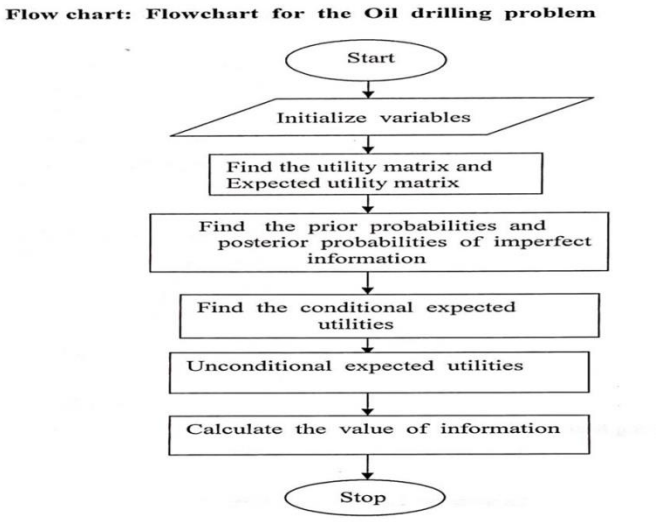

Fig 1.5 Flowchart for oil drilling problem

IV. RESULT AND DISCUSSION

In this example of the oil drilling problem, we studied about the large oil firm to help make a decision about whether to drill for natural gas in a particular geographical region. The prior probabilities geographical region. The prior probabilities of drilling information was

Ps1= p(s1) =0.5
Ps2 =p(s2) =0.5

The expected utility matrixes have been done by using utility matrix and prior probabilities. The eight geographical boring samples from the region have been considered for drilling. The table of imperfect and perfect information was very useful for this problem. The marginal probabilities for the new imperfect information, conditional probabilities, conditional expected utilities for imperfect and perfect information was studied. At last the values of new information have been calculated of both imperfect and perfect information. Some procedure will be happened in case of perfect information.

In this result, the fuzzy information was considered and fuzzy conditional probabilities have been derived. The fuzzy posterior probabilities P(Si/M) and fuzzy expected utilities E(uj/Mt) was done. The maximum conditional probabilities have been calculated and at last the fuzzy information calculated. The fuzzy information is less than the value of perfect information and less than the value of imperfect information. The result of imperfect information and perfect information is as shown in below table.

	X1	X2	X3	X4	X5	X6	X7	X8
p(s1/xk)	0	0.3333	0.2000	0.3333	0.6667	0.8000	0.6667	1.0000
p(xk/s2)	0.05	0.1	0.4	0.2	0.1	0.1	0.05	0
p(xk)	0.0250	0.0750	0.2500	0.1500	0.1500	0.2500	0.0750	0.0250
E(u*/xk)	2.0000	0.6667	1.2000	0.6667	2.0000	2.8000	2.0000	4.0000
aj/xk	a2	a2	a2	a2	a1	a1	a1	a1

Table 1. Posterior probabilities based on imperfect information

	X1	X2	X3	X4	X5	X6	X7	X8
P(s1/xk)	0	0	0	0	1	1	1	1
P(xk/s2)	0	0	0	0	1	1	1	1
P(xk)	0.05	0.1	0.25	0.1	0.1	0.25	0.1	0.05
E(u*/xk)	2	2	2	2	4	4	4	4
aj/xk	a2	a2	a2	a2	a1	a1	a1	a1

Table 2. Posterior probabilities based on perfect information

V. DISCUSSION

One area in which fuzzy set theory has a great potential that in psychology; in particular the psycho logistics which is essential for studying the connection between human communication and decision machines. Today, close to four decades after the artificial intelligence (AI) was born. It can finally be said that intelligent systems are becoming a reality. The soft computing has direct bearing on machine

intelligence. Neuro fuzzy soft computing has a special role in the design of modern intelligent systems.

VI. APPLICATIONS OF FUZZY LOGIC

- Control systems
- Pattern recognition
- Robotics
- Consumer electronics
- Automobiles
- Intelligent systems

VII. FUZZY LOGIC IN CONSUMER GOODS

Cameras , Washing machine , Air conditioners , Luxury cars , Elevators , Rice cookers , Automobile , Dishwashers , Refrigerator , Camcorders , Vac. Cleaner etc.

VIII. SCOPE OF WORK

The scope of further research work is to develop and design some electronic circuits such as speed control motor, automatic control system and some decision making problem like weather forecast. This has been recently used for user-oriented verification of probability forecasts, but there is applied to aid forecast users in optimizing their decision making from probability forecasts.

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Homomorphism on Pentapartitioned Neutrosophic Pythagorean K-algebra

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ABSTRACT

A Pentapartitioned neutrosophic set (PNS) is a powerful structure where we have five components Truth, Falsity, Ignorance, Contradiction and unknown. And also it generalizes the concept of fuzzy, intuitionistic and neutrosophic set. In this paper we have proposed the concept of homomorphism on Pentapartitioned neutrosophic Pythagorean set and have also discussed the characteristics of PNS K-subalgebras under homomorphism.

Keywords: Pentapartitioned Neutrosophic Pythagorean Set, K-algebras, Homomorphism, Pentapartitioned Neutrosophic Pythagorean K-subalgebra

I. INTRODUCTION

Dar and Akram [12] proposed a novel logical algebra known as K-algebra. The algebraic structure of a group G which K-algebra was built on should have a right identity element and satisfy the properties of non-commutative and non-associative. Furthermore this group G is of the type where each non-identity element is not of order 2 and K-algebra was built by adjoining the induced binary operation on G [11,12,13]. Zadeh's [26] fuzzy set theory was a powerful framework which deals the concept of uncertainity, imprecision and also it represented by membership function which lies in a unit interval of [0,1]. Fuzzy K-algebra was introduced by Akram et.al [2,3,5] and also they established this in a wide-reaching way through other researchers. When fuzzy set was broadened, a new set called Intuitionistic fuzzy set which was introduced by Atanasov [9] in 1983. It has an additional degree called the degree of nonmembership. Intuitionistic fuzzy K-subalgebras was proposed by Akram et al. [4,6]. Intuitionistic Fuzzy Ideals of BCK-Algebras was proposed by Y.B.Jun, K.H.Kim[14]

Neutrosophic set which is a generalization of fuzzy set and intuitionistic fuzzy set was introduced by Smarandache[20] in 1998. Akram et al.[8] studied K-algebras on single valued neutrosophic sets and also discussed homomorphisms between the single valued neutrosophic K-subalgebras. Belnap[10] introduced the concept of five valued logic that is the information are represented by five components T,F,None,Both which denotes true,false, neither true nor false, both true and false and unknown respectively. Based on this concept Smarandache proposed five numerical valued neutrosophic logic

where indeterminacy is splitted into three terms known as Contradiction(C) and Unknown(U) and unknown(G). The concept of Pentapartitioned Neutrosophic Pythagorean Sets was introduced by R. Radha and A. Stanis Arul Mary[22] and have studied more about Pythagorean sets[15-22]. Fuzzy K-algebra was introduced by Akram et.al [2,3,5] and also they established this in a wide-reaching way through other researchers. The concept of Quadripartitioned Neutrosophic Pythagorean sets and K- algebra on the respective set was initiated by R. Radha and A. Stanis Arul Mary. In this paper, we extend the concepts to Pentapartitioned Neutrosophic Pythagorean Sets. Rama Malik and Surpathi Pranamik [22] introduced pentapartitioned neutrosophic set and its properties.

Neutrosophic set which is a generalization of fuzzy set and intuitionistic fuzzy set was introduced by Smarandache[23] in 1998.In additional to membership and non-membership function neutrosophic set has one more extra component called indeterminacy membership function. Also all the values of these three components lies in the real standard or non-standard subset of unit interval]–0,1+[where –0 = 0 – ϵ, 1+ = 1 + ϵ, ϵ is an infinitesimal number. Algebraic structures applied in Neutrosophic set theory[7] and it has immense applications in different disciplines. A. A. A. Agboola, B. Davvaz[1] presented the introduction to neutrosophic BCI/BCKalgebras. Smarandache and Wang et al. [21] introduced single-valued neutrosophic set which plays a vital place in many real life problems and it takes the values from the subset of [0,1]. Akram et al.[8] studied K-algebras on single valued neutrosophic sets and also discussed homomorphisms between the single valued neutrosophic K-subalgebras. Belnap[10] introduced the concept of five valued logic that is the information are represented by five components T,F,None,Both which denotes true,false, neither true nor false, both true and false and unknown respectively. Based on this concept Smarandache proposed five numerical valued neutrosophic logic

where indeterminacy is splitted into three terms known as Contradiction(C) and Unknown(U) and unknown(G). Rajashi Chatterjee.,et al[19] introduced Quadripartitioned Single Valued Neutrosophic(QSVN) set in which we have four components T,C,U and F respectively and also it lies in the real unit interval of [0,1]. R. Radha and A. Stanis Arul Mary [15-18] introduced the concept of Pentapartititioned neutrosophic Pythagorean Sets and topological space. The concept of heptapartitioned neutrosophic sets was introduced by us. The Quadripartitioned Neutrosophic Pythagorean set on K- algebra has been initiated by us. The concept of Pentapartitioned Neutrosophic Pythagorean K- subalgebra was initiated by R. Radha and A. Stanis Arul Mary[22].In this paper, we have studied the concept of homomorphism under Pentapartitioned Neutrosophic Pythagorean K-algebra and discussed some of its properties.

II. PRELIMINARIES

Definition 2.1[12] Let $(G,\cdot, \Theta, e)$ be a group in which each non-identity element is not of order 2. Then a K-algebra is a structure K= $(G,\cdot, \Theta, e)$ on a group G in which induced binary operation $\odot: G\times G \to G$ is defined by $\odot(x,y) = x\odot y = xy^{-1}$ and satisfies the following axioms:

(i) $(x\odot y)\odot(x\odot z) = \Big(x\odot\big((e\odot z)\odot(e\odot y)\big)\Big)\odot x$,
(ii) $x\odot(x\odot y) = \big(x\odot(e\odot y)\big)\odot x$,
(iii) $x\odot x = e$,
(iv) $x\odot e = x$,
(v) $e\odot x = x^{-1}$, for all $x, y, z \in G$.

Definition 2.2[8] A single-valued neutrosophic set $A = (T_A, I_A, F_A)$ in a K-algebra K is called a single-valued neutrosophic K-subalgebra of K if it satisfies the following conditions:

(i) $T_A(s\odot t) \geq min\{T_A(s), T_A(t)\}$,
(ii) $I_A(s\odot t) \geq min\{I_A(s), I_A(t)\}$,
(iii) $F_A(s\odot t) \leq max\{F_A(s), F_A(t)\}$, for all $s, t \in G$.

Note that $T_A(e) \geq T_A(s), I_A(e) \geq I_A(s), F_A(e) \leq F_A(s), for\ all\ s \in G.$

Definition 2.3[23]

Let P be a non-empty set. A Pentapartitioned Neutrosophic set PNS A over P characterizes each element p in P by a truth-membership function T_A, a contradiction membership function C_A, an ignorance membership function G_A , unknown membership function U_A and a falsity membership function F_A ,such that for each $p \in P$,

$0 \leq T_A + C_A + U_A + G_A + F_A \leq 5$

Definition 2.4[22]

A Pentapartitioned Neutrosophic set M = (A1 M, A2 M , A3 M ,A4 M , A5 M) in a K-algebra Ƙ is called a Pentapartitioned Neutrosophic Pythagorean K-subalgebra of Ƙ if it satisfies the following conditions.

