

# An Improved Method of Dna Data Encryption using Xor Based Data Segments

D.Ratna Kishore, D.Suneetha, G.G.S.Pradeep

**Abstract:** Internet is developing each day. One of the most important factors is to provide security for data in internet. In fact that there are numerous number of security algorithm were proposed at the same time hackers are also working with various technique and introduced so many new algorithm to break the security. DNA cryptography is one of the rising regions of computer science. In this paper we proposed a new technique to provide security for data using DNA cryptography. In this we use 256 DNA ASCII table instead of 64 lookup table and key is generated in random manner based on the length of the plaintext\*4. In this proposed technique the original plaintext and key was divided into 4 equal parts. The proposed algorithm produces better results when compared to other existing algorithm in terms of encryption and decryption times.

**Keywords:** DNA Cryptography, Encryption, Decryption, PCR

## I. INTRODUCTION

Data and information has become very important resource in present century and the process of providing security is also important parameter. So many ways are present to provide security to the data[1-4]. Cryptography is also one of the most important components in computer security. There are multiple number of cryptography algorithm of multiple number of types are available. There are so many defects are present in some existing conventional and classical cryptography techniques. So the attackers easily break the cipher text and create many problems to the authorized persons. There is no relation in between cryptography and molecular biology. Originally there are not relevant to each other but in depth study of molecular biology and also modern biotechnology DNA computing is present these two areas are work together to provide security for data[5]. DNA cryptography is the new field of science in the area of providing security for data. Many researchers introduced so many security algorithms with the help of DNA cryptography to hide the sensitive secret data [6-7]. Completely DNA cryptography is based on the biological problem. Generally the DNA computer not only performs computing just like a compute system it is also able to perform potency and function which a traditional computer system cannot perform.

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DNA computing is huge scale of parallelism and its computing speed is very huge like 1 billion times per second. Secondly DNA computing has large capacity of storage. In one cubic decimeter of DNA solution have tera bytes of data. Third DNA cryptography has low power consumption. So many techniques are used to carry DNA computation. Some of these techniques are

**Gel electrophoresis:** In this technique separate DNA fragments are used according to their length. A gel is prepared. The negatively charged molecules are placed are one side of this gel. The negatively charged molecular are moved to the positive gel[8].

**Polymer chain reaction:** PCR is having high amplification affection. This is used to amplify DNA molecules [11].

In DNA we can add binary segments to interpret data. Those are

A-00 C-01 G-10 and T-11

In this binary format is used For the purpose of data storage and transmission from one place to another place.

## II. RELATED WORK

Adi et al proposed a new scenario to link E-DNA for identify the DNA molecules and it is dynamic in nature. IT attempts to link the unit and to identify the interaction profile in the data communication. Mousa et al propose a new approach for data hiding using DNA cryptography. It uses the concept of reversible contrast mapping. This scheme uses two words to achieve reversibility on the contrast mapping [9].

Jin taur et al proposed a new advanced scheme in data hiding based on the look up table and it is called as Table lookup table substitution method. In this the plain text is replaced with the values of look up table and that replaceable data is transferred to the receiver as a cipher text and the look up table was modified randomly for every data transmission[10].

Mohamed [12] proposed a new innovation in the asymmetric cryptographic technique based on the protocol. The main advantage of the proposed algorithm is that it uses innovative DNA cryptography for sharing secret key among sender and receiver throughout the unsecured transmission.

Banahmed[13] discusses a new reference DNA sequence shared in two parties. Not only the sequence shared and the data is accessed from NCBL and EBI databases and the hacker is not able to access the database because the database is virtually created and accessed randomly. Yamuna [14] present a different encryption technique based on the binary strings. In this 4 different algorithms are present.

# ADAPTIVE CONFORMITY ROUTING PROTOCOL FOR WIRELESS SENSOR NETWORKS FOR LOAD BALANCING

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**Abstract**— The energy consumption is a great challenge in Wireless sensor networks that may affect the performance of the entire network. Even though many techniques are being still addressed to this issue, it is ongoing problem. One of the most energy efficient routing protocols is Geographic Adaptive Fidelity (GAF), which is the location based protocol. This reduces the use of energy by switching off some nodes that do not take part in routing. Load balancing reduces hot spots in sensor networks by spreading the workload across a sensor network there by increasing the life time of the sensor network. Here we use chebyshev sum metric for evaluation via simulation and this method is better compared to the routing based on Breadth first search(BFS) and shortest path obtained by Dijkstra's algorithm. By combining Geographic Adaptive Fidelity with load balancing, a considerable amount of energy can be saved that tends to extend the lifespan of the whole network.

**Index Terms**— wireless sensor networks; routing; energy efficient; load balancing.

## 1. INTRODUCTION

Remote sensor systems (WSN) are a self association remote system framework used to gather information from a machine outfitted with sensor hubs, and forward information to the sink hub This framework is constituted by the spatially disseminated self-governing vitality restricted smaller scale sensor hubs furnished with detecting, registering, and with correspondence capacities [1]. Systems of sensors are agreeable to help a great deal of genuine applications that shift extensively regarding necessities and attributes[2].

As sensor systems scale-up in estimate, viably dealing with the appropriation of the systems administration load will be of incredible issue By spreading the workload over the sensor arrange, stack adjusting midpoints the vitality utilization. This may prompt expand the normal life expectancy of the whole system by broadening the time until the point that the primary hub is out of vitality. Load adjusting additionally be utilized for diminishing clog problem areas, along these lines decreasing remote impacts. Another testing issue is to spare the vitality of the hub [6]. When sensor organization is finished, it is difficult to supplant or energize the battery.

## II.RELATED WORK

A variety of routing protocols have been proposed with different techniques to minimize the energy consumption and to increase the lifespan of the network. In [4], some of the techniques such as Data reduction, protocol overhead reduction, topology control, energy efficient protocols and Sleep/Active scheduling are focused. An example of single path load-balancing is Load-Balanced Ad hoc Routing (LBAR) algorithm proposed in [15] which uses traffic interference as a metric to distribute the network load and to avoid routing via heavily loaded paths. Multipath Routing Protocol (MSR) [16] is based on DSR and uses a Round Trip Time (RTT) to measure delays for different paths, which form the basis of its routing metric . In [6] , GAF protocol and it's working are considered. It also reviews the variety of new versions based on GAF protocol to make it better. Hierarchical Geographic Adaptive Fidelity (HGAF) is proposed to save the power of the nodes which increases the lifetime of whole network in[6].


Coordination-based data Dissemination protocol for wireless sensor networks (CODE) is proposed which is based on GAF protocol in [10]. In [11], TENT rule defines the method of finding the neighbor nodes with the angle and distance. HGAF uses a layered structure in which the entire area is divided into virtual grids. eHGAF extends the HGAF in which the place of the active sub cell is rotated. GAF & Co[12] maintain the connectivity of a network and avoids the routing tables. Some of the sensor network routing [17] [18] and QoS routing in Wireless ad hoc networks[19] ignore the load balancing issues. In many works such as in [20] [21] consider the base station as a resource rich focal point hosting the services such as securing the sensor network against vulnerabilities[22], data aggregation or monitoring of WSNs. Another protocol Energy efficient and Collision Aware (EECA)[23] takes energy of the nodes into account and it tries to avoid collision by choosing distant route paths.

## III. GEOGRAPHIC ADAPTIVE FIDELITY (GAF)

Geographic Adaptive Fidelity or GAF [6][7] is vitality mindful area based steering calculation .It is at first intended for portable specially appointed systems,

# Impact of PDS Based kNN Classifiers on Kyoto Dataset

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## ABSTRACT

This article compares the performance of different Partial Distance Search-based (PDS) kNN classifiers on a benchmark Kyoto 2006+ dataset for Network Intrusion Detection Systems (NIDS). These PDS classifiers are named based on features indexing. They are: i) Simple PDS kNN, the features are not indexed (SPDS), ii) Variance indexing based kNN (VIPDS), the features are indexed by the variance of the features, and iii) Correlation coefficient indexing-based kNN (CIPDS), the features are indexed by the correlation coefficient of the features with a class label. For comparative study between these classifiers, the computational time and accuracy are considered performance measures. After the experimental study, it is observed that the CIPDS gives better performance in terms of computational time whereas VIPDS shows better accuracy, but not much significant difference when compared with CIPDS. The study suggests to adopt CIPDS when class labels were available without any ambiguity, otherwise it suggested the adoption of VIPDS.

## KEYWORDS

kNN Classification, Kyoto Dataset, Network Intrusion Detection, Network Security, Partial Distance Search (PDS), Variance Indexing

## 1. INTRODUCTION

Network Intrusion refers to a number of techniques that allows the malicious users to penetrate into the computer networks and exploit the computing and network resources. Network Intrusion Detection System (NIDS) is a technology that uses network intrusion datasets and identifies the intruders by applying machine learning strategies on these datasets to detect malicious activities. A network intrusion dataset is a collection of network traces i.e., traffic captures from network for a period of time.

The quality and quantity of network datasets will aid machine learning strategies to build heuristic systems for given real-world problems. These heuristic systems will help the decision makers to ever cure risk. Early detection of intrusion helps in control and prevention of malicious activities in a system.

Machine learning algorithms are heuristic approaches to solve complicated problems for which a human designer unable to define the appropriate rules in an explicit form. It is very difficult to construct an efficient real-time NIDS especially for high speed network traffics.

To build such an ideal solution and evaluation of the same, different kinds of datasets are made available for researchers. One such detection system is Kyoto 2006+ which is a real-world data set and is nearer to the current network problems. This dataset is provided with class label hence

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# A Novel Approach for Lossless Image Compression for Cloud Computing Using Adaptive LZW Dictionary

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**Abstract:** Cloud computing is a powerful, cost efficient platform for providing heterogeneous services to the consumers over the Internet. Moreover storing data in the cloud storage is a one of the key challenging issues now a day. In cloud environment universal data is available from different vendors. To avoid capital expenditure for hardware and software the image data must be reduced in size and they should have a better quality. Image compression is the one of the prominent techniques for data storage in cloud. The main aim of image compression is to reduce the size and also it provide better quality image with better compression ratio. This paper proposes improving compression method which uses a SPIHT, bit plane slicing and adaptive LZW dictionary. The limitations is decreased by using SPIHT and bit plane slicing for colored and also gray scale images. The compression ratio of the proposed method is better than the standard method for both colored and gray scaled images. An experimental result for the proposed methods is better than existing methods for different types of image.

**Keywords:** Image Compression, SPIHT, LZW, Bit Slicing, PSN.

## I. INTRODUCTION

In cloud computing environment data is available in different formats like text, images, audio and videos. Storing data is also one of the prominent parameters. For that we have different approaches and techniques are available. Image compression is also one of the prominent techniques if the data is in the form of images. Image compression deals with reducing the amount of data required to represent a digital image by removing of redundant data. The main aim of image compression is which makes storage and transmission of images more practical. The basic requirement of maintaining image quality is easily translated into two basic quantitative parameters:

1) Rate of digital image data transfer or data rate (Megabit per second or Mb/s)

2) Total amount of digital storage required or data. With image compression both data rate and data capacity are reduced to great extent. So less space, less time and less bandwidth are required for storage and transmission of digital images.

Two categories of data compression algorithm can be distinguished: lossless and 'lossy'. Lossy techniques [4] cause image quality degradation in each compression/ decompression step. Careful consideration of the human visual perception ensures that the degradation is often unrecognizable, though this depends on the selected compression ratio. In general, lossy techniques provide far greater compression ratios than lossless techniques. However, in this paper, we will focus on the topic of SPIHT, Bit plane slicing and adaptive LZW Huffman lossless compression [5]. The SPIHT and LZW compression algorithms are the powerful and useful techniques for lossless data compression and it gives high compression ratio for textual data as well as image data. In this paper we consider SPIHT, variant of the Huffman code called adaptive Huffman code or the dynamic code, which does not need to know the probability of the input symbols in prior or in advance.

### 1.1 SPIHT Compression

SPIHT was designed for optimal progressive transmission, as well as for compression. One of the important features of SPIHT (perhaps a unique feature) is that at any point during the decoding of an image, the quality of the displayed image is the best that can be achieved for the number of bits input by the decoder up to that moment. Another important SPIHT feature is its use of embedded coding. This feature is defined as follows: If an (embedded coding) encoder produces two files, a large one of size M and a small one of size m, then the smaller file is identical to the first m bits of the larger file.

Suppose that three users wait for you to send them a certain compressed image, but they need different image qualities. The first one needs the quality contained in a 10 Kb file. The image qualities required by the second and third users are contained in files of sizes 20 Kb and 50 Kb, respectively. Most lossy image compression methods would have to compress the same image three times, at different qualities, to generate three files with the right sizes. SPIHT, on the other hand, produces one file, and then three chunks—of lengths 10 Kb, 20 Kb, and 50 Kb, all starting at the beginning of the file—can be sent to the three users, thereby satisfying their needs.

# ARCHIVES


## Analysis of Theoretical Sampling Distributed using combined LPETM and ANOM subgrouping


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 Kotte Sandeep\*, R.Satya Prasad, K.Sowmya

### Abstract

A whole new software reliability technology is introduced that predicts expected failures as well or superior to anything existing software reliability models, which is simpler than any of the models that approach it in predictive legitimacy. The model consolidates both execution time and schedule time components, each one off and this can be inferred. The model is assessed using genuine information. Logarithmic Poisson Execution Time Model (LPETM) is a software reliability model which predicts the normal disappointments like failures and henceforth related reliability quantities superior to existing software models. It utilizes Non-Homogenous Poisson Process (NHPP) with a mean esteem work that is reliant on exponentially falling flaw recognition rate. The Maximum Likelihood (MLE) is an aspect devised to accurate the LPETM model's required intriguing determinations. The Analysis of Means (ANOM) is the best graphical statistical techniques for contrasting group means to grand mean to uncover convincing contrasts among means which are generated through adopted LPETM. The model is evaluated by using Brazilian Electronic Switching System (BESS) for 1500 subscribers with 70 data entries and 100000 random percentiles generated by using Python programming.

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# A. Amalgamative sentiment analysis framework on social networking site

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## Abstract

Sentiment analysis is the most widely used in many applications. Knowing the sentiment analysis for any of the dataset becomes most important to know the sentiment for the given inputs. In this paper, the amalgamative sentiment analysis framework developed for dividing the positive and negative emotions taken from the user's tweets. In this system, an integrated social networking is developed which is integrated with ASAF. Results show the classification of these tweets.

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PAPER • OPEN ACCESS

# Ensemble feature analysis classifier for sentiment analysis using convolutional neural networks

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## Abstract

Text mining is the worldwide fast growing domain in research. Sentiment analysis is the one of the sub domain in the text mining to extract the sentiment from the various texts available in the internet and from other sources. Various existing systems are implemented to get the sentiment analysis with the migration of natural language processing algorithms (NLP) and artificial intelligence algorithms. Various issues identified in the text mining with sentiment analysis are solved very rarely. According to the previous research, deep-learning and artificial intelligence based TSA prediction method that comprises of a stacked auto encoder (SAE) model that is used to learn generic linguistic and text semantic features But the system not reached up to the mark. In this paper, Ensemble Feature Analysis Classifier to incorporate the new domain dimension within the rating and text based sentiment analyzer. Implementation of this proposed prototype validates our claim and highlights our efficiency in supporting multiple dimensions during sentiment analysis.

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Dr.M.ARUNA SAFALI

## ” Comparative Analysis of Sentiment Analysis Techniques “

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# Comparison of Ensemble Sentiment Analysis using Convolutional Neural Networks

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**Abstract:** Sentiment analysis is the fast-growing field in the present world and this is also the part of the data mining. Analysing the sentiments of various documents, texts and reviews can be done by the various application or tools. To improve the results for given inputs various NLP, AI and deep learning algorithms are implemented for the better results. The proposed sentiment analyzer is language independent i.e this can analyze any of the language called as multilingual sentiment analysers. Comparative results show the performance of the various algorithms.

**Keywords:** Artificial Intelligence, NLP, text mining.

## I. INTRODUCTION

Various emotions are present in the form of text called sentiment analysis. SA classifies the various emotions such as positive, negative, stress and neutral. Sentiments are analyzed based on the sentences, tweets, reviews, and various documents. This can be also analyzed the opinion of the users. Text may in various formats i.e document format, text file format and concept format. Various classification techniques are implemented to get sentiment analysis for the various types of documents, sentences etc. To get the better sentiment analysis (SA) various NLP and deep learning techniques can be utilized for the better analysis.

In general, some subjective sentiment expressions are pointed out necessarily and this is explained by Wilson et al. [2]. For the short documents, it is known that there is no basic difference between document and sentence level classifications [3]. In many applications, it is important that document level or sentence level classification text does not supply needed information or opinions on various features of every entity. Based on the above level it is known that these are not efficient because of their nature. In this paper, the proposed level of sentiment aims to classify the sentiment based on the specific aspects of objects. Firstly in this, to find the objects and their features or aspects. Various opinions are given by the various opinion holders for the same object. For example, "The food in this restaurant is not good but the cost of each item is low compared with other restaurants". This is taken consideration by the proposed aspect.

In the last few years, many applications and enhancements are done on SA algorithms and techniques. The proposed Ensemble Feature Analysis Classifier (EFAC) is implemented and this will take two parameters into

consideration i.e review rating and sentiment analysis for the given sentence which is done with artificial intelligence and with the convolutional neural network algorithm.

## II. LITERATURE SURVEY

This section, describes various sentiment analysis techniques.

Bruce and Wiebe made an effort to manually tag sentences as subjective or objective by different judges and the resultant confusion matrix was analyzed [19]. 14 articles were randomly chosen and every non-compound sentence was tagged. Also a tag was attached to conjunct of every compound sentence. Authors then attempted to identify if pattern exists in agreement or disagreement between human judges. Authors observed that manual tagging suffered due drawback of biased nature of human beings during tagging phase.

Subrahmanian and Reforgiato graded sentiments by the combination of adjective, verb and adverb [11]. In contrast to the algorithms that extracted the sentiments using adjective - verb combination or adverb - adjective combination, the model was trained using adjective, verb and adverb combination. The opinion was drawn from eight combinations of positivity or negativity of adjective, verb and adverbs in the reviews.

Cai et al. stated that solution for sentiment analysis should include a sentiment classification scheme as well as a sentiment topic detection scheme [15]. The sentiment classification component measured the relative sentiment (on a positive/negative scale) expressed by the words. The sentiment topic detection component detected the most significant topics hidden behind each sentiment category



## International Journal of Science Engineering and Advance Technology

### Efficient Conjunctive Cooperative Routing Schemes In Divergent Sensor Networks

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**Abstract** — Wireless sensor networks are faced by challenges not present in wired networks. Mobility of nodes or lack of fixed infra in wireless sensor networks gives rise to issues like route changes, link failures, and need for change of IP addresses. These reasons require changes at various layers of protocol stack. In such a situation, their lifetime is expected to be extended by cooperative packet forwarding. Albeit a few scientists have learned about collaboration in different WSNs, the greater part of them don't consider the heterogeneity in the qualities of each WSN, for example, battery limit, activity begin time, the quantity of hubs, hubs areas, vitality utilization, parcel measure or potentially information transmission timing, etc. In a heterogeneous situation, gullible lifetime enhancement with participation may not be reasonable. In this paper, we propose a reasonable helpful steering strategy for heterogeneous covered WSNs. It acquaints a vitality pool with keep up the aggregate sum of vitality utilization by helpful sending. The vitality pool assumes a job of merchant for reasonable participation. At last, reenactment results demonstrate the great execution of the proposed strategy.