(i) A1 M (e) ≥ A1 M(u), A2 M (e) ≥ A2 M(u), A3 M (e) ≤ A3 M(u), A4 M (e) ≤ A4 M(u) and A5 M (e) ≤ A5 M(u)for all $u \in G$.

(ii) A1 M (u ⊙ v) ≥ min {A1 M(u), A1 M(v)}

(iii) A2 M (u ⊙ v) ≥ min {A2 M(u), A2 M(v)}

(iv) A3 M (u ⊙ v) ≤ min {A3 M(u), A3 M(v)}

(v) A4 M (u ⊙ v) ≤ min {A4 M(u), A4 M(v)}

(vi) A5 M (u ⊙ v) ≤ min {A5 M(u), A5 M(v)}

Example 2.5[22]

Let M = (A1 M, A2 M , A3 M ,A4 M , A5 M) is the cyclic group of order five in a K-algebra

Ƙ= $(G, \cdot, \Theta, e)$. The Cayley's table for Θ is given as follows.

Θ	E	G	g^2	g^3	g^4
E	E	g^4	g^3	g^2	G
G	G	E	g^4	g^3	g^2
g^2	g^2	G	e	g^4	g^3
g^3	g^3	g^2	g	E	g^4
g^4	g^4	g^3	g^2	G	E

We define a PNP set in K-algebra as follows.

A1M(e) = 0.5, A2M(e) = 0.4, A3M(e) = 0.1, A4M(e) = 0.3, A5M(e) = 0.2,

A1M(u) = 0.1, A2M(u) = 0.2, A3M(u) = 0.4, A4M(u) = 0.5, A5M(u) = 0.3

for all $u \neq e \in G$. Clearly it shows that M = (A1 M, A2 M , A3 M ,A4 M , A5 M) is a PNP K-algebras of Ƙ.

Definition 2.6 [22]

Let M = (A1 M, A2 M , A3 M ,A4 M , A5 M) be a Pentapartitioned Neutrosophic Pythagorean set in a K-algebra of Ƙ and let $(\lambda, \mu, \vartheta, \xi, \varphi) \in [0,1] \times [0,1] \times [0,1] \times [0,1] \times [0,1]$ with $\lambda + \mu + \vartheta + \xi + \varphi \leq 5$. Then the sets,

$M_{(\lambda,\mu,\vartheta,\xi,\varphi)} = \{u \in G | A1_M(u) \geq \lambda, A2_M(u) \geq \mu, A3_M(u) \leq \vartheta, A4_M(u) \leq \xi, A5_M(u) \leq \varphi\}$,

$M_{(\lambda,\mu,\vartheta,\xi,\varphi)} = U(A1_M, \lambda) \cap U'(A2_M, \mu) \cap L(A3_M, \vartheta) \cap L'(A4_M, \xi) \cap L''(A5_M, \varphi)$ are called $(\lambda, \mu, \vartheta, \xi, \varphi)$ level subsets of Pentapartitioned Neutrosophic Pythagorean set M.

And also the set $M_{(\lambda,\mu,\vartheta,\xi,\varphi)} = \{u \in G | A1_M(u) > \lambda, A2_M(u) > \mu, A3_M(u) < \vartheta, A4_M(u) < \xi, A5_M(u) < \varphi\}$ is known as strong $(\lambda, \mu, \vartheta, \xi, \varphi)$ level subset of M.

Note: The set of all $(\lambda, \mu, \vartheta, \xi, \varphi) \in Im(A1_M) \times Im(A2_M) \times Im(A3_M) \times Im(A4_M) \times Im(A5_M)$ is known as image of M = (A1 M, A2 M , A3 M ,A4 M , A5 M)

III. HOMOMORPHISM OF PENTAPARTITIONED NEUTROSOPHIC PYTHAGOREAN Ƙ -ALGEBRAS

Definition 3.1 Consider two K-algebras $Ƙ_1 = (G_1, \cdot, \odot, e_1)$ *and* $Ƙ_2 = (G_2, \cdot, \odot, e_2)$ and f be a function from $Ƙ_1$into $Ƙ_2$. If M = (A1 M, A2 M , A3 M ,A4 M , A5 M) is a Pentapartitioned neutrosophic Pythagorean K-subalgebra of $Ƙ_2$ then the preimage of M =(A1 M, A2 M , A3 M ,A4 M , A5 M) under f is a pentapartitioned neutrosophic Pythagorean K-subalgebra of $Ƙ_1$ defined by,

$f^{-1}(A1_M)(u) = A1_M(f(u)), f^{-1}(A2_M)(u) = A2_M(f(u))$,
$f^{-1}(A3_M)(u) = A3_M(f(u)), f^{-1}(A4_M)(u) = A4_M(f(u))$ and
$$f^{-1}(A5_M)(u) = A5_M(f(u))$$
for all $u \in G$.

Definition 3.2

A Pentapartitioned neutrosophic Pythagorean K-subalgebra M = (A1 M, A2 M , A3 M ,A4 M , A5 M) of a K-algebra Ƙ is called characteristic if $A1_M(f(u)) = A1_M(u), A2_M(f(u)) = A2_M(u), A3_M(f(u)) = A3_M(u), A4_M(f(u)) = A4_M(u), A5_M(f(u)) = A5_M(u)$, for all $u \in G$ and $f \in Aut(K)$.

Definition 3.3

A K-subalgebra U of a K-algebra Ƙ is said to be fully invariant if $f(U) \subseteq U$ for all $f \in End(K)$ where $End(K)$ is the set of all endomorphisms of a K-algebra Ƙ. A Pentapartitioned neutrosophic Pythagorean K-subalgebra M = (A1 M, A2 M , A3 M ,A4 M , A5 M) is called fully invariant if $A1_M(f(u)) \leq A1_M(u), A2_M(f(u)) \leq A2_M(u), A3_M(f(u)) \geq A3_M(u), A4_M(f(u)) \geq A4_M(u)$ $and A5_M(f(u)) \geq A5_M(u)$ for all $u \in G$ and $f \in End(K)$.

Definition 3.4

Let M = (A1 M, A2 M , A3 M ,A4 M , A5 M) and N = (A1 N, A2 N , A3 N ,A4 N , A5 N) be two Pentapartitioned neutrosophic Pythagorean K-subalgebras of Ƙ. Then M = (A1 M, A2 M , A3 M ,A4 M , A5 M) is said to be the same type of N = (A1 N, A2 N , A3 N ,A4 N , A5 N) if there exists $f \in Aut(K)$ such that M = N $\circ$ f i.e.,$A1_M(u) = A1_N(f(u)), A2_M(u) = A2_N(f(u)), A3_M(u) = A3_N(f(u)), A4_M(u) = A4_N(f(u)), and\ A5_M(u) = A5_N(f(u))$ for all $u \in G$.

Theorem 3.5

Let $f: Ƙ_1 \to Ƙ_2$ be an epimorphism of K-algebras. If Y = (A1 Y, A2 Y , A3 Y ,A4 Y , A5 Y) is a Pentapartitioned neutrosophic Pythagorean K-subalgebra of $Ƙ_2$, then $f^{-1}(Y)$ is a Pentapartitioned neutrosophic Pythagorean K-subalgebra of $Ƙ_1$.

Proof:

It is obvious that,
$f^{-1}(A1_Y)(e) \geq f^{-1}(A1_Y)(u), f^{-1}(A2_Y)(e) \geq f^{-1}(A2_Y)(u)$,
$$f^{-1}(A3_Y)(e) \leq f^{-1}(A3_Y)(u), f^{-1}(A4_Y)(e) \leq f^{-1}(A4_Y)(u), f^{-1}(A5_Y)(e) \leq f^{-1}(A5_Y)(u)$$
for all $u \in G_1. Let\ u, v \in G_1$ then,
$f^{-1}(A1_Y)(u \odot v) = A1_Y(f(u \odot v))$
$f^{-1}(A1_Y)(u \odot v) = A1_Y(f(u) \odot f(v))$
$f^{-1}(A1_Y)(u \odot v) \geq \min\{A1_Y(f(u)), A1_Y(f(v))\}$
$f^{-1}(A1_Y)(u \odot v) \geq \min\{f^{-1}(A1_Y)(u), f^{-1}(A1_Y)(v)\}$,

$f^{-1}(A2_Y)(u \odot v) = A2_Y(f(u \odot v))$
$f^{-1}(A2_Y)(u \odot v) = A2_Y(f(u) \odot f(v))$
$f^{-1}(A2_Y)(u \odot v) \geq \min\{A2_Y(f(u)), A2_Y(f(v))\}$
$f^{-1}(A2_Y)(u \odot v) \geq \min\{f^{-1}(A2_Y)(u), f^{-1}(A2_Y)(v)\}$,

$f^{-1}(A3_Y)(u \odot v) = A3_Y(f(u \odot v))$
$f^{-1}(A3_Y)(u \odot v) = A3_Y(f(u) \odot f(v))$
$f^{-1}(A3_Y)(u \odot v) \leq \max\{A3_Y(f(u)), A3_Y(f(v))\}$
$f^{-1}(A3_Y)(u \odot v) \leq \max\{f^{-1}(A3_Y)(u), f^{-1}(A3_Y)(v)\}$,

$f^{-1}(A4_Y)(u \odot v) = A4_Y(f(u \odot v))$
$f^{-1}(A4_Y)(u \odot v) = A4_Y(f(u) \odot f(v))$
$f^{-1}(A4_Y)(u \odot v) \leq \max\{A4_Y(f(u)), A4_Y(f(v))\}$
$f^{-1}(A4_Y)(u \odot v) \leq \max\{f^{-1}(A4_Y)(u), f^{-1}(A4_Y)(v)\}$,

$f^{-1}(A5_Y)(u \odot v) = A5_Y(f(u \odot v))$
$f^{-1}(A5_Y)(u \odot v) = A5_Y(f(u) \odot f(v))$
$f^{-1}(A5_Y)(u \odot v) \leq \max\{A5_Y(f(u)), A5_Y(f(v))\}$
$f^{-1}(A5_Y)(u \odot v) \leq \max\{f^{-1}(A5_Y)(u), f^{-1}(A5_Y)(v)\}$.

Hence $f^{-1}(Y)$ is a Pentapartitioned Neutrosophic Pythagorean K-subalgebra of $Ƙ_1$.

Theorem 3.5

Let $f: Ƙ_1 \to Ƙ_2$ be an epimorphism of K-algebras. If Y = (A1 Y, A2 Y , A3 Y ,A4 Y , A5 Y) is a Pentapartitioned neutrosophic Pythagorean K-subalgebra of $Ƙ_2$ and X = (A1 X, A2 X , A3 X ,A4 X , A5

x) is the preimage of Y under f. Then X is a Pentapartitioned neutrosophic Pythagorean K-subalgebra of $\mathbb{K}_1$.

Theorem 3.7

Let $f: \mathbb{K}_1 \to \mathbb{K}_2$ be an epimorphism of K-algebras. Then $X^f = (A1_X^f, A2_X^f, A3_X^f, A4_X^f, A5_X^f)$ is a Pentapartitioned Neutrosophic Pythagorean K-subalgebra of $\mathbb{K}_1$ if and only if $X = (A1_X, A2_X, A3_X, A4_X, A5_X)$ is a Pentapartitioned Neutrosophic Pythagorean K-subalgebra of $\mathbb{K}_2$.