**Keywords** — Wireless Sensor Networks, Fair Routing Overlapped.

#### INTRODUCTION

As of late, as remote sensor systems (WSNs) are broadly diffused, various covering WSNs developed on a similar region turn out to be progressively normal.

#### IP and Routing

The stations in remote system don't stay at the equivalent subnet because of versatility; subsequently either their IP delivers should be changed as well as the parcels ought to be sent to them. These prerequisites have lead to advancement of versatile IP Reference where the addresses are relegated to portable has powerfully and the bundles are fittingly sent to them. Session Initiation Protocol References handles versatility at the application layer. In SIP, the hub, when moves to a remote area, gets another IP address from the DHCP base-station, and continues its correspondence at the new IP address.

Taste straightforwardly bolsters name mapping and redirection administrations, which underpins individual portability – clients can keep up a solitary remotely unmistakable identifier paying little respect to their system area.

#### Delay Issues

The cell handoff delay is the timeframe between the minute at which the portable hub recognizes the subnet change, and the time at which it gets the principal bundle of it continuous correspondence in the new subnet. Existing versatility conventions have been for the most part intended for system, and application layers, and the dominant part of studies allude o the intrinsic portability bolster given by the remote system. The essential structure objective of any plan, that handles versatility, is to keep the handoff delay as less as could reasonably be expected. On the off chance that the applications are ongoing the this oblige on postponement turns out to be significantly increasingly critical, as the constant applications are exceedingly delay-touchy. Plans like portable IP and SIP exist that handle versatility at system and application layers separately, yet these are a few issues that are yet to be fathomed in these plans.

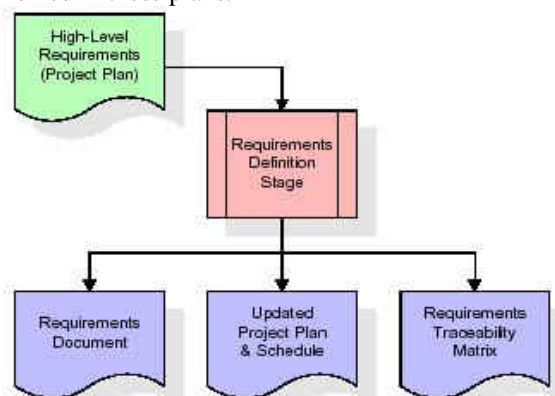


Fig-1, Architecture of the system

As of late remote sensor systems (WSNs) have gotten much consideration as a methods for gathering and using information from genuine world. The quantity of WSN applications has been expanding

## **A NEW INTRUSION DETECTION SYSTEM VICTIMISATION FUZZYSET CLUSTER ALGORITHMIC PROGRAM**

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**Abstract:** Intrusion detection is one of the major fields of research and researchers are trying to find new algorithms for detecting intrusions. Clustering techniques of data mining is an interested area of research for detecting possible intrusions and attacks. The present detection method different overview of existing Intrusion Detection Systems (IDS) along with their main principles. We propose new intrusion detection system based on a parallel particle swarm optimization clustering algorithm using the MapReduce approaches.. In our proposed framework for a Parallel Fuzzy Genetic Algorithm (PFGA) is developed classification and prediction over decentralized data sources. The model parameters are evolved using two nested genetic algorithms (GAs). The outer GA evolves the fuzzy sets whereas the inner GA evolves the fuzzy rules. During optimization, best rules are only distributed among agents to construct the overall optimized model. We implement our experiments K-means clustering algorithm and measured the performance based on detection rates and false positive rate with different cluster values. The KDD dataset which is freely available online is used for our experimentation and results are compared.

**Index Terms:** Network, Attacks, k-means Clustering, Security, Fuzzy Classification; Rule-Base; Fuzzy Logic System (FLS); Genetic Algorithm; Distributed Data Mining (DDM),

### **1. INTRODUCTION**

Intrusion Detection System (IDS) is a device typically another separate computer that monitors activity to identify malicious or suspicious events [1]. Traditionally network users usually use firewall as the first line of defense for security. But with attacking tools and means becoming much more complicated, simple firewall is difficult to resist various attacks [2]. On the other hand, anomaly-based IDSs are able to detect new attacks that have not been seen before. However, this model produces a large

number of false positives. The reason for this is the inability of current anomaly-based techniques to cope adequately with the fact that in the real world, normal, legitimate computer networks, and system usage changes over time [3]. This implies that any profile of normal behavior needs to be dynamic [4]. The pattern match against packet in network for worm signature detection [5]. We have used KDD dataset. Additionally the features were reduced to some level to have better accuracy using

## NEW INTRUSION CATEGORIZATION SYSTEM USED PARALLEL CLUSTERING METHOD

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**Abstract:** Intrusion Detection Technology is a research hotspot in the field of information security. This study introduces the types of traditional intrusion detection and data mining technology. The present article gives an overview of existing Intrusion Detection Systems (IDS) along with their main principles. Also this article argues whether data mining and its core feature which is knowledge discovery can help in creating Data mining based IDSs that can achieve higher accuracy to novel types of intrusion and demonstrate more robust behavior compared to traditional IDSs. In this research work new guidelines is proposed for an efficient GPU adaptation of Aho-corasick algorithm for regular expression matching. Also several techniques are introduced to optimization on GPU, including reducing global memory access, storage format for output table. In case of misuse detection, intrusion patterns are built automatically from a training data by the use of the random forest classification method. The adaptive immune system in our proposed architecture also takes advantage of the distributed structure, which has shown better self-improvement rate compare to centralized mode and provides primary and secondary immune response for unknown anomalies and zero-day attacks.

**Index Terms:** Artificial immune system, Innate immune system, Data mining, Random Forest and Weighted K-Means. Aho-Corasick, Graphics processing Unit, security, intrusion detection

### I. INTRODUCTION

With the rapid development of the internet, the various attacks, which emerge endlessly in the network, have become a major threat to network and information security [1]. Traditionally, network users usually use firewall as the first line of defense for security. But with attacking tools and means becoming much more complicated, simple firewall is difficult to resist various attacks; therefore people put forward a kind of technology which can discover in time and report unauthorized or abnormal phenomena in the system, named intrusion detection technology [2]. Recent exploits also suggest that the more sensitive the information that is held is, the higher the probability of being a target. Several Retailers, banks, public utilities and organizations have lost millions of customer data to attackers, losing money and damaging their brand

image [3]. In Multi pattern Matching algorithm we have to report all occurrence of pattern in given string. Multi pattern string matching use in number of application is network intrusion detection digital forensics, natural language processing [4]. For example Snort is open source network intrusion detection system which contained thousands of pattern that are match against packet in network for virus/worm signature detection [5]. They are correlation feature selection (CF) and minimal redundancy maximal relevance (mRMR). Another challenge of intrusion detection system is an imbalance between real and trained data [6]. Misuse detection has a key advantage is their high rate of accuracy in detecting known attacks. Their main drawback is the inability to detect novel attacks. Anomaly detection, built profiles based on normal

# A Novel Approach for Data Security for Cloud Data using Image Steganography and Genetic Algorithms

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**Abstract**—Cloud Computing is a powerful, flexible, cost efficient platform for providing IT services over the Internet. However Cloud Computing has various levels of risk factors because services are maintained by third party vendors and the most important information is handled by third party, so harder to maintain the security. Steganography is the one of the technique to provide security for secret data in inserting an image or video. In the most of the steganographic algorithms secret data is inserted in Least Significant Bit of an image but the hackers easily detect the algorithm and hack the secret data easily. In this paper proposed an approach based on the heuristic genetic algorithm for hiding secret data in the original image and instead of considering only Least Significant Bit and we also consider Most Significant Bit with the help of Image Segmentation technique. The proposed approach will be tested and analyzed for various color and gray scale images of different sizes for different length of secret messages. The performance of the proposed approach will be analyzed with various parameters like PSNR, MSE and the results are good compared with existing algorithms.

**Index Terms**— Heuristic Genetic Algorithm, Image Segmentation, PSNR, MSE.

## I. INTRODUCTION

In Cloud Computing environment, one of the vital parameter is to providing security for user's secret data. We have so many approaches like cryptography, Steganography and watermarking hiding strategies, with the help of this techniques we can hide the secret data in an image. Those techniques are suffered with some problem because in this environment data is maintained by third party from different locations of different users with different formats. In cloud environment data is accessed by third party and it is difficult to maintain the security. So it is necessary to have novel method which can have the capability of embedding data securely before placing into the cloud environment. For this in the proposed approach Steganography technique has chosen and image segmentation is utilized for maintaining of data secrecy.

Steganography is the art and the science to hide the secret data in the form of text, audio and video in an image (cover image). In other words, steganography is a one of the way to hide the secret data from unauthorized persons or which cannot know the presence of secret data for unauthorized persons or hackers.

There are several algorithms to hide the secret data in an image to protect it from unauthorized hackers. This paper introduce a new approach which will hide the secret data in LSB and MSB bits of the image with an heuristic genetic algorithm and image segmentation technique. Also, this proposed algorithm is used for

# Data Hiding using Cascading Feed Forward Network Prime Number Edge based Steganography

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**Abstract**—Steganography is one of the vital and popular techniques to protect the sensitive data from an unauthorized person or from third party. Now a day's providing security for data is one of the vital concepts. Due to this growing need for security of message, image steganography is become popular. The traditional steganography algorithms consists of Least Significant Bit embedding, but this technique known to everyone and easily detected by third party or hackers. In this Least Significant Bit embedding technique many of the algorithms are embed the secret data in sequential form. Instead of this if the data can be embedded in random pixels it leads to provide a better security. So in this a paper we present a novel approach to embed data in the prime number based edge pixels of the image by extending various least significant bit embedding algorithms. This prime numbers are also trained with Artificial Neural Networks in order to get actual pixels values for embedding secured data. This algorithm ensures better results against providing security for data when compared to other popular existing algorithms.

**Index Terms**—Steganography, Cascading Feed Forward Network, PSNR, MSE.

## I. INTRODUCTION

The term Steganography comes from the Greek Words" STEGANOS, GRAPHIE. The Steganos means "covered" and Grgraphie means "writing". The main aim of steganography is to provide security for user data from unauthorized persons. In this technique the secret data is placed inside of the image which is not visible by the human eye directly. We have so many ways of steganography techniques, like image steganography, audio steganography and video steganography. Due to the need of security we choose either one the security technique in order to hide the data securely, among those in this we choose image steganography technique because in this data is not directly visible by the human eye typically.

The normal image steganography technique or algorithm uses Least Significant bit embedding. The main advantage of this algorithm is simple and it is easily to hide the secret data in LSB pixels of the image. But it can be easily detected by anyone who has the basic idea about the steganography technique because it is simple to extract an LSB pixels form an image. So it is less secure if we embed secret data in LSB pixels of an image. So instead of inserting an image in sequential pixels better to insert in the random pixels of an image it leads to performance improvement of the algorithm. But choosing random pixels of an image is also simple technique because every one generates random pixels with some basic predefined functions.

# Software Reliability Estimation Using Modified Genetic Algorithm: Rayleigh Model

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**Abstract:** *The underlying assumptions of Software reliability growth models are often violated in practice, however they are quite robust despite these assumption violations. In practice, there is no method to know which models to apply. In this paper an empirical method is presented for selecting a best SRGM among a set of SRGMs. They are fitted to cumulative failure data and used to estimate the Reliability of the software. In principle, two widely used methods for the parameter estimation of SRGMs are the Maximum Likelihood Estimation and the Least Squares Estimation. However, the approach of these two methods may impose some restrictions on SRGMs, such as the existence of derivatives from formulated models or the needs for complex calculation. In this paper, a Modified Genetic Algorithm (MGA) is proposed to assess the reliability of software on Time domain software failure data using Rayleigh model which is Non-Homogenous Poisson Process based. Experimental results shows that the proposed algorithm is more effective and faster than traditional algorithms.*

**Keywords:** Software reliability, Rayleigh model, Time domain data, Mean Value Function, Modified Genetic Algorithm, NHPP.

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## I. INTRODUCTION

Software reliability is one among a number of important attributes of software and its assessment to evaluate the quality of software system. In software industry, one of the most difficult problems is to ship a reliable product. Therefore it is necessary to have accurate and fast estimation techniques for verifying software reliability. For the past Five decades, many Software Reliability Growth Models (SRGMs) have been proposed in estimating reliability growth of software products. SRGMs can be used to depict the behaviour of observed software failures characterized by either times of failures or by the number of failures at fixed times (Lyu, 1996).

The parameters of SRGMs are generally not known and have to be estimated based on collected failure data. Two of the most popular estimation techniques to estimate the unknown parameters are Maximum Likelihood Estimation (MLE) and Least Squares Estimation (LSE) (Ohba, 1984; Goel, 1985). In fact, MLE and LSE involve the property of probability theory and statistical analysis. Thus, this may impose restrictions such as the continuity, the unimodality, the existence of derivatives from formulated models, the complex likelihood function etc., on the parameter estimation of SRGMs (Minohara and Tohma, 1995; Costa *et al.*, 2007). The method of MLE estimation by solving a set of simultaneous equations is better in deriving confidence intervals. The method of LSE minimizes the sum of squares of the deviations between what we actually observe and what we expect. Nevertheless, LSE is suitable for fitting data from small to medium sample sizes (Wood, 1996), while MLE is considered to be better statistical estimator for large sample sizes. In particular, when the formulated model of SRGMs is complicated or the sample size of failure data is large, these two estimation techniques may not be effective to find out the optimal solutions and generally require to be solved numerically. Hence, the more effective and applicable approaches for the parameter estimation of SRGMs may be necessary.

In recent years, the Genetic Algorithms (GAs) has gained popularity in solving the optimization problem of scientific fields (Goldberg, 1989; Mitchell, 1998). Because, the parameter estimation can be reformulated as a searching process within the domain of all the feasible solutions (Harman and Jones, 2001; Jiang, 2006), it may be attractive to introduce GA into the process of software reliability modeling (Dai *et al.*, 2003). Therefore, in this paper, a modified genetic algorithm (MGA) (Chao-Jung, 2008; Kim *et al.*, 2015) is proposed to estimate the parameter of the SRGMs. We attempted to modify GA's operators with weighted bit mutation and a rebuilding mechanism to improve the performance and efficiency of estimations. Finally, the applicability of proposed MGA, the result of parameter estimation and the reliability with Rayleigh model will also be demonstrated through real data.

The rest of this paper is organized as follows. Section 2 surveys NHPP based SRGMs and in specific Rayleigh Model along with the past researches of GAs in software engineering areas. In Section 3, an effective

# Ensemble Text Mining using NLP and AI Techniques

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**Abstract** - The other name of text mining is text analytics. In the present world everyday huge data is generated everywhere such as social networking, airlines, spam mails and finding the interesting and important data from various sources. Text mining reads the data, analyze the data based on the topic present in that data. Natural Language processing (NLP) is the sub domain of the text mining. Many researchers have been done to solve the ambiguity problem the work is still immature. In this paper, the new ensemble approach which is merged with the features of text mining approach, NLP technique and artificial intelligence. This shows the result based on the documents mining with document or article belongs to which topic such as political, sports, technology and various domains. The dataset utilized for this project is 29-documents and 65-documents synthetic datasets.

**Keywords** - Artificial Intelligence, NLP, text mining.

## I. INTRODUCTION

All kind of colleges, associations, and business ventures are using to store data in various databases. An enormous measure of content is streaming over the web as advanced libraries, archives, and other textual data, for example, online journals, web-based social networking system and messages [1]. It is demanding task to decide proper examples and patterns to retrieve important information from this huge volume of information [2]. It is very tedious for the existing data mining techniques to handle the textual data.

Text mining retrieves the interesting and various remarkable patterns to define the textual data [3]. A few content mining systems like outline, grouping, bunching and so forth, can be connected to remove information. Content mining manages regular dialect content which is put away in the semi-organized and unstructured organization [4]. Content mining procedures are persistently connected in industry, the scholarly world, web applications, web and different fields [5]. Application territories like web indexes, client relationship administration framework, channel messages, item proposal investigation, extortion discovery, and online networking examination utilize content digging for assessment mining, include extraction, supposition, prescient, and drift examination [6].

Extracting the precious data from various documents, HTML files and articles belongs to various domains such as sports, political, social networking etc. To identify the patterns in every article and categorize the articles based on

the data present. In this paper, text mining algorithm is utilized to extract the information; NLP is used to extract the huge interesting data from the given articles. The AI algorithm Naive Bayes is used for feature extraction. The results are shown in three phases matching articles, feature extraction, and show the labels.

This paper is organized in different sections. Previous work is discussed in Section II. In Section III, existing techniques of text mining are explained. Section IV presents the proposed system. In section V, Results. Section VI concludes the outcomes.

## II. LITERATURE SURVEY

This section II explains the previous works based on text mining, NLP and AI.

S.H. Liao *et al.* [5] that get-together, separating, pre-preparing, content change, highlight extraction, design determination, and assessment steps are a piece of content mining process. What's more, extraordinary broadly utilized content mining methods, i.e., grouping; arrangement, choice tree order, and their application in assorted fields are reviewed.

N. Zhong *et al.* [8] featured the issues in content mining applications and systems. They talked about that managing unstructured content is troublesome when contrasted with organized or unthinkable information utilizing conventional mining instruments and systems. They have demonstrated the uses of content mining process in bioinformatics, business knowledge and national security framework. NLP and ERT have lessened the issues that happen amid content mining process. In any case, there exist issues which require consideration.

A. Henriksson *et al.* [9] investigated MEDLINE biomedical database by incorporating a structure for named element acknowledgment, characterization of content, theory age and testing, relationship and equivalent word extraction, separate truncations. This new system takes out pointless subtle elements and concentrates important data.

B. Laxman and D. Sujatha [10] examined the content utilizing content mining designs and demonstrated term based methodologies can't investigate equivalent words and polysemy appropriately. Also, a model was intended for determination of examples regarding allocating weight as indicated by their conveyance. This approach upgrades the productivity of content mining process. C. P. Chen and C.-Y. Zhang [11] introduced a wrongdoing identification



# Analysis of Data Analytics

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**Abstract-** Today Big Data draws a lot of attention in the IT world. The rapid rise of the Internet and the digital economy has fuelled an exponential growth in demand for data storage and analytics, and IT department are facing tremendous challenge in protecting and analyzing these increased volumes of information. The reason organizations are collecting and storing more data than ever before is because their business depends on it. The type of information being created is no more traditional database-driven data referred to as structured data rather it is data that include documents, images, audio, video, and social media contents known as unstructured data or Big Data. Big Data Analytics is a way of extracting value from these huge volumes of information, and it drives new market opportunities and maximizes customer retention. This paper primarily focuses on discussing the various technologies that work together as a Big Data Analytics system that can help predict future volumes, gain insights, take proactive actions, and give way to better strategic decision-making. Further this paper analyzes the adoption, usage and impact of big data analytics to the business value of an enterprise to improve its competitive advantage using a set of data algorithms for large data sets such as Hadoop and MapReduce.