Theorem 3.8

Let $X_1 = (A1_{X_1}, A2_{X_1}, A3_{X_1}, A4_{X_1}, A5_{X_1})$ and $X_2 = (A1_{X_2}, A2_{X_2}, A3_{X_2}, A4_{X_2}, A5_{X_2})$ be two Pentapartitioned Neutrosophic Pythagorean K-subalgebras of $\mathbb{K}$. Then a Pentapartitioned neutrosophic Pythagorean K-subalgebra $X_1 = (A1_{X_1}, A2_{X_1}, A3_{X_1}, A4_{X_1}, A5_{X_1})$ is of the same type of Pentapartitioned neutrosophic Pythagorean K-subalgebra $X_2 = (A1_{X_2}, A2_{X_2}, A3_{X_2}, A4_{X_2}, A5_{X_2})$ if and only if X_1 is isomorphic to X_2.

Proof:

It is enough to prove only the necessary condition since sufficient condition holds trivially. Let $X_2 = (A1_{X_2}, A2_{X_2}, A3_{X_2}, A4_{X_2}, A5_{X_2})$ be Pentapartitioned neutrosophic Pythagorean K-subalgebra having same type of $X_2 = (A1_{X_2}, A2_{X_2}, A3_{X_2}, A4_{X_2}, A5_{X_2})$. Then there exists $f \in Aut(K)$ such that $A1_{X_1}(u) = A1_{X_2}(f(u)), A2_{X_1}(u) = A2_{X_2}(f(u)), A3_{X_1}(u) = A3_{X_2}(f(u)), A4_{X_1}(u) = A4_{X_2}(f(u)) and\ A5_{X_1}(u) = A5_{X_2}(f(u))$ for all $u \in G$.

Let $g: X_1(K) \to X_2(K)$ be a mapping defined by $g(X_1(s)) = X_2(f(u))$ for all $u \in G$ i.e., $g\left(A1_{X_1}(u)\right) = A1_{X_2}(f(u)), g\left(A2_{X_1}(u)\right) = A2_{X_2}(f(u)), g\left(A3_{X_1}(u)\right) = A3_{X_2}(f(u)), g\left(A4_{X_1}(u)\right) = A4_{X_2}(f(u))\ and\ g\left(A5_{X_1}(u)\right) = A5_{X_2}(f(u))$ for all $u \in G$. g is surjective obviously. And if $g\left(A1_{X_1}(u)\right) = g\left(A1_{X_1}(v)\right)$ for all $u, v \in G$ then $A1_{X_2}(f(u)) = A1_{X_2}(f(v))$ and we get $A1_{X_1}(u) = A1_{X_1}(v)$. Similarly we can prove for $A2_{X_1}(u) = A2_{X_1}(v), A3_{X_1}(u) = A3_{X_1}(v), A4_{X_1}(u) = A4_{X_1}(v) and\ A5_{X_1}(u) = A5_{X_1}(v)$.

Hence g is injective. Therefore g is a homomorphism such that for $u, v \in G$ we have,

$$\begin{aligned} g(A1_{X_1}(u \odot v)) &= A1_{X_2}(f(u \odot v)) \\ &= A1_{X_2}(f(u) \odot f(v)) \\ g(A2_{X_1}(u \odot v)) &= A2_{X_2}(f(u \odot v)) \\ &= A2_{X_2}(f(u) \odot f(v)) \\ g(A3_{X_1}(u \odot v)) &= A3_{X_2}(f(u \odot v)) \\ &= A3_{X_2}(f(u) \odot f(v)) \\ g(A4_{X_1}(u \odot v)) &= A4_{X_2}(f(u \odot v)) \\ &= A4_{X_2}(f(u) \odot f(v)) \\ g(A5_{X_1}(u \odot v)) &= A5_{X_2}(f(u \odot v)) \\ &= A5_{X_2}(f(u) \odot f(v)) \end{aligned}$$

Hence $X_1 = (A1_{X_1}, A2_{X_1}, A3_{X_1}, A4_{X_1}, A5_{X_1})$ is isomorphic to $X_2 = (A1_{X_2}, A2_{X_2}, A3_{X_2}, A4_{X_2}, A5_{X_2})$.

IV. CONCLUSIONS

Need of algebra in today's life is more important since it plays a vital role without even recognizing it. Algebraic thinking helps us to solve the real-world problems in a logical way. Recently K-algebra applied in fuzzy set, intuitionistic fuzzy set and single valued neutrosophic set which helps us to extend the concept to Homomorphism of Pentapartitioned neutrosophic Pythagorean K-subalgebra. In this paper we have studied, the homomorphism of Pentapartitioned neutrosophic pythagorean K-algebras, characteristic and fully invariant K-subalgebras also studied in detail.

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Combustion Synthesis and Thermo Luminescence of Ce^{3+} Doped YAlO3 Phosphor

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ABSTRACT

Yttrium Orthoaluminate phosphor doped with Ce^{3+} were prepared by combustion synthesis using fuel mixture of Urea and Glycine. Phase identification was confirmed by XRD technique. Thermoluminescence study of the said phosphor was investigated for 0.2 mol% Ce^{3+} concentration on Nucleonix (TL 100I) Thermoluminecence Reader. The single glow peak around 166^0C was observed for sample for 1 KGy gamma dose suggesting the possible use of said phosphor in radiation dosimetry.

I. INTRODUCTION

At least three different compounds derive from the Y_2O_3 -Al_2O_3 system: $Y_3Al_5O_{12}$ (YAG), $YAlO_3$ (YAP) and $Y_4Al_2O_9$ (YAM) and that they are all useful host materials in lasers [1] and scintillators [2]. For example, YAP doped with Ce is a promising fast scintillator for synchrotron X-ray experiments [3]. The polycrystalline powders of these materials are usually synthesized by a solid-state reaction between yttria and alumina at high temperatures, but it is difficult to prepare fine powders in a single phase due to aggregation of particles and simultaneous formation of other detrimental phases. In view-point of low temperature preparation of this phosphor, Sol-gel and related chemical techniques were investigated [4-7]. However, Synthesizing single-phase YAP is still difficult because of preferential formation of other phases, even with the wet chemical process [8,9]. Polymer complex method using citric acid was invented by Pechini [10] to prepare single phase YAP. The advantages of this method including small particle size, second phase suppression, and low heat treatment temperature were reported earlier [11, 12]. Nevertheless these methods were not free from disadvantages like high cost of industrialization and procedural complexity.

In the present method, we used the metal nitrates as the base materials and mixture (glycine + Urea) as fuel to decompose the metal nitrates by a facile combustion process.

In the present paper, we have used one step combustion synthesis to prepare the powder sample of YAP. Activation of Ce^{3+} is also incorporated during synthesis.

II. EXPERIMENTAL

$YAlO_3$ with Ce^{3+}dopant concentration of 02 mol% were prepared by modified procedure employing dual fuel (Urea + Glycine). The method involves heating aqueous solution comprising stoichiometric amount of corresponding metal nitrates and fuel at 500 °C furnace temperature. Reagent grade (Indian Rare

Earths, Ltd.) rare earth Oxides /carbonates were converted to the corresponding nitrates by dissolving in nitric acid. The nitrates were dried by prolonged, gentle warming. Stoichiometric amounts of hydrated nitrates of yttrium, aluminum, and cerium were thoroughly mixed with urea/glycine. The nitrates to fuel ratios were calculated by the method described earlier [13, 14]. Due to the presence of large crystallization water in aluminum nitrate, a thick paste was formed. A china dish containing
the paste was inserted in a furnace heated to 500°C. Within minutes the paste foamed and a flame was produced which lasted for several seconds. The china dish was immediately removed from the furnace and the sample was collected. No further annealing is needed.

No further annealing is needed. X ray diffraction patterns were recorded with Rigaku- Miniflex-II diffractometer for Phase identification. Thermoluminecence characteristics of as prepared sample $Y_{0.998}Ce_{0.002}AlO_3$ is recorded on Nucleonix(TL 1009 I) Thermoluminecence Reader (Integral PC based) by previously irradiated by 1 KGy gamma dose on gamma chamber GC 900.

III. RESULTS AND DISCUSSIONS

In our experiment, when urea was used as a fuel, combustion products were poorly crystallized. Yttrium nitrate does not have exothermic reaction with urea. Hence we tried a mixed (glycine + urea) fuel. Glycine has exothermic reaction with yttrium nitrate and urea with aluminum nitrate. XRD pattern of the product obtained with this fuel is shown in Fig. 1.

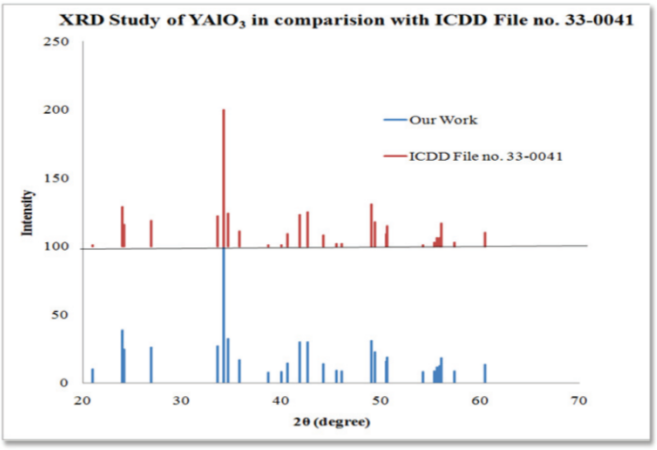
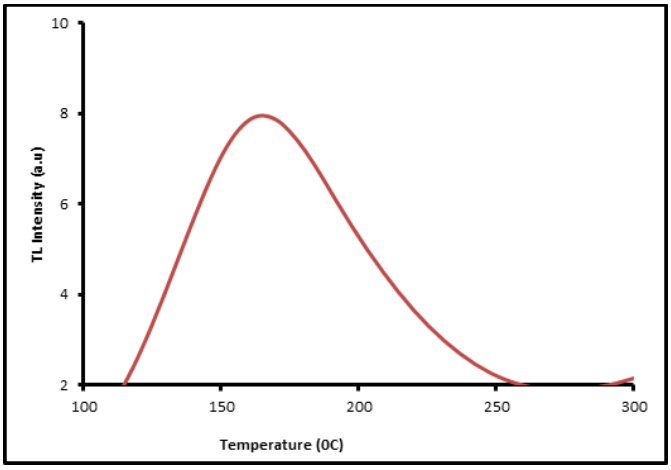


Fig.1 X-ray diffraction pattern of YAP in comparision with ICDD File no. 33-0041.

An excellent match is obtained with ICDD file 33-0041corresponding to YAP. No lines corresponding to YAG or YAM could be seen suggesting the effectiveness of method employed. Phase pure YAP is thus obtained in a single step combustion process without any additional thermal treatment when mixed fuel (glycine + urea) was used. Activation with Ce^{3+} was also attempted by adding cerous nitrate to the combustion mixture.

Curve structure and TL intensity of YAP:Ce^{3+} phosphor mainly depends on the impurities doped into the host.



TL of the previously 1 KGy gamma irradiated sample was taken by heating the sample at the rate of 5^0C/sec. The single glow peak around 166^0C was observed indicating that there is possibly one kind of trapping

site/luminescent centre generated due to gamma irradiation.

IV. CONCLUSION

Single phase YAP: Ce^{3+} was successfully prepared in one step by modified route employing mixed (Urea + Glycine) fuel. No further annealing is needed. The method employed is simple, safe and rapid for preparation of fine homogeneous powder. TL study reveals appearance of single glow peak around 166^0C suggesting that one kind of trapping site/luminescent centre was generated due to irradiation. Such phosphor may exploited for high dose dosimetry.