**Keywords-** Big Data, Analytics, Hadoop, MapReduce

## I. INTRODUCTION

Big Data is an important concept, which is applied to data, which does not conform to the normal structure of the traditional database. Big Data consists of different types of key technologies like Hadoop, HDFS, NoSQL, MapReduce, MongoDB, Cassandra, PIG, HIVE, and HBASE that work together to achieve the end goal like extracting value from data that would be previously considered dead. According to a recent market report published by Transparency Market Research, the total value of big data was estimated at \$6.3 billion as of 2012, but by 2018, it's expected to reach the staggering level of \$48.3 billion that's almost a 700 percent increase [29]. Forrester Research estimates that organizations effectively utilize less than 5 percent of their available data. This is because the rest is simply too expensive to deal with. Big Data is derived from multiple sources. It involves not just traditional relational data, but all paradigms of unstructured data sources that are growing at a significant rate. For instance, machine-derived data multiplies quickly and contains rich, diverse content that needs to be discovered. Another example, human-derived data from social media is more

textual, but the valuable insights are often overloaded with many possible meanings.

Big Data Analytics reflect the challenges of data that are too vast, too unstructured, and too fast moving to be managed by traditional methods. From businesses and research institutions to governments, organizations now routinely generate data of unprecedented scope and complexity. Gleaning meaningful information and competitive advantages from massive amounts of data has become increasingly important to organizations globally. Trying to efficiently extract the meaningful insights from such data sources quickly and easily is challenging. Thus, analytics has become inextricably vital to realize the full value of Big Data to improve their business performance and increase their market share. The tools available to handle the volume, velocity, and variety of big data have improved greatly in recent years. In general, these technologies are not prohibitively expensive, and much of the software is open source. Hadoop, the most commonly used framework, combines commodity hardware with opensource software. It takes incoming streams of data and distributes them onto cheap disks; it also provides tools for analyzing the data. However, these technologies do require a skill set that is new to most IT departments, which will need to work hard to integrate all the relevant internal and external sources of data. Although attention to technology isn't sufficient, it is always a necessary component of a big data strategy. This paper discusses some of the most commonly used big data technologies mostly open source that work together as a big data analytics system for leveraging large quantities of unstructured data to make more informed decisions.

## II. LITERATURE REVIEW

Big Data is a data analysis methodology enabled by recent advances in technologies that support high-velocity datacapture, storage and analysis. Data sources extend beyond the traditional corporate database to include emails, mobile device outputs, and sensor-generated data where data is no longer restricted to structured database recordsbut rather unstructured data having no standard formatting [30]. Since Big Data and Analytics is a relatively newand evolving phrase, there is no uniform definition; various stakeholders have provided diverse and sometimescontradictory definitions. One of the first widely quoted definitions of Big Data resulted from the Gartner report of2001. Gartner proposed that, Big Data is defined by three V's volume, velocity, and variety. Gartner expanded itsdefinition in 2012 to include veracity, representing requirements about trust and uncertainty

# A NOVEL APPROACH FOR MAP REDUCES USING DYNAMIC JOB ORDERING AND SLOT CONFIGURATIONS

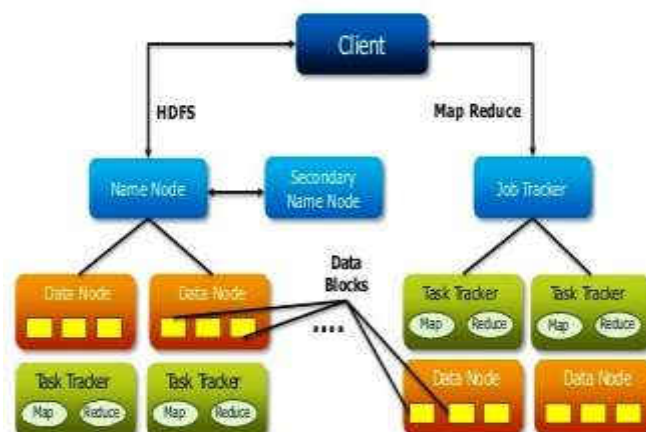
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**Abstract:** A MapReduce workload generally contains a set of jobs, each of which consists of multiple map tasks followed by multiple reduce tasks. Due to 1) that map tasks can only run in map slots and reduce tasks can only run in reduce slots, and 2) the general execution constraints that map tasks are executed before reduce tasks, different job execution orders and map/reduce slot configurations for a MapReduce workload have significantly different performance and system utilization. This paper proposes two classes of algorithms to minimize the makespan and the total completion time for an offline MapReduce workload. Our first class of algorithms focuses on the job ordering optimization for a MapReduce workload under a given map/reduce slot configuration. In contrast, our second class of algorithms considers the scenario that we can perform optimization for map/reduce slot configuration for a MapReduce workload. We perform simulations as well as experiments on Amazon EC2 and show that our proposed algorithms produce results that are up to 15 \_ 80 percent better than currently unoptimized Hadoop, leading to significant reductions in running time in practice.

## INTRODUCTION

MapReduce and Hadoop are used to support batch processing for jobs submitted from multiple users (i.e., MapReduce workloads). Despite many research efforts devoted to improving the performance of a single MapReduce job, there is relatively little attention paid to the system performance of MapReduce workloads. Therefore, this paper tries to improve the performance of MapReduce workloads. Makespan and total completion time (TCT) are two key performance metrics. Generally, makespan is defined as the time period since the start of the first job until the completion of the last job for a set of jobs. It considers the computation time of jobs and is often used to measure the performance and utilization efficiency of a system. In contrast, total completion time is referred to as the sum of completed time periods for all jobs since the start of the first job. It is a generalized makespan with queuing time (i.e., waiting time) included. We can use it to measure the satisfaction of the system from a single job's perspective through dividing In this paper, we target at one subset of production MapReduce workloads that consist of a set of independent jobs (e.g., each of jobs processes distinct data sets with no dependency between each other) with different approaches. one MapReduce can only start only when its previous dependent jobs finish the computation subject to the input-output data dependency. In contrast, for independent jobs, there is an overlap computation between two jobs, i.e., when the current job completes its map-phase computation and starts its reduce-phase computation, the next job can begin to perform its maphase computation.



# Analysing The Homogeneity of Means of Data Distributed Over Best Suited Model Using Anom

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## Abstract

Data can be analyzed by observing the homogeneity of means with the aid of well-known technique –Analysis of Means (ANOM) that decides that the given live data identified to follow the best suitable model out of proposed competing models. The competing models are tested for their suitability for each dataset depending on the structure of dataset using a more rational technique based on Correlation coefficient rather than graphical technique namely Quantile-Quantile (QQ) Plot. The best identified model and the corresponding dataset are then paired to develop the ANOM calculation procedure using R.

**Keywords:** ANalysis Of Means, subgrouping, Maximum Likelihood Estimation (MLE), Half Logistic Distribution (HLD), Correlation, Reliability, Visualization of Data

## INTRODUCTION

Data plays a vital role in understanding the nature of the domain in which it is generated. Data generated is said to be different types based on its nature like descriptive, inferential, grouped, ungrouped etc. We can broadly categorize into quantitative and qualitative. Qualitative data emboss the nature and help in understanding behaviour of the process which generated the data. Generally Qualitative data when is in the form the counting or capturing the measure during a period we consider it as grouped data. All such data are best analysed using Poisson Models. Poisson Process models are again categorized into homogeneous and non-homogeneous based on the interval during which the data is captured. The time intervals in between the event occurrences play a vital role in assimilating and visualizing the data [1].

Data analysis is critical in portraying the revelations from various origins of data. It acts like a filter in acquiring meaningful insights out of huge datasets. Analysing the data using statistical approach aids in reaching the research conclusion removing the human bias factor.

To inspect the data for its insight and behaviour various techniques are available namely central tendencies, dispersion

measures, analysis of means & variances, distribution models, etc. [1]. Data diagnosis is carried out by various techniques but usage of distribution models has a greater impact and gives a truthful insight on data

In this paper, the main focus is to identify the nature and behaviour of means of the data using Analysis of Means (ANOM) over the selected model. The following sections

The following sections are portrayed to detail the distribution model in consideration for the data - Half Logistic Distribution (HLD) model is considered for analysing data. The unknown parameters of the models are estimated using Maximum Likelihood Estimation (MLE) process in Section II.

In section III the justification of the selected model is further investigated to clinch to the best suited model by using correlation coefficient instead of traditional graphical approach of QQ-Plots. In section IV the model is applied and data is deeply inspected to attain a detail picture on the homogeneity of means using ANOM under various measures. All the process mentioned is coded and implemented in statistical programming language R.

Section V is presented with the experimentation datasets, results of MLE, correlation coefficient comparisons, ANOM subgrouping and corresponding graphs and the detailed analysis of the obtained results and the conclusion follows in section VI.

## HLD PARAMETER ESTIMATION USING MLE PROCESS.

Assessment of parameters is very influential in predicting the software reliability. Upon concluding the analytical solution for the mean value function  $m(t)$  for the specific model, the MLE technique is enforced for attaining the parameter estimation. The crucial intention of Maximum Likelihood parameter Estimation is to resolve the parameters that magnify the probability of the fragment data. The MLE is deliberated as vigorous, robustious and mathematically fierce. They yield estimators with good statistical factors. In the



**Proceedings of the 2nd International Conference on Data Engineering and Communication Technology** pp 201–209

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## Enhancement of Security for Cloud Data Using Partition-Based Steganography

[D. Suneetha](#)  & [R. Kiran Kumar](#)

Conference paper | [First Online: 04 October 2018](#)

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### Abstract

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Data security is a major issue in computer science and information technology. In the cloud computing environment, it is a serious issue because data is located in different places. In the cloud, environment data is maintained by the third party so it is harder to maintain security for user's data. There is a prominent need for security for cloud data, so we proposed an approach which provides better results as compared to previous approaches. In this work, we tried to secure the data by using image steganography partition random edge-based

# Robot Assisted Brain Wave Sensor Network in Smart Home Environment For Elderly Persons

A. Harikrishna, K.V.Sambasiva Rao, S.Raviteja, S.Alekhyia

**Abstract:** Human thoughts consists of of a massive variety of interconnected neurons. The examples of collaboration among those neurons are spoken to as issues and enthusiastic states. As indicated through way of the human contemplations, this example will change which thusly produce particular electric powered waves. A muscle compression will likewise create a one in every of a kind electrical sign. a variety of these electric powered waves will be detected by way of the cerebrum wave sensor and it'll change over the records into parcels and transmit thru Bluetooth medium. Level analyzer unit (LAU) gets the thoughts wave crude records and it's going to listen and device the signal using MATLAB level that's seemed in data getting ready unit. At that factor the manage directions may be transmitted to the robotic it truly is the assistive robotic. With this whole framework, we are able to drift a robotic as consistent with the imparting instructions to the robot and it very well can be have become by means of squint problems and it has an inclination to be grew to become by flicker muscle constriction.

Electroencephalography (EEG) is the estimation of electrical motion inside the residing mind. in this assignment we applied a brainwave sensor to dissect the EEG alerts . This plan speak about making geared up and recording the crude EEG signal from the thoughts Wave sensor within the MATLAB situation and through WIFI transmission control recommendations can be exceeded to the robotic section. thoughts wave sensors are not utilized in clinical use, however are applied inside the thoughts Brain Control Interface (BCI).

The BCI is a prompt correspondence pathway among the cerebrum and an outside framework to offer direct correspondence and control between the human personality and substantial gadgets through disentangling various instances of cerebrum movement into guidelines step by step . This endeavor works of art fuses of a Processor utilizing cerebrum wave sensor and arranged unit block prominence unit as device parts and a fruitful musings signal system utilizing Matlab organize. directly, the proprietor wants to test whether the automated move or never again. on the off hazard that he's a now not strolling, by then the automated will obviously start. Be that as it can, at the off risk that he's ordinary mode, by then the vehicle will run and there's no notice. while the vehicle got gleaming request it will prevent at any rate the spot. what's more, if the owner wants to move the car he has a need to come ordinary mode. this can keep a key good ways from the improvement sooner or later of up close and personal.

The present day system isn't having any faraway control leisure activity. depend upon others to work and No muscle withdrawal identifying and the proposed structure is having the mind wave examination for the sign which can be taken from the human cerebrum as appeared in the rectangular chart, is having controlling of the mechanical utilizing Human thoughts, Self

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controlled and working office for not to rely on others to work. This endeavor at Matlab, explains that tranquil speakme inside the sentiment of this stage is "discerning effort to express a word, portrayed through unpretentious advancements of inner talk organs without unquestionably voicing it." The way gets markers from the cerebrum to the muscle bunches while the client purposely vocalizes inside. The device later companions such banner with an out of entryways preparing framework. Like talk affirmation structures, it allows the customer to make solicitations to such gadgets, however without reporting anything.

**Keywords:** Brainwave sensor EEG, Wi-Fi, brainwave visualizer, Smart Sensors, Processors, Assistive Robot, Care givers

## I. INTRODUCTION

In India, the more seasoned masses far and wide is tirelessly expanding. the amount of individuals 60 years old and extra snared expanded to directly around 900 million out of 2015 and resolved to achieve 2 billion by methods for 2050. In India, at present, the whole mean male and lady is fifty one million and 53 million. existing crisis facilities, care centers and unmistakable establishments starting at now convey care to severa physically disabled and more seasoned sufferers. these are over the zenith expensive and practical. more prominent master and sufferers might want to remain inside the comfort of their home wherein they feel extra sure than moving to any very estimated adult thought or human administrations work environments. in this manner, if more noteworthy mounted developed u.s.can complete self-care sports without every other person, it will encourage them to keep up self-governance and outfit them with a feeling of accomplishment and potential to acknowledge opportunity longer. The most extreme ideal strategy to help them is to give a real area that advances dynamic developing utilizing creative developments, for instance, Artificial Intelligence (AI), mind waves, brilliant homes and assistive robots. This mission recommendation outfits a self-care brandishing exercises course of action with a mind wave oversaw assistive robot, manufactured Intelligence and cloud organizations. the world changed over into new observations with imaginative endeavors and advances.

## II. TECHNOLOGIES

### 2.1.1 Artificial Intelligence

programmed thinking is a procedure for making a PC, a pc controlled automated, or an item think acutely, in the near way the savvy individuals suppose. AI is developed by pondering how human cerebrum thinks, and how individuals



## EFFICIENT SEARCHABLE ENCRYPTION WITH MULTI-KEYWORD RANKED SCHEME OVER ENCRYPTED CLOUD DATA

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**Abstract** —The public cloud server like Amazon, Microsoft Azure, Google Drive, etc. With the help of data outsourcing, the organizations can provide reliable data services to their users without any concerns for the data management overhead. . Normally, CSPs (Cloud Service Providers) take care of the data and its privacy, but there are some of the factors because of which the data privacy and user identity may be violated like an apostate employee, etc. Therefore, data owners should encrypt their respective sensitive data before outsourcing it to the public cloud server. Because the data is getting encrypted before outsourcing which may affect the performance of some important data accessing operations like searching of a document, etc. Searchable encryption is a cryptographic method to provide security. In literature many researchers have been working on developing efficient searchable encryption schemes. , we present a secure multi-keyword ranked search scheme over encrypted cloud data, which simultaneously supports dynamic update operations like deletion and insertion of documents. So we propose Encryption Module. This entity is considered to be a trusted third party which is responsible for the generation and management of the decryption Data. So we by considering this we can reduce the data owner work load.

**Keywords** — Cloud Storage, multi Ranked-Search, Encrypted-Data Search, secure cloud.

### INTRODUCTION

Security and privacy concerns have been the major challenges in cloud computing. The hardware and software security mechanisms like firewalls etc. have been used by cloud provider. These solutions are not sufficient to protect data in cloud from unauthorized users because of low degree of transparency [4]. Since the cloud user and the cloud provider are in the different trusted domain, the outsourced data may be exposed to the vulnerabilities [5]. Thus, before storing the

valuable data in cloud, the data needs to be encrypted [2]. Data encryption assures the data confidentiality and integrity. To preserve the data privacy we need to design a searchable algorithm that works on encrypted data [13]. Many researchers have been contributing to searching on encrypted data. The search techniques may be single keyword search or multi keyword search [11]. In huge database the search may result in many documents to be matched with

# An Efficient Ids Based on Fuzzy Firefly Optimization and Fast Learning Network

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## Abstract

Overseen Interruption Recognition Framework is a framework that has the capacity of picking up from cases about past attacks to perceive new strikes. Using ANN based interruption discovery is promising for decreasing the amount of false negative or false positives in light of the fact that ANN has the capacity of picking up from certified cases. In this article, a made learning model for Quick Learning System (FLN) in light of fluffy firefly streamlining (FFO) has been proposed and named as FF-FLN. The model has been associated with the issue of interruption location and endorsed in perspective of the famous dataset KDD99. Our created strategy has been taken a gander at against a broad assortment of meta-heuristic figurings for planning ELM, and FLN classifier. FF-FLN has defeated other learning approaches in the testing exactness of the learning.

**Keywords:** Fast learning network, IDS, Fuzzy Firefly's, ANN.

## 1. Introduction

In current days, security angles for PC arrange is a key disturb of PC human advancement in view of the quick improvement of advances and web administrations. Advances in PC innovation have engaged a few new possibilities, including the capacity to remotely control and oversee frameworks, too opening up a door to get together of data through online sources. In associations level the essential concern is digital security, it investigated the different issues experienced by Multinational organizations in watch their data security, accessibility and unwavering quality. The inspiration has made by above thing for keeping frameworks anchored from any fringe machines, program, or individual going for breaking the security line of the system. There are numerous trappings and applications innovatively progressed to development the security of the environment like machines, systems and PCs. There is a one instrument that endeavors to shield the machines from an aggressor is called Interruption identification framework (IDS).IDS screens the single machine or PC compose for interloper [2]. It is useful in perceiving successful intrusions, and in addition in watching tries to break security, which gives basic information to favorable counter-measures [3]. The basic recommendation to use interruption identification endeavoring to address misuses and frameworks organization attacks in PCs, was progressed by Dorothy E. Denning in 1987 [4]. The strategy is executed by an interruption identification system. Before long such systems are for the most part available with combination. [5], points out the general deficiency and nonattendance of amplexness gave by the present monetarily open structures, this uncovered the necessity for advancing exploration on more intense interruption identification systems. With a particular ultimate objective to execute the methodology of interruption location, there is a need to recognize constant or attempted interruptions or strikes on the structure or framework, this unmistakable evidence data consolidate data aggregation, lead

portrayal, data decreasing, and in end declaring and response, this is suggested, as ID [6].The IDS tried to choose whenever checked customer activity or framework development is threatening. If a noxious attack is distinguished, an alert would be made. Diverse particular are available for IDSs' to perceive an ambush, for instance, eccentricity discovery or signs of attack, [7] moreover raises that the accomplishment of IDS depends on these systems. One among the first factors speaking to the amplexness of the IDS is the idea of the component advancement and feature assurance figuring.

There exists an extensive number of procedures, a vast segment of which have been used for different interruption location models to play out a varying arrangement of basic errands, a segment of these techniques fuse; Machine learning based, Half and half ANN based and also planned frameworks. Likewise, as shown by [8], there are cream data mining designs, different leveled hybrid keen structure models, and outfit learning approaches all of which have gotten popularity in progress investigated.

In this paper we proposed an IDS dependent on Quick learning system and an advanced strategy called Fluffy firefly technique. Whatever remains of the present work is organized everything considered.