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Dielectric Studies of Zinc and Zirconium Substituted Calcium Hexaferrites

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ABSTRACT

Zinc and Zirconium substituted Calcium hexaferrites have been synthesized by microwave assisted sol-gel auto combustion method. The synthesized samples were analysed by X-ray diffraction studies, and it revealed that the samples belong to Space Group P63/mmc and are single-phase magneto plumbite (M) structure. The samples had a particle size was less than 100nm. Transmission electron microscopy (TEM) analysis suggests that formation is hexagonal platelets. The dielectric constant decreased with the increase in frequency is a traditional dispersion behaviour due to the lagging of the space charge carriers. The dielectric constant of the Zinc-Zirconium substituted Calcium hexaferrites decreased as the substitution increases. The synthesized samples can used for higher frequency applications.

Keywords: M-type Calcium hexaferrites, Sol-gel method, Magneto-plumbite, TEM, Dielectric properties.

I. INTRODUCTION

Ferrites is one of the currently and widely used advanced magnetic materials. These materials are structure sensitive materials as the electrical resistances are very large. We already know that the special properties of nanomaterials are strongly size dependent which is a prerequisite for their practical applications. Once hexaferrites were discovered, researchers continuously took interest on studying their unique properties and found their applications in microwave devices, micro strip antennas, high frequency transformers, memory core, radar devices and high-density recording media.

Mostly researched M-type hexagonal ferrites are BaFe12O19 and SrFe12O19. They are known for their high uniaxial magneto crystalline anisotropy with the easy axis of magnetization along the hexagonal c-axis and their chemical stability [1]. In our research paper we have reported the dielectric studies of Zinc and Zirconium substituted Calcium hexaferrites. Our interest in Calcium hexaferrites is due to narrow range of particle size distribution. It has a very broadband of properties like magnetic, electrical, mechanical, and magneto-optical properties along with perfect thermal and chemical stability. The electric and magnetic properties of these hexaferrites can be tuned by making suitable metallic

substitutions for iron (Fe3+) with paramagnetic and diamagnetic cations.

Researchers like Lotgering, F. K.[2], Kobayashi, Y.[3], T. Kikuchi [4]have studied the characteristics of M-type Calcium hexaferrites doped with La or La and Co by different methods of synthesis. In his paper, S. V. Blazhevich [5], has investigated and aimed at preparing fine grained crystals of calcium hexaferrite. Many researchers have accounted that Calcium hexaferrites can be used for medical applications as it has better biological compatibility with other base compositions than alkaline earth hexaferrites. In this paper we are reporting the dielectric studies of the effect of substitution of Zinc and Zirconium substituted in Fe3+ ions of Calcium hexaferrites (Ca (Zn-Zr)x Fe12-2xO19 (x=0.2 and 1.0)). When Zinc and Zirconium were substituted in Fe3+ sites in CaFe12O19, it decreases the number of Fe3+ ions, thus decreasing the number of sites responsible for the conduction that leads to high resistivity materials. Zirconium was added as it maintains the neutrality of the material synthesized.

II. EXPERIMENTAL DETAILS

The samples were synthesized using microwave assisted sol-gel technique as it requires low temperature, and no intermediate phases will be obtained, and it will meet the stringent requirements of the fineness and morphology of the particles and optimal size. [6], [7] [8] [9] [10],[11]. The resultant precursor material was ground into a fine powder using pestle and mortar. The powdered samples were pressed at 10 KN/m2 to form pellets of 6.5 mm diameter and ~2 to 2.5 mm thickness which were used in measurements for dielectric properties.

III. RESULTS AND DISCUSSION

3.1 X-ray diffraction Analysis:

The formation of a single-phase hexagonal magneto plumbite structure of the substituted Zn2+ and Zr4+ in the M-type Calcium hexaferrites was confirmed by X-ray diffraction analysis. The X-ray diffraction patterns were indexed based on magneto plumbite structure and space group P63/mmc (No.194) was retained (Figure 1).

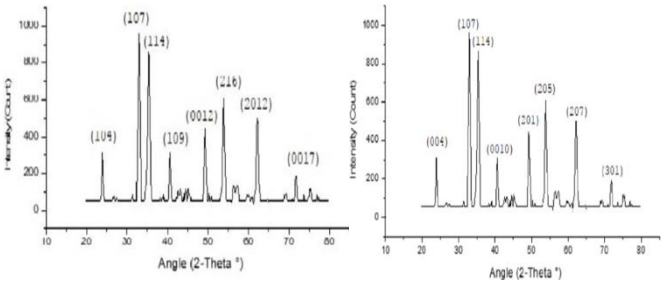

Figure 1: XRD patterns for CaFe12-2x (Zn Zr)xO19 (x=0.2 and 1.0)

3.2 Microstructure analysis:

From figure 2(a), the particles display a nanoscale hexagonal nature of the synthesized materials. There were agglomeration and clusters were formed and it is due to the increase in the grain size when the substitutions were increased. The crystal lattice and morphology of the Zn2+ and Zr4+substituted Calcium hexaferrites was not affected by the small substitutions. Figure 2 (b) gives the SAED images of the same.

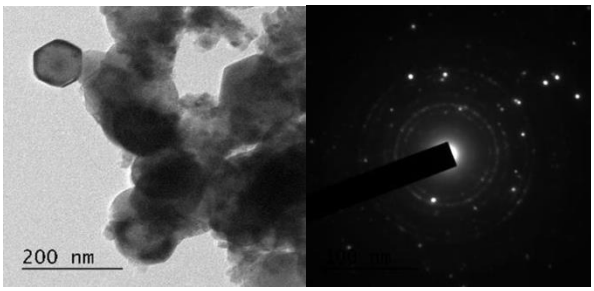

Figure 2(a) and 2(b): TEM image and SAED image of CaFe12-2x(Zn Zr)xO19 (x=1.0)

3.3 Dielectric studies of Ca Fe12-2x (Zn Zr)x O19 (x=0.2,0.4,0.6,0.8)

Dielectric properties provide an idea about the behaviour of electrical charge carriers. It represents the inherent ability of the material to withstand an applied voltage without undergoing any structural degradation or becoming electrically conducting. The dielectric loss tangent is the amount of energy loss

during each cycle. M-type hexaferrites possess low dielectric strengths because of their high resistivity. The variation of dielectric constant, tan and dielectric loss with frequency in the range 1000 Hz to 1Mhz was studied. The inductance capacitance and resistance (LCR) metre bridge (Wayne Kerr LCR 4275) was used to study the dielectric properties of the synthesized samples Ca Fe12-2x (Zn Zr)x O19 (x=0.2,0.4,0.6,0.8) were studied.

The dielectric constant, dielectric tangent loss factor and dielectric loss were calculated using the following relations:

$\varepsilon' = C\ d$

$\varepsilon 0\ A$ (1)

where '' is the dielectric constant, 'C' is the capacitance of the pellet in farad, 'd' is the thickness of the pellet in metres, 'A' is the cross-sectional area of the flat surface of the pellet and '0' is the permittivity of free space

tan = 1

$2\ \pi\ RpCp$ (2)

where, 'tan ' is the dielectric tangent loss factor, '' is the loss angle, 'Rp'is the equivalent parallel resistance, 'Cp'is the equivalent parallel capacitance and 'f' is the frequency.

$\varepsilon'' = \varepsilon' \tan$ (3)

Where, 'ε''' is the dielectric loss.

The dielectric constant, dielectric tangent loss factor and dielectric loss at 1kHz and 10kHz are tabulated in table 1.

Table 1: Dielectric constant, tan , of Ca Fe12-2x(Zn Zr)x O19 as a function of frequency:

Content (x)	Dielectric constant		Dielectric loss tangent	
	10 kHz	100 kHz	10kHz	100 kHz
0.2	97.0	38.2	76.0	41.8
0.4	93.0	34.8	58.6	28.3
0.6	57.7	27.4	36.0	23.7
0.8	55.0	25.8	30.3	13.3

From table 1, the room temperature dielectric properties of Zinc and Zirconium substituted Calcium hexaferrites at 10kHz and 100kHz are listed. The values of dielectric constant and dielectric loss tangent were found to decrease with the increase of the applied field frequency and with the substitution of Zinc and Zirconium in Calcium hexaferrites. The Zinc cations usually prefer tetrahedral sites and the concentration of Fe2+ ions decrease thereby decreasing the electric polarization. This reduces the dielectric constant in the materials. Very low values of dielectric constant for La Zn doped Strontium hexaferrites have been reported in some studies [12].

3.3.1. Frequency variation of dielectric constant:

From the graph (Figure 3), it was observed that the dielectric constant decreases rapidly with frequency and became a constant beyond a certain frequency. This is a conventional behaviour of hexaferrites. Dielectric constant is mainly due to electronic polarization, ionic polarization, intrinsic polarization, and interfacial polarization [13] [14].

In Zn2+ and Zr4+ substituted Calcium hexaferrites, the positive ions of Ca2+ and Fe3+ are surrounded by O2- ions contribute to dielectric constant (''), dielectric loss ('') through dipolar polarization and dipolar relaxation respectively. In the synthesized samples, there are more positive ions with different coordination numbers so there is a formation of dipoles of different strengths [15]. When Zn2+ and Zr4+ cations are substituted for Fe3+ ions the dielectric constant reduces which is related to diminution of polarization.

The dielectric constant decreases with the increasing frequency and at a certain frequency the electron exchange between Fe3+ and Fe2+ cannot follow the alternating field. The large value of dielectric constant at higher frequency may be due to predominance of Fe2+, interfacial dislocations pile ups, oxygen vacancies, grain boundary defects etc. In this study, the dielectric constant values were not so high, and the same explanation holds good [16].

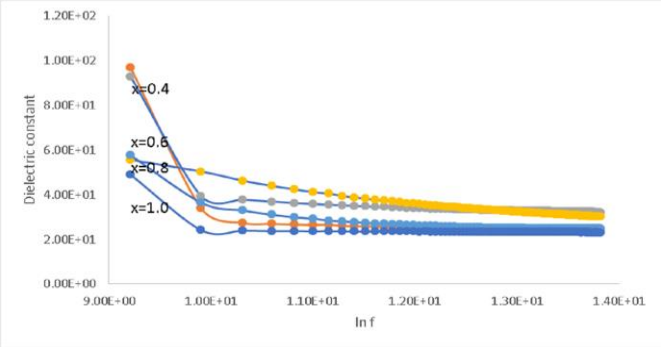

Figure 3: Variation of Dielectric constant with applied frequency for Ca Fe12-2x(Zn Zr)x O19(x=0.2,0.4,0.6,0.8,1.0)

3.3.2. Frequency variation of dielectric loss tangent:

The frequency variation of dielectric loss tangent is shown in figure 4. The variations are like the variation of frequency with dielectric constant. Ashima [17] had studied Ca and Sr substituted in Barium hexaferrites and have observed similar results. When Calcium was substituted in Barium hexaferrites the dielectric constant, dielectric loss tangent decreased with increasing frequency. M.J. Iqbal [18] worked on doping Zinc and Zirconium to Strontium hexaferrites. He had analysed and reported that the dielectric constant of the synthesized nanoparticles had a much lower value than the bulk materials.

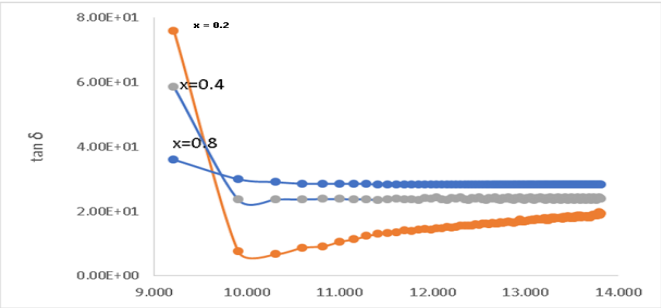

Figure 4: Variation of Dielectric loss tangent with applied frequency for Ca Fe12-2x (Zn Zr)x O19(x=0.2,0.4,0.8)

IV. CONCLUSIONS:

The variation of dielectric constant with frequency dielectric studies are reported for the synthesized samples of Zinc-Zirconium substituted Calcium hexaferrites. It was found that the value of the measured dielectric constant decreased when the content of Zinc and Zirconium were increased. It decreased very swiftly with the increasing frequency. Also, it was found that the dielectric constant at high frequency region becomes approximately constant. As the values of dielectric constant are lower in the synthesized materials it can be used at higher frequencies. The studies suggest the synthesized Zinc and Zirconium substituted Calcium hexaferrites samples can be probable materials for high frequency applications as radiation absorbing materials and core loss materials in transformers.

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The Role of Graphs in Multiple Disciples in Computer Science

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ABSTRACT

Graphs are considered as an excellent modeling tool which is used to model many type of relations amongst any physical situation. Many problems of real world can be represented by graphs. This paper explores different concepts involved in graph theory and their applications in computer science to demonstrate the utility of graph theory. These applications are presented especially to project the idea of graph theory and to demonstrate its objective and importance in computer science engineering. Graphs, connectivity, constraints, graph coloring, graph drawing. This paper gives an overview of the applications of graph theory in heterogeneous fields to some extent but mainly focuses on the computer science applications that uses graph theoretical concepts. Various papers based on graph theory have been studied related to scheduling concepts, computer science applications and an overview has been presented here.

Index Terms - Graphs, connectivity, constraints, graph coloring, graph drawing

I. INTRODUCTION

Graph theory is a branch of discrete mathematics. In mathematics and computer science, graph theory is the study of graphs which are mathematical structures used to model pair wise relations between objects. There is wide use of graphs in providing problem solving techniques, because it gives an intuitive manner prior to presenting formal definition. To analyze the graph theory application two problem areas are considered.

1- Classical problem

2- Problems from applications

the classical problem are defined with the help of the graph theory as connectivity, cuts, paths and flows, coloring problems and theoretical aspect of graph drawing. Whereas problems from application particularly emphasis on experimental research and the implementation of the graph theory algorithms. Graph drawing is a key topic in implementation point of view, because the automatic generation of drawing graph has important applications in key computer science technologies such as data base design, software engineering, circuit designing, network designing and visual interfaces.

Graph theoretical ideas are highly utilized by computer science applications. Especially in research areas of computer science such data mining, image segmentation, clustering, image capturing, networking etc., For example a data structure can be designed in the form of tree which in turn utilized vertices and edges. Similarly modeling of network topologies can be done using graph concepts. In the same way the most important concept of graph

coloring is utilized in resource allocation, scheduling. Also, paths, walks and circuits in graph theory are used in tremendous applications say traveling salesman problem, database design concepts, resource networking. This leads to the development of new algorithms and new theorems that can be used in tremendous applications.

A. Graphs Theory

Graphs provide a convenient way to represent various kinds of mathematical objects. Essentially, any graph is made up of two sets:

1- A set of vertices

2- A set of edges.

Depending on the particular situation, restrictions are imposed on the type of edges we allow. For some problems directed edges are applied and for other problem undirected edges are applied from one vertex to other. So graphs give us many techniques and flexibility while defining and solving a real life problem. Graphs has many features, some of them are:

- Provides abstracted view
- Establishes relationship among objects
- Balancing
- Modeling
- Decision -making ability
- Structural arrangement of various objects
- Easy modification or change in the existing system

B. History of Graph Theory

The origin of graph theory started with the problem of Koinsber bridge, in 1735. This problem lead to the concept of Eulerian Graph. Euler studied the problem of Koinsberg bridge and constructed a structure to solve the problem called Eulerian graph. In 1840, A.F Mobius gave the idea of complete graph and bipartite graph and Kuratowski proved that they are planar by means of recreational problems. The concept of tree, (a connected graph without cycles) was implemented by Gustav Kirchhoff in 1845, and he employed graph theoretical ideas in the calculation of currents in electrical networks or circuits. In 1852, Thomas Gutherie found the famous four color problem. Then in 1856, Thomas. P. Kirkman and William R.Hamilton studied cycles on polyhydra and invented the concept called Hamiltonian graph by studying trips that visited certain sites exactly once. In 1913, H.Dudeneymentioned a puzzle problem. Eventhough the four color problem was invented it was solved only after a century by Kenneth Appel and Wolfgang Haken. This time is considered as the birth of Graph Theory.

II. APPLICATION OF GRAPH THEORY IN COMPUTER SCIENCE

Graph theory is playing an increasingly important role in the field of computer science. Any software that has to be developed, any program that has to be tested is making themselves easy using graphs. Its importance is derived from the fact that flow of control and flow of data for any program can be expressed in terms of directed graphs. Graph theory is also used in microchip designing, circuitry, scheduling problems in operating system, fi le management in database management system, data flow control between networks to networks. The theory of graphs had made the field of computers to develop its own graph theoretical algorithms. These algorithms are used in formulating solutions to many of computer science applications.

Some algorithms are as follows:

- Shortest path algorithm in a network
- Kruskal's - minimum spanning tree
- Euler's- graph planarity
- Algorithms to find adjacency matrices.
- Algorithms to find the connectedness
- Algorithms to fi nd the cycles in a graph
- Algorithms for searching an element in a data structure (DFS,BFS) and so on.

A. Network system

Graph theory has wide application in the field of networking. To analyze the graph theory application in networking two areas are considered: graph based representation and network theory. Graph based representation has many advantages such as it gives different point of view; it makes problem much easier and provide more accurate definition. Whereas network theory provide a set of techniques for analyzing a graph and applying network theory using a graph representation. The term graph and network are equal. Both refer to a type of structure in which there exists vertices (i.e. nodes, dots) and edges (i.e. links, lines). There are numerous types of graphs and networks which yield more or less structure. These two terms can be differentiating on the basis of their utility. the term graph is used in mathematics whereas the term network is used in physics.

B. Data Structure

Data may be organized many different ways. The logical or mathematical model of a particular organization of data is called a "data structure". The choice of data model depends on two considerations:

- It must be rich enough in structure to mirror actual relationship of data in real world.
- The structure should be simple enough that one can effectively process data when necessary.

These two considerations is fulfilled by the graph theoretical concepts. Arbitrary relation among data can also be represented by a graph and its matrices, operations performed on these metrics are further useful for deriving relations and data association and is useful in order to understand how these data may be stored in memory.

C. Communication Network

The graph theoretical ideas are used by various computer applications like data mining, image segmentation, clustering, image capturing, networking etc. Graph theory can be used to represent communication networks. A communications network is a collection of terminals, links and nodes which connect to enable telecommunication between users of the terminals. Each terminal in the network must have a unique address so messages or connections can be routed to the correct recipients. The collection of addresses in the network is called the address space. Every communications network has three basic components: terminals (the starting and stopping points of network), processors (which provide data transmission control functions), transmission channels (which help in data transmission). The communication network aims to transmit packets of data between computers, telephones, processors or other devices. The term packet refers to some roughly fixed-size quantity of data, 256 bytes or 4096 bytes. The packets are transmitted from input to output through various switches. The communication networks can be represented using the various mathematical structures which also help us to compare the various representations based on congestion, switch size and switch count. Graphs have an important application in modeling communications networks. Generally, vertices in graph represent terminals, processors and edges represent transmission channels like wires, fibers etc. through which the data flows. Thus, a data packet hops through the network from an input terminal, through a sequence of switches joined by directed edges, to an output terminal.

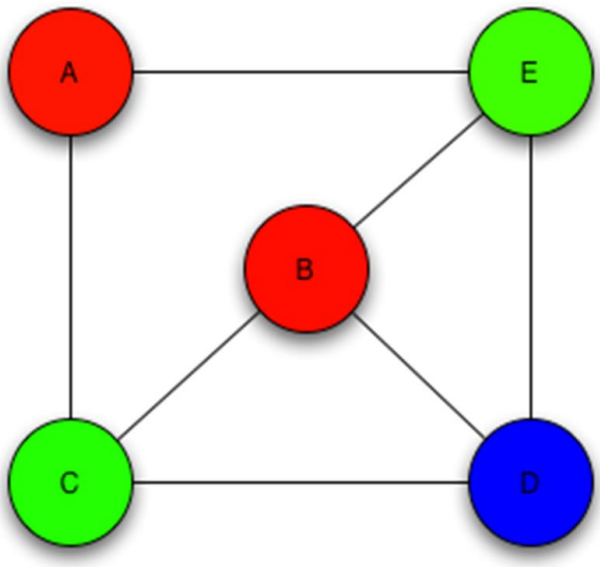
D. Graph Coloring

Graph coloring especially used various in research areas of computer science such data mining, image segmentation, clustering, image capturing, networking etc., For example a data structure can be designed in the form of tree which in turn utilized vertices and edges. Similarly modeling of network topologies can be done using graph concepts. In the same way the most important concept of graph coloring is utilized in resource allocation, scheduling. Also, paths, walks and circuits in graph theory are used in tremendous applications say traveling

salesman problem, database design concepts, resource networking. This leads to the development of new algorithms and new theorems that can be used in tremendous applications. Graph coloring is one of the most important concepts in graph theory and is used in many real time applications in computer science. Various coloring methods are available and can be used on requirement basis. The proper coloring of a graph is the coloring of the vertices and edges with minimal number of colors such that no two vertices should have the same color. The minimum number of colors is called as the chromatic number and the graph is called properly colored graph.

Vertex coloring is the most common graph coloring problem. The problem is, given m colors, find a way of coloring the vertices of a graph such that no two adjacent vertices are colored using same color. The other graph coloring problems like Edge Coloring (No vertex is incident to two edges of same color) and Face Coloring (Geographical Map Coloring) can be transformed into vertex coloring.

Chromatic Number: The smallest number of colors needed to color a graph G is called its chromatic number. For example, the following can be colored minimum 3 colors.



The graph coloring problem has huge number of applications as follows:

1) **Making Schedule or Time Table:** Suppose we want to make am exam schedule for a university. We have list different subjects and students enrolled in every subject. Many subjects would have common students (of same batch, some backlog students, etc). How do we schedule the exam so that no two exams with a common student are scheduled at same time? How many minimum time slots are needed to schedule all exams? This problem can be represented as a graph where every vertex is a subject and an edge between two vertices mean there is a common student. So this is a graph coloring problem where minimum number of time slots is equal to the chromatic number of the graph.
2) **Mobile Radio Frequency Assignment:** When frequencies are assigned to towers, frequencies assigned to all towers at the same location must be different. How to assign frequencies with this constraint? What is the minimum number of frequencies needed? This problem is also an instance of graph coloring problem where every tower represents a vertex and an edge between two towers represents that they are in range of each other.
3) **Suduku:** Suduku is also a variation of Graph coloring problem where every cell represents a vertex. There is an edge between two vertices if they are in same row or same column or same block.
4) **Register Allocation:** In compiler optimization, register allocation is the process of assigning a large number of target program variables onto a small number of CPU registers. This problem is also a graph coloring problem.
5) **Bipartite Graphs:** We can check if a graph is Bipartite or not by colowing the graph using two colors. If a given graph is 2-colorable, then it is Bipartite, otherwise not. See this for more details.
6) **Map Coloring:** Geographical maps of countries or states where no two adjacent cities cannot be

assigned same color. Four colors are sufficient to color any map.