## 2. Related work

In The likelihood of an execution examination among Grunt and Suricata isn't new. Both perform well, anyway are not perfect and have confinements as showed up in our examinations. Snort has a lone hung outline, and Suricata has a multi-hung designing which makes the two IDS obvious from one another, yet the oversee set is the customary part of the two IDS. Gathering the framework development and accuracy of the control set are the key parts of the two IDS's execution. In addition, PC have execution unmistakably influences the general IDS execution. An execution examination consider [8] was finished on Grunt and Suricata IDS

RESEARCH

Open Access



# Privacy preserving data publishing based on sensitivity in context of Big Data using Hive

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## Abstract

Privacy preserving data publication is the main concern in present days, because the data being published through internet has been increasing day by day. This huge amount of data was named as Big Data by its size. This project deals with the privacy preservation in context of big data using a data warehousing solution called hive. We implemented nearest similarity based clustering (NSB) with Bottom-up generalization to achieve (v,l)-anonymity which deals with the sensitivity vulnerabilities and ensures the individual privacy. We also calculate the sensitivity levels by simple comparison method using the index values, by classifying the different levels of sensitivity. The experiments were carried out on the hive environment to verify the efficiency of algorithms with big data. This framework also supports the execution of existing algorithms without any changes. The model in the article outperforms than existing models.

**Keywords:** Sensitivity, Sensitive level, Clustering, PPDP, Bottom-up generalization, Big Data

## Introduction

As a part of information sharing through internet every organization publishes the personal data which they collect from different users [1]. This published data may disclose personal private information. The data provided by the corporations, government and individuals will create enormous opportunities for individual knowledge based decision making [2]. In consideration of the mutual benefits or by the rules that require to publish the data, there is a demand for exchange or publication of data among various parties. Personal data in its actual form, however, typically contains individual sensitive information and if this data published as it is then that kind of data will violate the individual privacy [3]. The present practice initially relies on guidelines and policies to deprive the types of publishable data and on agreements on the use and storage of sensitive data. The limitation of this approach is that it either manipulates data overly or requires a trust level that is practically very low in many present data sharing scenarios [4, 5]. For instance, contracts and agreements between any parties cannot ensure that sensitive data will not be carelessly misplaced and end up in the wrong hands.

The actual task of the data provider is to develop methods and tools for publishing data in more antagonistic environment, so that the data will be available to the needed people



## Smart home based security system for door access control using smart phone

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**Keywords:** Web Camera Module, Door Access, Voice Alert, Switch/Calling Bell, Email Alert.

### ABSTRACT

The system is regarding the remotely overseen Door availability and voice alarming with the help of Smart Phone. It captures the guest picture at the Door as Email caution. Use of Smart home security control framework became essential in our day to day life. This paper describes the outline of an advanced home security framework. In this method the door availability has been controlled based on guest character by considering the human movement location and remotely checking innovation. This paper describes the remote control framework execution and organization and allows the validated individuals in to a home as it were. This Security Framework can be implemented by using switch/calling bell and a Camera module. The camera module captures the pictures of the guest separately and ideally to make the home security framework alive on demand. In this method we used an Electromagnetic entryway bolt module which created the entryway availability. This proposed framework deploys a controller interface framework and LPC 2148. If a guest press calling bell at the door then the web Camera module is interfaced with switch to capture pictures and send these pictures as Email caution with the help of TCP/IP protocol. Now, we can control this home security system by seeing camera module video stream with the help of Smart cell Phone. Like this, the proposed home security framework allows us for sending an order as a reply of voice ready whenever the gatecrasher recognized using smart phone. By using android stage and improved JavaScript, the Clients can see the guest on the screen and able to control the entryway by locking or unlocking the door. This software can be used in a wide range of application where the physical nearness can't be possible forever i. e in territories. The entire control framework is implemented with LPC 2148 now a days usage of smart lock system is increasing day by day in wide range of applications. This efficient effort less low power calling bell based home lock system is essential for security purpose in every home and offices. So many nations are worked on home based locking frame work to implement advanced technologies in it. Most of smart houses and business offices are associated with a chip for security purpose. Though numerous advancements take place, the clients face troubles i. e interface problems in utilizing this smart lock system. To avoid such type of issues i proposed microcontroller. This advanced home security system is useful for real time home environment.

### REFERENCES

# A Fast KNN Based Intrusion Detection System For Cloud Environment

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**Abstract**-In this paper an attempt has been made to implement the fast kNN classification algorithms to detect intruders without compromising the accuracy within short span of time. The objectives of this paper is to implement the VIPDS (Variance Index based Partial Distance Search) based k Nearest Neighbor (kNN) on a benchmark dataset CIDDS-001 and compare the performance with traditional kNN Partial Distance Search kNN classifier with less computational time without loss of accuracy. For this study to adopt two performance measures are considered i.e., accuracy and computational time. Finally the results and discussions are presented.

**Keywords:** Cloud Computing, Cloud Security, Intrusion Detection System, kNN classifier

## I. Introduction

Cloud computing is a technology that provides various services like storage, computing etc., for heterogeneous community of users. Cloud computing is a promising area that is providing solution for the most of the service issues and infrastructure optimization of the Information Technology. Even though cloud computing provides a better services to the vendors; some of its biggest challenging issues are data reliability and security.

Intrusion Detection System (IDS) can provide a better security measures for cloud computing environment by investigating configurations, logs, network traffic, and user actions to identify typical attack behaviour. However, an IDS must be distributed to work in a cloud computing environment.

Many of the pattern recognition techniques will help in detect attacks from legitimate users.

k-Nearest Neighbour (kNN) classifier is one of the pattern recognition algorithm that is simple to implement as well as yield high detection rates. In spite of these advantages one major drawback of this classifier is its lazy learning. This classifier doesn't build any model in prior, because of this reason prediction takes much time (Basaveswara Rao B et al. 2016).

kNN classifier is a distance based algorithm and the distance measure is calculated mostly using Euclidean distance. A variation on Euclidean distance called Partial Distance Search (PDS) algorithm. By applying this PDS algorithm on kNN it is possible to reduce the prediction time of the classifier.

Another major problem for the researchers is the lack of availability of proper data sets to implement and evaluate their models. Most of the available data sets are not addressing current/real time problems. CIDDS (Cloud Intrusion Detection Data Set) is a data set that addresses these problems.

The remainder of this paper is as follows: section II elaborates various researchers' work in this area where as in section III provides a brief study of the cloud data set CIDDS1. Section IV presents the methodology of the proposed model, section V and Section VI covers discussion on results and conclusion respectively.

## II. Related Work

Basaveswara Rao B & et al. (2016) proposed a variance index based feature selection method on a benchmark dataset KDDCUP'99.

# MODELLING AND SIMULATION OF SOLAR PV ARRAY FED BRUSHLESS DC MOTOR DRIVEN WATER PUMP USING FUZZY LOGIC CONTROLLER

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**ABSTRACT-** According to this project deals with the use of photovoltaic (SPV) energy in the brushless DC (BLDC) motor driven water pump using of fuzzy logic controller. A dc-dc boost converter, used as an intermediate power controller unit plays a vital role in improving the efficiency of SPV array and soft starting of the BLDC motor with the fuzzy controller. Fuzzy controller is advance controller which is mostly suitable for the human decision making mechanism which also provided the operation of an electronic system with the expert decision. For the speed control of BLDC motor is operated by PWM technique of the voltage source inverter using DC link voltage control. No other control or current sensing element is required for speed control. The output waveforms analyzed through MATLAB/simulink based simulation study.

## INTRODUCTION

Solar energy is the most important, most effective and least expensive over other renewable energy source. Solar energy conversion can be achieved using either by thermal or photo voltaic effects. Many applications can use such renewable source of energy such as: water pumping, air conditioning, light sources electric vehicles, refrigeration systems. Standalone photovoltaic (PY) systems are widely used in military and space applications .

The evolution of life has been possible thanks to the presence of water. Using photovoltaic generators to operate the water pumps is now a technology in development that is characterized by gradual decrease in cost. Since the first installation of photovoltaic pumping system in the late seventies, these systems provide human domestic needs, livestock and irrigation water in rural areas, and have gained considerable acceptance in terms of reliability and performance and today they are considered to be the most significant applications of photovoltaic energy conversion. On the other hand, fuzzy logic is an intelligent control method that has been used

recently for improving the efficiency of PY installations by giving the maximum power point tracking (MPPT) algorithm the ability to track effectively the maximum power point of a photovoltaic system under variable irradiation conditions.

In this paper, an intelligent control technique using fuzzy logic control is associated to an MPPT controller in order to improve energy conversion efficiency of a PY standalone water pumping system.

## CONFIGURATION OF PROPOSED SYSTEM

Fig.1 shows a detailed schematic of proposed PV array fed BLDC motor driven water pump. This system constitutes a SPV array, boost DC-DC converter, VSI, BLDC motor and water pump. An incremental conductance (INC) MPPT method is applied for efficiency enhancement of PV array through boost converter operation. On the other hand, the speed control of BLDC motor and electronic commutation are performed by PWM control of the VSI. An inbuilt encoder, mounted on the BLDC motor itself, provides three Hall signals following the rotor position which are further converted into six pulses.

# Closed Loop Control of Hybrid Boosting Converter for Photovoltaic Applications

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**Abstract:** Conventional sources like fossil fuels were used earlier to satisfy the energy demands. Nowadays these are being replaced by renewable sources like photovoltaic sources. In this paper, a hybrid boosting converter using photovoltaic system with closed loop Control is analyzed and simulated. A new hybrid boosting converter is used to increase the input dc voltage. In Existing method hybrid boosting converter used with one switch in the converter and produce pulses for that switch in open loop. By using the open loop method we get only output as produced amount of input which is given. Then we propose a closed loop method for HBC. By using this closed loop control technique we achieve required output voltage.

**Key words:** Bipolar voltage multiplier (BVM), hybrid boosting converter (HBC), nature interleaving, renewable energy, single switch single inductor, Induction motor drive.