E. Operating System

A graph is a data structure of finite set of pairs, called edges or vertices. Many practical problems can be solved with the help of graph in the field of operating system such as job scheduling and resource allocation problems. For example graph coloring concept can be applied in job scheduling problems of CPU, jobs are assumed as vertices of the graph and there will be an edge between two jobs that cannot be executed simultaneously and there will be one to one relationship between feasible scheduling of graphs.

Graph purpose in operating system:

- System processes are represented in graph form.
- Graph extraction techniques are used in event tracing.
- Excellent testing tool in performance evaluation because of easy validation and modification.

F. Image Processing

Image Analysis is the methodology by which information from images is extracted. Image analysis is mainly performed on digital image processing techniques. The image processing techniques can be improved using a graph theoretic approach. The applications of graphs in image processing are: to find edge boundaries using graph search algorithms in segmentation.

- To calculate he alignment of the picture.
- Finding mathematical constraints such as entropy by using minimum spanning tree.
- Finding distance transforms of the pixels and calculates the distance between the interior pixels by using shortest path algorithms.

G. Software Engineering

Graph has many applications in software engineering. For example: during Requirements Specification, Data Flow diagrams are used where vertices represent transformations and edges represents the data flows. During Design phase, graphical design is used for describing relations among modules; while during Testing, the control flow of a program associated with McCabe's complexity measure which employs directed graphs for addressing the sequence of executed instructions and etc. Even Software Process Management has also applications of network diagrams which involves graph algorithms.

H. Data base Designing

In data base designing graphs are used as graph data bases. Graph database uses graph representation with nodes, edges, and properties to represent and store data. This graph structure has key role in designing database, because it gives fast implementation process using different functionality and properties of graph structure .Graph database uses as:

- Storage system that provides index free adjacency
- Analyzing tool for interconnection
- Powerful tool for graph like-query
- Graph databases are often faster for associative data sets that map more directly to the structure of object-oriented applications.

I. Website Designing

Website designing can be modeled as a graph, where the web pages are represented by vertices and the hyper links between them are represented by edges in the graph. This concept is known as web graph. Which discover the interesting information? Other application areas of graphs are in web community. Where the vertices represent classes of objects, and each vertex representing one type of objects, and each vertex representing a type of object is connected to every vertex representing other kind of objects. In graph theory such a graph is called a complete bipartite graph. There are many advantages of using graph representation in website development such as:

- Searching and community discovery.
- Graph representation (directed graph) in web site utility evaluation and link structure.

- Finding all connected component and provide easy detection.

III. CONCLUSION

The main aim of this paper is to present the importance of graph theoretical ideas in various areas of computer applications. This paper is designed to benefit the students of computer science to gain depth knowledge on graph theory and its relevance with other subjects like operating systems, Networks, Databases, software engineering etc. this paper focused on the various applications of major graph theory that have relevance to the field of computer science and applications.

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Challenges in Online Subjective Examination Systems : An Overview

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ABSTRACT

As technology advances, the use of computers has rapidly expanded, as has the interest in researching beneath the computer space in areas such as biometrics, natural language processing, human computer interaction, artificial intelligence, and so on. Even the pandemic due to covid-19 has also created a necessity of having online examination. Trends of objective examination for such courses are currently accessible, but various courses require assessment in a traditional way so that the candidate's subject understanding can be assessed, which requires subjective evaluation, i.e. subjective based examination. Thus this paper discusses the major challenges of having online subjective exam and suggests a theoretical model as solution.

I. INTRODUCTION

The need for automated question answering systems grows as users struggle to navigate the wealth of online information now available, we need systems that allow a user to ask a question in everyday language and receive a quick and succinct answer with enough contexts to validate the answer, current search engines are capable of returning ranked lists of documents; however, they do not provide answers to the user [1]. Different queries are provided by the user in QA with the goal of receiving accurate answers in Question Answering Systems. Question Answering is the ideal solution for retrieving valid and accurate answers to user questions asked in natural language rather than query. A lot of progress has been made in QA for languages such as English, Chinese, Japanese, and Korean. In the field of information retrieval, question answering is a specialized area. There are numerous question-answering systems, each with its own set of applications. Based on the source of answers, the Question Answering System (QAS) has a wide range of applications. Such as information extraction from documents, language learning, online examination systems, human-computer interaction, document management, document classification, and many others, Structured data and semi-structured data are the two types of data in a question answering system, the primary goal of a question answering system is to retrieve answers to questions rather than entire documents, Open domain and closed domain are the two types of question answering systems. Open domain systems are primarily web-based and have no era restrictions, whereas closed domain systems have limited work domains (e.g., medicine, weather forecasting, and so on) [2].

II. TYPES OF QUESTION ANSWERING SYSTEM

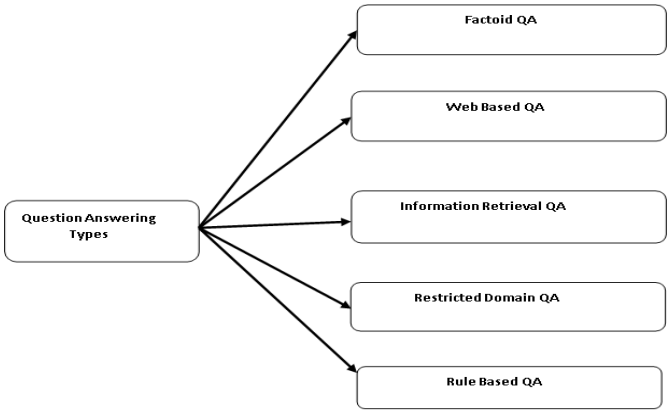

Fig. 1: Types of Question Answering System

2.1 Factoid Question Answering System

Question Answering (QA) is the process of eliciting information. In response to natural stimuli, provide brief, relevant textual responses. Language problems Factoid QA is a subset of QA that focuses on questions with syntactic and/or semantic answers Entities, such as company or person names. The introduced QA system uses a typical architecture composed of three sequentially linked components, Question Processing (QP) that identifies the question type, Passage Retrieval (PR), that removes a small number of pertinent passages from the underlying transcripts and finally, Answer Extraction (AE), which extracts and ranks accurate answers from the past [3].

2.2 Web Based Question Answering System

QA on the worldwide web with the widespread use of the internet, a massive amount of data is available; the internet is one of the best places to get information. Search engines (such as Google, Yahoo, Alto Vista, and others) are used by web-based question answering systems to retrieve webpages that may contain answers to the questions. The majority of these Web-based QA systems are open domain, but some are domain oriented as well. The most of Web-based QA systems make a better effort to produce correct answers. Though these systems are mostly capable of handling WH-type questions, they lack the ability to produce accurate answers. Instead, these systems retrieve relevant passages that contain keywords to extract answers from the knowledge base, which necessitates an additional process to obtain an exact answer [4].

2.3 Information Retrieval Question Answering System

The Information Extraction (IE) system parses the questions or documents returned by IR systems using natural language processing (NLP) systems. The IR/IE-based QA systems rely on a knowledge base, which necessitates an extension to the Correlated Element (CE) and General Element (GE) components to handle yes/no questions in the text. Some IR-based systems, such as AskJeeves and LaSiE, perform text analysis using basic modules such as Tokenizer, Sentence splitter, Parse process, Name matcher, and Discourse Interpreter [3].

2.4 Restricted Domain Question Answering System

In order to correctly answer the questions, this type of Question Answering System requires linguistic support to understand the natural language text. An effective method of improving QA system accuracy is to limit the domain of questions and the size of the knowledge base, which resulted in the development of restricted domain question answering systems Restricted Domain Question Answering (RDQA). RDQAS is not concerned with language comprehension; rather, it is concerned with a specific set of domain rules. Current RDQA systems are limited to specific domains such as railways, medicine, weather forecasting, and geographic systems, among others. The RDQA systems employ Internet Explorer engines that include web crawlers and wrappers. Web crawlers are used to select a set of extraction rules that can extract domain information, while wrappers are used to retrieve relevant domain-oriented Webpages that contain answers. RDQA first analyses questions and converts them into Structured Query Language (SQL) statements, which are then processed to retrieve data from a database [5].

2.5 Rule Based Question Answering System

The rule-based QA system is a supplement to the IR-based QA system. Rule-Based QA does not rely on deep language understanding or sophisticated approaches. To achieve accuracy in the answers retrieved, a wide range of NLP techniques are used. Some well-known rule-based QA systems, such as Quarc and Noisy channel, generate heuristic rules based on lexical and semantic features in questions. It generates rules for semantic classes such as who, when, what, where, and why for each type of question. These Rule Based QA systems begin by establishing parse notations and then generate training and test cases using the semantic model [6].

III. ISSUES OF SUBJECTIVE EXAMINATION

The main issue with subjective examination is the explanation, example, and description given by students, which may use different words, i.e. synonyms, to frame the sentence but must have the same meaning and points for the answer to be correct. The size or length of the sentences in an answer is the second issue. Indirectly, the answer varies from person to person, necessitating significant effort to categorize them based on context. If we consider the problem of online subjective examination, it often necessitates a good command of the language, whether it is literature or a technical question paper, and thus it falls under the purview of Natural Language Processing [7].

Subjective questions can be answered in as few as a few paragraphs or as many as a few pages. As a result, evaluating subjective answers will take time because an evaluating strategy must be used while evaluating those questions. Examiners may become frustrated as the action is repeated numerous times, and the answers provided by students may be too ridiculous. Mistakes were made while evaluating the subjective questions' answers. As a result, many processes are required to correct the subjective answers. Human evaluation can be more effective in dealing with subjective questions such as subtle judgments, complex reasoning, and attitude expression. However, the human evaluator spent a significant amount of time, sensitivity, and skill evaluating the responses in order to receive feedback after a delay for scoring an inexperienced examiner would reduce the accuracy with which subjective answers were evaluated and would create a plethora of redundant processes to correct the evaluation. SQ&A System evaluates subjective answers in an efficient manner in order to save time. Furthermore, by executing the algorithms, the system assists examiners in increasing the accuracy of evaluating subjective questions. Aside from that, the system could assist lecturers in keeping track of the students' records, allowing lecturers to gain a better understanding of the students' academic standing [8].

IV. PROBLEMS OF ONLINE SUBJECTIVE EXAMINATION

In determining the correct answer to subjective questions, the online examination system heavily relies on syntax match. To determine in-depth knowledge comparable to that of traditional examination systems, the system should consider semantics when evaluating the answer. Semantic evaluation is required because there are various points of view and assumptions about what is essentially the same concept. As a result, without at least some semantic knowledge, evaluating and comparing user inputs to the designated correct answer is impossible [9].

V. PROPOSED SYSTEM:

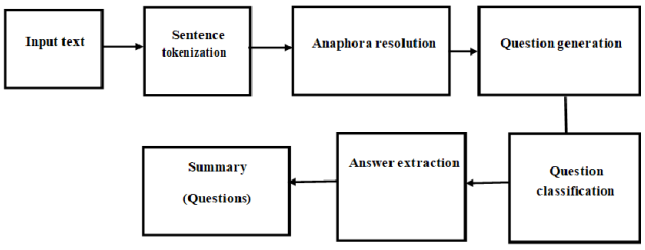

Fig 2: shows work flow diagram

5.1 Input text:

In this phase input is considered in the form of text document and it is given to the next phase for further processing.

5.2 Sentence tokenization:

In this phase the text documents is tokenized into sentences [10].

5.3 Anaphora resolution:

In this phase anaphora resolution is applied. Anaphora resolution is used to resolve pronoun which refer to previous or next item in the context. [11].

Example: - Alex ate all of his lunch, but still he was hungry.

In this example his, he refers to Alex.

5.4 Question generation:

In this phase questions are generated, resolved sentences and simple sentences get from anaphora resolution phase for question generation. Linguistic techniques such as tokenization, POS tagging and parsing and rule based approach are applied to generate question. Questions are of two types that are WH type and yes/no type [12].

5.4.1. WH type:

WH type questions include who, what, when, where, why, which and how.

Table 1: Shows the types of WH questions

Questions	Meaning	Example
Who	It refer to Person	Who are you?
What	It refer to object, idea, action	What is your profession?
When	It refer to time	When is mother's day?
Where	It refer to location	Where is your home?
Why	It shows the reason	Why are you so upset?
Which	It ask about choices	Which is your favorite place?
How	It indicates various things such as way, degree, quality, etc.	How are you?

5.4.2. Yes/no type:

Yes/no questions are mostly start with an Auxiliary verb and expect response of answer in the Yes or No form.

For example: Do you like my new car?

Can you suggest me? Is this good a mobile?

5.5 Question classification:

Question classification is plays important role in the QA system by identifying the question type and consequently the type of the expected answer. Therefore, the questions are classified by its type, like as WH type (what, why, who, how, when, where questions, etc.) and yes/no type.

5.6 Answer extraction:

In this phase answers are extracted. Firstly the syntax of questions are checked by using POS tag, if it is correct then it will pass for answer extraction phase.

Answer extraction is the process of extract an exact answer from a relevant text snippet. Answer extraction is done by using unigram, bigram, and trigram and four gram method. Total similarity between the question and every sentence in the passage are calculated by using cosine similarity. After extracting answer the POS tag is applied to check the syntactic correctness of answer.

5.7 Summary generation:

Summary generation phase gives emphasis on question selection. The question selection components select a set of candidate questions that are relevant to text document. We have applied

extractive text summarization for generating question-based summary.

VI. CONCLUSION

The Question Answering System is the ideal solution for repossessing valid and correct answers to candidate's questions requested in natural language rather than query. Like different queries provided by the user on QAS the main goal of that system is accurate answer receiving. Online subjective examination is need of time, it is too complex due to the expressive power, vocabulary used and understanding of the subject is involved of every individual and all this courses have large variations of subject & the writing style i.e. answer varies from person to person. The work is focused on brief introduction of Question Answering System, types of QAS factoid based question answering system focuses on semantic entity based question, in web based QA systems are mostly clever of supervision WH-type questions, Information retrieval QAS components to handle yes/no questions in the text. In Restricted domain QAS is concerned with a specific set of domain rules. The Rule Based QA systems build by founding parse notations and then produce training and test cases using the semantic model, We have also discuss Issue of Subjective Question Answering System the basic problem of subjective examination is explanation, example, description by given student. The current online subjective examination is heavily relies on syntax match to semantic match is different meaning of that answer, and also explain a proposed system of that work flow diagram.

VII. ACKNOWLEDGMENT

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Emerging Trends in Teaching and Learning Mathematics: Mathematical modelling by simulations

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ABSTRACT

Mathematics education has changed a lot in last 2 years. Due to pandemic covid -19 Some of these changes, like the use of computers, are very visible and are being implemented in mathematical education quite extensively. There are other, more subtle trends that may not be so obvious. We discuss some of the simulators and how they could, or should, influence the future of mathematical education.

I. INTRODUCTION

We live today in a society that is undergoing constant change with the evolution of science and technology and now the individual has contact, at an earlier age with the technological resources. Instruments such as mobile computers and devices are part of the current culture and everyday reality. Therefore, technology takes on an important function in terms of educational support in the education system. In this new reality it is necessary to search for new teaching methodologies, and mathematics teacher need differentiated and consistent educational tools with the reality in which students are entered. The school has to be closer to his time, searching through ICT means to harness the full potential of each student - improving in this way, the act of teaching and learning allying technological advances. Using ICT can transform the dynamics in math classes, making the lectures integrated to practice and providing resources that help in securing content and approach of theory with everyday life. ICT can be in a mathematical laboratory that experience, develop intuition, conjecture, prove, show and "see the mathematical situations" in a practical way. For this reason, ICT has become a valuable teaching tool, offering great possibilities to education. It can produce significant changes in teaching methods and the way in which students can access and interact with the mathematical knowledge. Among the resources of ICT, mobile devices have been shown to be very promising. From the great expansion of mobile technologies, mobile learning was bet in the current environment for teaching and learning in various subjects

II. OBJECTIVES

In this paper, we discuss some trends that may not be so obvious in Mathematics .The goal of this paper include (a) to compare changes in yesterday and todays Mathematics classroom and providing students with the opportunity to learn specific technological resources in Mathematical context (b) focusing

teacher attention on how and when to use technology appropriately in Mathematics classrooms and for assessment.

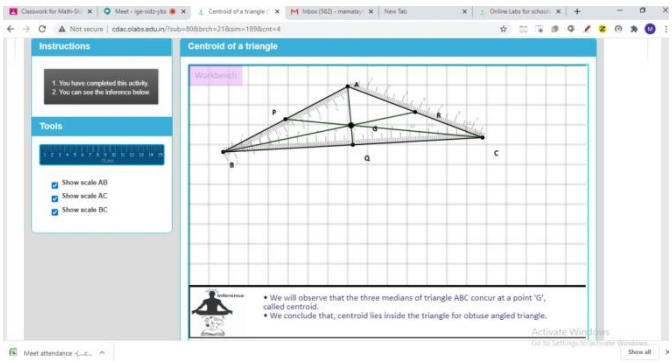
III. TRENDS IN MATHEMATICS

Yesterday's Class room	Today's classroom
Teacher showing students how to solve questions and students copying steps from the board	Students working together with genuine Math tasks receiving guidance from the teacher when needed.
Students memorizing procedures to solve routine problems	Students applying Mathematical and logical reasoning to solve unique problems.
Students working independently on multiple similar questions	Students working together communicating about the mathematics they are using.
Mathematics seen as a collection of isolated concepts and procedures	Mathematics as a way of understanding interpreting and describing our word. Making connections between concepts and real world applications

IV. EMERGING TRENDS IN MATHEMATICS

1) Mathematical experiments using online labs

The OLabs is based on the idea that lab experiments can be taught using the Internet, more efficiently and less expensively. The labs can also be made available to students with no access to physical labs or where equipment is not available owing to being scarce or costly. This helps them compete with students in better equipped schools and bridges the digital divide and geographical distances. The experiments can be accessed anytime and anywhere, overcoming the constraints on time felt when having access to the physical lab for only a short period of time It is easiest to see this about experimentation with Maple, Mathematica , Matlab. These programs open for us a range of observations and experiments which had been inaccessible before the computer age, and which provide new data and reveal new phenomena..



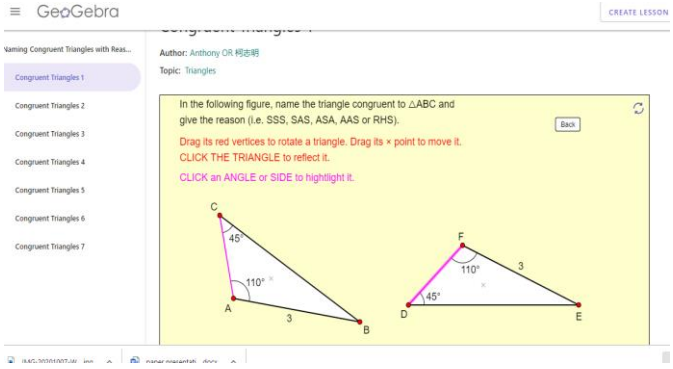
Link: simulators For Math Lab Activites

http://cdac.olabs.edu.in/?sub=80&brch=21&sim=189&cnt=4

2) Interactive Geometry Application

One way to introduce teacher candidates to a particular piece of technology is through classroom-ready, published materials. This is particularly useful when the software is well established and used regularly in classrooms After becoming familiar with the software from the activity, discussions take place on the appropriate uses of the technology. In the case of the interactive geometry software, teacher candidates should recognize several potential uses of the software in a high school geometry course. For example, appropriate use of the software can reinforce properties of similar triangles in students' minds. The preservice teachers should also recognize that the interactive component of the software allows their students to see that corresponding angle measures remain equal and that corresponding ratios of sides remain equal during actions that change the dimensions of the similar triangles. Preservice teachers reflect on the ability of the software to have students discover these properties, rather than simply telling their students, thus creating a more student-centered classroom environment. These future teachers should also recognize the need to transfer the knowledge gained from the interactive domain to

problem situations away from the technology, which leads to discussions of how this might be accomplished.



Link
https://www.geogebra.org/m/ds9uKfRC#material/UTdM97b7

3) Mobile Learning in mathematics teaching

One of the ways to innovate in the educational environment through ICT is the use of mobile devices, this mode known as Mobile Learning. The term Mobile Learning or m-Learning is a concept associated with the use of mobile technology in education and can be considered as the intersection of "mobile computing" and "e-Learning" to produce an educational experience anywhere and anytime. Mobile learning has the potential to become an integral part of teaching and learning processes, it is increasingly common for students to have and use mobile technologies. The m-learning is among the new trends to transform teaching and learning processes. They allow you to learn anytime and anywhere, making the formal and informal learning to approach, building new dynamic and stimulating environments for students .Being constantly connected, ease of communication and content sharing, and easy location information makes these devices can perform different tasks related to learning,

4) Advantages of teaching using virtual classes

Virtual Classroom is the most important and efficient way to reduce distance barrier in education and collaboration. Virtual classroom has many advantages over traditional classrooms for teaching and learning 24 X 7 from anywhere.

Virtual Classroom eliminates distance barrier completely, you don't need to travel for teaching and learning purpose, Virtual Classroom gives you freedom to teach and learn from anywhere and at any time Virtual classroom eliminates the limitation of time and location. Learners have the freedom to study, finish assignment, engage with other participants, absorb learning content, and take exams at any time that fits best of their schedule.

Students can join Virtual Classroom using any Internet enabled device such as PC, Laptop, Mobile, Tablet and so on. You don't require higher bandwidth to access Virtual Classroom, it utilises your own Internet connection and adjust accordingly. It allows business and education institute to create multimedia learning content using audio, video, images and text, which is comprehensively practical. All participants access the same learning material from different locations. Another advantage of Virtual Classroom is that people find it interesting for sharpening their digital skill. VC helps to increase knowledge and content retention of your subject and digital skill as well since you are learning the things online.

Instead of waiting for weeks to receive scores of conducted Test/Exam, this solution allows to have online progress reports. Which helps to increase students' academic performance and achievements. Virtual classroom is beneficial from the affordability point of view. The cost required to set up a classroom at multiple locations is much higher than Virtual Classroom comparatively. It integrates interactive whiteboard and many annotation tools for topic explanation. Allows instant messaging and hand-raise option. Provides secure streaming.

GeoGebra is free dynamic mathematics software for schools that joins geometry, algebra, and calculus. Help, examples, screenshots, and more are available online. The GeoGebra Wiki is a free pool of educational materials for GeoGebra where anyone can contribute and upload materials.

5) Assessment using tools

Although classroom teachers have long used various forms of assessment to monitor their students' mathematical learning and inform their future instruction, increasingly external assessments are being used by policy makers throughout the world to gauge the mathematical knowledge of a country's students and sometimes to compare that knowledge to the knowledge of students in other countries. As a result, external assessments often influence the instructional practices of classroom teachers. The importance given to assessment by many stakeholders makes assessment a topic of interest to educators at many levels. Google form is a free online is tool of assessment from Google* which allows users to create forms, surveys, and quizzes as well as to collaboratively edit and share the forms with other people. Math teachers can use Google forms to assess their students at the beginning of the class and Check pre-existing knowledge. Math teachers can create quick quizzes using basic Math concepts such as equations, graphs, and statistical display for their students at all levels. Google Forms lets you create a survey with lots of different kinds of questions:
Short answer, Long answer, multiple choices.

V. HANDHELD DATA ANALYSIS

One of the easiest technologies for pre-service teachers to learn, and yet one of the most adaptable for classroom instruction, is graphing calculator technology. Still, too few secondary school mathematics teachers are comfortable using graphing calculators or know how to use them effectively for classroom instruction. A primary goal of the technology methods course is to provide instruction and experience with handheld technology. Utilizing graphing calculators in a statistical application is one way to meet this goal. Recording, graphing, and analyzing data are important skills in mathematics, as well as in everyday life. The notion that data exist everywhere in the world is important for students to realize. Additionally, the ability to organize data provides a person with quick numerical and visual representations of the data and the power to predict, to within a predetermined degree of accuracy, future related events based on the data. An introductory lesson for managing data using handheld technology is to enter and graph party affiliations of the presidents of the United States. One of the issues that should be raised by pre-service teachers involves the best visual representation of the political parties of the presidents. They should discuss the advantages and disadvantages of their bar graphs and circle graphs, as well as other common graphical representations. Although the graphs can be obtained from computer spread sheet technology, students must recognize the importance of being familiar with handheld technology as well. We want our teacher candidates to be capable and experienced with various technological tools so that they are comfortable using the technology available to them in the schools in which they will be teaching. One required activity of the course is to develop a problem involving the collection, graphing, and analysis of data for middle school or high school mathematics students to complete. . The activity extends the relatively simple task of representing data using handheld technology and includes more statistically rigorous analysis of the presidential ages. The activity highlights the mathematical power available to most students to make sense of the world around them using statistical analysis.

VI. CONCLUSION

Teachers will use technology appropriately and effectively in their mathematics classrooms if they are familiar and comfortable with the technology and, especially, if they have had successful experiences with the technology in an instructional environment. Additionally, teachers who are able to use today's technology in the classroom will be prepared to learn and utilize tomorrow's technology

Today's middle school and high school students were born into a world with technology. Using technology during mathematics instruction is natural for them, and to exclude these devices is to separate their classroom experiences from their life experiences. One objective in preparing teachers for the future is to ensure that their classrooms will include the technology that will be commonplace for a future generation of mathematics learners, thus ensuring that the mathematicians, mathematics educators, and citizens of tomorrow experience harmony between their world of mathematics and the world in which they live.

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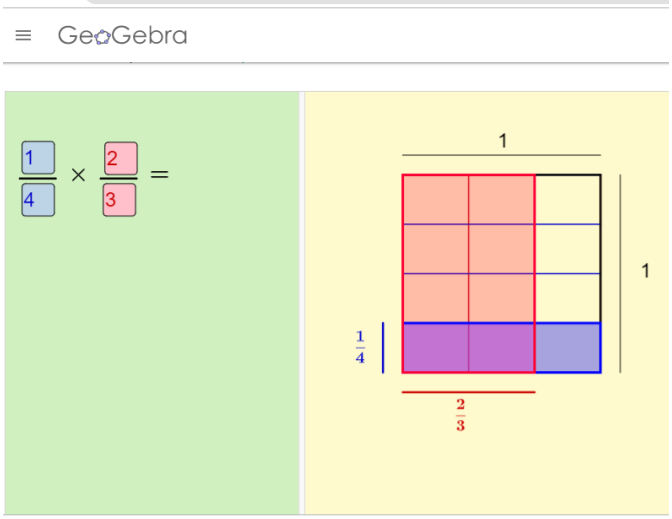

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It Is Time to Find an Equilibrium

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ABSTRACT
The law making should aim at protection of man and nature. There is a an ever-growing bio collapse on account of over utilization caused by ever increasing population and the advancement of technology. The movements started in sixties shed light on and drew attention to multifarious environmental issues. There came up debates. The use of plastic has been banned by the Governments.

Keywords: Environment, Green Chemistry, Ecosystem Sustainable, Toxic, Pesticides, Metrics, Paradigm, Catalyze Acid Rain.

I. INTRODUCTION

The voluntary environmental agreements provide platforms for companies to be recognised for moving beyond the minimum regulatory standards to support the development of best environmental practice. We are integral part of an ecosystem. There is an inevitable inter dependence of each other for survival in the life we get on this planet. There is a dire need for deep thought over the resource management and guard of the varied eco systems in soil, pond, river, forest etc. to make earth to be a living planet. Our chance to last on this planet very much rest on on how we delicately handle the ecosystem about us.

Sustainable in very simple terms is just a different way of thinking about how chemistry and chemical engineering can be done. Over the years different principles have been projected that can be used when thinking about the design, expansion and performance of chemical products and processes. These ideologies enable scientists and engineers to look after and advantage the economy, people and the planet by finding ingenious and resourceful ways to cut waste, preserve energy, and discover substitutes for hazardous materials.

It is remarkable to note that the extent of these of green chemistry and engineering doctrines go beyond concerns over threats from chemical venomousness and encompass vigour safety, waste reduction, and life cycle contemplations such as the use of more maintainable or renewable feedstock and scheming for end of life or the final character of the product.

Green chemistry can also be demarcated through the use of metrics. While a unified set of metrics has not been established, many ways to enumerate greener procedures and products have been strategic. These metrics include ones for mass, energy, hazardous material decrease or abolition, and life cycle environmental effects.

The distinctive, scientific book of Rachael Carson, Silent Spring in 1962 outlined the debris that certain chemicals had on local bionetworks. The book served as a wake-up call for the public and scientists alike, and inspired the modern ecological movement. In

1969, Congress recognized the importance of the issue and passed the National Environmental Policy Act (NEPA) in the USA. The law's goal was to "create and maintain conditions under which man and nature can exist in productive harmony," and called for a Presidential Council on Environmental Quality. The EPA's first major decision was to ban the use of DDT and other chemical pesticides. Congress passed a series of regulatory laws to stop the environmental contamination, such as the Safe Drinking Water Act in 1974. In the late 1970s, the discovery and publicity surrounding Love Canal in Niagara Falls, NY scandalized the chemical industry. At this and other locations, thousands of barrels filled with chemical waste - which had been hidden by chemical companies over the previous decades - rusted through, leaking lethal chemicals into the soil and contaminated groundwater.

The activities of EPA were focused mainly on toxic waste clean-up and obvious toxins, but a archetype shift began to occur among chemists. Scientists, who came of age during the decades of growing ecological awareness, began to research avenues of preventing toxic waste in the first place. Leaders in the industry and in government began international conversations addressing the problems and looking for preventative solutions.

By 1980s the Organization for Economic Co-operation and Development (OECD), an international body of over 30 industrialized countries, held meetings to find a solution for ecological concerns. They made a series of international recommendations which focused on a co-operative change in existing chemical processes and pollution prevention. The Office of Pollution Prevention and Toxics was established within the EPA in 1988 to make easy these environmental goals.

The term 'Green Chemistry' was coined by Staff of the EPA Office of Pollution Prevention and Toxics. This decade marked speeded up approval of pollution prevention and the establishment of green chemistry as a lawful scientific field. The Pollution Prevention Act of 1990 marked a regulatory policy change from pollution control to pollution preclusion as the most helpful approach for these environmental issues. Kenneth G. Hancock the Chemistry Director at National Science Foundation (NSF), made a point to openly crusade this approach as a lucratively practicable system. Chemists across the globe agreed that this could overturn the manufacturing disposition toward environmental weathering.

The European Community's Chemistry Council published papers on the subject, including the influential work, in early years of 1990 "Chemistry for a Clean World". The first conference based on these ideas, "Benign by Design: Alternative artificial devise for Pollution deterrence," was held in 1994 in Chicago. In 1995, the US EPA received support from President Bill Clinton to establish an annual awards programme giving importance to scientific revolutions in academic world and industry that advanced Green Chemistry. This created the annual Presidential Green Chemistry Challenge Awards. The University of Massachusetts at Boston established the field's first Green Chemistry Ph.D. program in 1997.In that same year, in cooperation with the EPA, Dr. Joe Breen, a retired 20-year staff member of the EPA and chemist, Dennis Hjeresen, co-founded the Green Chemistry Institute (GCI) as an independent non-profit with Mary Kirchoff as Assistant Director and a staff devoted to working solely to advancing green chemistry.GCI established the Green Chemistry & Engineering Conference in 1997, which has continued to convene annually. The 12 Principles of Green Chemistry chalked out within this work declared a viewpoint that stimulated scholastic and industrial scientists at the time and continues to guide the green chemistry movement till date.

The Green Chemistry Institute became a division of the American Chemical Society in 2001, the largest professional scientific society and membership organization for chemists in the world. The Nobel Prize in Chemistry was won for research in areas of chemistry that were largely seen as being green

chemistry in both 2001 (Knowles, Noyori, Sharpless) and 2005 (Chauvin, Grubbs, Schrock). These Nobel Prizes helped solidify the significance of research in green chemistry and helped create a higher awareness among scientists that the future of chemistry should be greener. Green chemistry groups, journals, and conferences launched all over the world. Examples include:

1. The Mediterranean Countries Network on Green Chemistry (MEGREC)
2. The Royal Society of Chemistry's (UK) journal Green Chemistry
3. The Green and Sustainable Chemistry Network in Japan (co-organizers of the Asian-Oceania Conference on Green and Sustainable Chemistry)
4. The Centre of Green Chemistry of Monash University in Australia

The ACS GCI established an industrial negotiation for the Pharmaceutical industry in 2005, to catalyze and enable green and engineering into chemical productions. Since then, two additional roundtables for a chemical manufacturing and a formulator's roundtable have been conducted. Many successful industrial companies, whose products are based on the application of green chemistry and engineering, have been established, are selling everything from 'green' glue to sustainable water processing solutions.

In spite of the research progress in green chemistry and engineering, conventional chemical businesses have not yet fully embraced the technology. Today, more than 98% of all organic chemicals are still copied from petroleum. Green chemists and engineers are working to take their research and new findings out of the lab and into the board room through the creation of workable industrial goods that can be accepted by today's industry leaders. The ACS Green Chemistry Institute continues to be a clearing-house of information, connection, and research sharing through The Nexus Newsletter and Blog, the annual GC&E Conference, industrial roundtables, and a growing number of educational and research programs. In our efforts to improve crop protection, commercial products, and medicines, we also caused unintended harm to our planet and humans.

Towards the middle 20th century, some of the long-term negative effects of these advancements could not be ignored. Pollution choked many of the world's waterways and acid rain declined woods physical ailment. There were measurable holes in the earth's ozone. Some chemicals in common use were supposed to be causing or directly linked to human cancer and other adverse human and ecological health results. Many governments began to regulate the generation and disposal of industrial wastes and emissions. Green chemistry takes the EPA's authorization a step further and creates a new reality for chemistry and engineering by asking chemists and engineers to design chemicals, chemical processes and commercial products in a way that, at the very least, avoids the creation of toxics and waste. Green Chemistry is not politics. Green Chemistry is not a public relations tactic. Green chemistry is not a make-believe. Green Chemistry is desirable reality.

There is an urgent need to develop chemical procedures and earth-friendly products that will prevent contamination in the first place. Through the practice of green chemistry, we can create alternatives to dangerous substances we use as our source provisions. We can plan chemical processes that reduce waste and reduce insist on lesser waste creation. We can make use of processes that use smaller quantity of energy. We can do all of this and still preserve an economic growth and chances while providing reasonably priced products and services to an ever growing population.

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