## I. INTRODUCTION

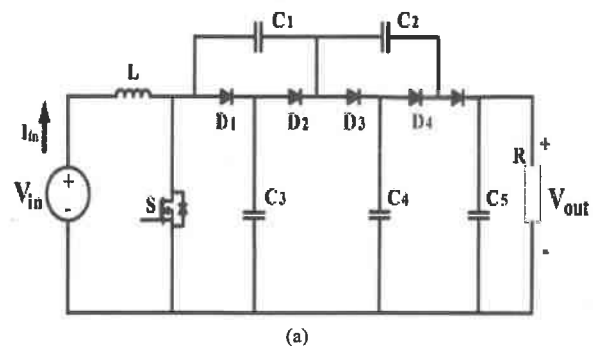
Solar energy is converted to electricity using an electronic device called solar panel using photo-voltaic effect. PV applications can be grouped into utility interactive and stand-alone applications [1]. Utility interactive applications provide a backup system to ensure that electricity is produced throughout the year irrespective of the weather conditions. While stand-alone systems without the utility connection uses the electricity where it is produced [2]. However, to cater to the energy needs during non-sunny and cloudy period PV-charged battery storage system is used. PV systems with batteries can be used to power dc or ac equipment [3-5]. PV systems with battery storage are being used all over the world to power lights, sensors, recording equipment, switches, appliances, telephones, televisions, and even power tools [6]. PV serves as an ideal source using the availability of low DC power requirement for mobile and remote lightning requirements [7]. Systems using several types of electrical generation combine the advantages of each. Engine generators can produce electricity anytime. Thus, they provide an excellent backup for the PV modules, which produce power only during daylight hours, when power is needed at night or on cloudy days. On the other hand, PV operates quietly and inexpensively, and it does not pollute [8].

In this paper a model of closed loop implementation of PI controller for hybrid boosting converter is presented. This controller maintains constant output voltage of the converter near to the utility voltage [9-10]. The input voltage to the converter is fluctuating between 20-45V, according to the sunlight intensity on PV cell. MATLAB based simulation is developed with PI controller.

The method of combining boost converter with traditional Dickson multiplier and Cockcroft-Walton multiplier to generate new topologies were proposed, such as topologies in Fig.1 (a) and (b). Air core inductor or stray inductor was used within voltage multiplier unit to reduce current pulsation.

An elementary circuit employing the super lift technique was proposed and extended to higher gain applications such as Fig.1(c). Its counterpart of negative output topology and double outputs topology were proposed and discussed. The concept of multilevel boost converters was investigated and the topology of Fig.1 (d) was given as central source connection converter. Besides, two switched capacitor cells were proposed and numerous topologies were derived by applying them to the basic PWM dc-dc converters. Typical topologies are shown as Fig.1 (e) and (f).

A modified voltage-lift cell was proposed and the topology of Fig.1 (g) was produced. Inspired by the above topologies, a new hybrid boosting converter (HBC) with single switch and single inductor is proposed by employing bipolar voltage multiplier (BVM) in this paper. The second-order HBC is shown as Fig.1 (h).



## Adaptable Unified Power Quality Conditioner Applied to Distribution Systems

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**Abstract:** This paper presents a Design of a Unified Power Quality conditioner (UPQC) connected to three phase four wire system (3P4W). The neutral of series transformer used in the fourth wire for the 3P4W system. The neutral current that may flow toward transformer neutral point is compensated by using a four-leg voltage source inverter topology for shunt part. The series transformer neutral will be at virtual zero potential during all operating conditions. In this simulation we observe the power quality problems such as unbalanced voltage and current, harmonics by connecting non linear load to 3P4W system with Unified Power Quality conditioner. Therefore, since the voltage and current controllers are implemented into the synchronous reference frame, their control references are continuous, decreasing the steady-state errors when traditional proportional-integral-derivative controllers are employed. Static and dynamic performances, as well as the effectiveness of the dual UPQC are evaluated by means of simulation results. The MATLAB/Simulink based simulations are provided the functionality of the UPQC.

**Keywords:** Active Filter, Dual Control Strategy, Power Conditioning, Three-Phase Distribution Systems, UPQC.

### I. INTRODUCTION

The power electronic devices due to their inherent nonlinearity draw harmonic and reactive power from the supply. In three phase systems, they could also cause unbalance and draw excessive neutral currents. The injected harmonics, reactive power burden, unbalance, and excessive neutral currents cause low system efficiency and poor power factor. The design of shunt active filter is described in [1]. The use of the sophisticated equipment/loads at transmission and distribution level has increased considerably in recent years due to the development in the semiconductor device technology. The equipment needs clean power in order to function properly. At the same time, the switching operation of these devices generates current harmonics resulting in a polluted distribution system. The power-electronics-based devices have been used to overcome the major power quality problems [1], [2]. A 3P4W distribution system can be realized by providing the neutral conductor along with the 3 power lines from generation station. The unbalanced load currents are very common and an important Problem in 3P4W distribution system. To improve the power quality series active power filter (APF) and shunt active power filters (APF) are connected. They are two types of filters one is passive filters and another one is active filters. In passive filters L and C components are connected. By connecting passive filters the system looks to be simple and cost is also very low. Due to the use of these filters resonance problem arises and for every frequency each filter need to be place it seems to be Bulky. To eliminate these problems we are placing active filters.

By using active filters the power converter circuit uses active components like IGBTs, MOSFETs, etc., and energy storage devices such as (L or C). The advantages are filtering for a wide range of frequencies and no resonance problem. Fast response. Only Disadvantage is cost is High. By connecting series active filters the voltage harmonic compensation, high impedance path to harmonic currents these are the main functions. All these non-linear loads draw highly distorted currents from the utility system, with their third harmonics component almost as large as the fundamental. Due to the increase use of non-linear loads, accompanied by an increase in associated problems concerns both electrical utilities and utility customer alike [3]. The modern power distribution system is becoming highly vulnerable to the different power quality problems [1], [2]. The extensive use of nonlinear loads is further contributing to increased current and voltage harmonics issues. Furthermore, the penetration level of small/large-scale renewable energy systems based on wind energy, solar energy, fuel cell, etc., installed at distribution as well as transmission levels is increasing significantly. This integration of renewable energy sources in a power system is further imposing new challenges to the electrical power industry. To accommodate these newly emerging distributed generation systems [3]. To maintain the controlled power quality regulations, some kind of compensation at all the power levels is becoming a common practice [5]–[9]. At the distribution level, UPQC is a most attractive solution to compensate several major power quality problems [7]–[9].

## A New Five-Level Voltage Source Inverter for Domestic Usage

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**Abstract:** This paper mainly concentrates on a new five-level voltage source inverter for domestic applications to reduce the switching power loss, harmonic distortion, and electromagnetic interference caused by the switching operation of power electronic devices. The proposed inverter is based on the upgrade of a four-level nested neutral-point clamped converter. This inverter can operate over a wide range of voltages without the need for connecting power semiconductor in series, has high-quality output voltage and fewer components compared to other classic five-level topologies. The features and operation of the proposed converter are studied and a simple sinusoidal PWM scheme is developed to control and balance the flying capacitors to their desired values. The performance of the proposed converter is evaluated by simulation.

**Keywords:** Multilevel Converter, DC-AC Power Conversion, Sinusoidal Pulse Width Modulation (SPWM).

### I. INTRODUCTION

Multilevel inverter can effectively reduce the voltage jump of each switching operation to reduce the switching loss and increase power efficiency. The number of power electronic switches used in the multilevel inverter is larger than that used in the conventional half-bridge and full-bridge inverters. Moreover, its control circuit is more complicated. Thus, both the performance and complexity should be considered in designing the multilevel inverter. However, interest in the multilevel inverter has been aroused due to its advantages of better power efficiency, lower switching harmonics, and a smaller filter inductor compared with the conventional half-bridge and full-bridge inverters. The diode-clamped converter (DCC), flying capacitor converter (FC), and the cascaded H-bridge (CHB) converter are the most well-known multilevel converter topologies [2] that have been commercialized successfully by major manufacturers. However, these topologies have some drawbacks which limit their applications for more levels. DCC topology with more number of levels is less attractive because of its limitations; 1) dc-link capacitor voltage balance becomes unattainable in higher level topologies with a passive front end, and 2) the number of clamping diodes increases substantially with the voltage level [5]. Flying capacitor (FC) topology needs to have higher switching frequencies to keep the capacitors properly balanced, whether a self-balancing or a control-assisted balancing modulation method is used.

Also the number of flying capacitors increases with the voltage level. Although cascade H-Bridge (CHB) topology can reach higher voltage and higher power levels with modular structure, this topology needs a number of isolated dc sources, an expensive and bulky phase-shifting

transformer, and a substantially more number of active devices to achieve a regenerative operation.

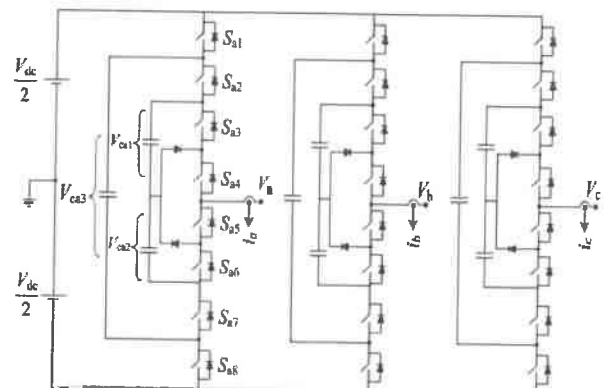


Fig. 1. New five-level three-phase inverter.

A number of new multilevel converters for more levels have been proposed in the literature [6]–[22]. These are variations or hybrids of the three major multilevel topologies. Among the existing topologies, the following topologies with five-level structure have found practical applications which are commercialized by manufacturers; the five-level H-bridge NPC (5L-HNPC) and the five-level active NPC (5L-ANPC). The main features of these converters are:

- A five-level H-bridge NPC (5L-HNPC) is the H-bridge connection of two classic 3L-NPC phase legs [6]–[8]. This topology requires three isolated dc sources fed by a phase shifting transformer and a number of diode bridges. The bulky phase shifting transformer increases also cost and complexity of the converter.



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## Flexible D-STATCOM Performance in Mitigating Faults

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**Abstract:** This paper proposes a flexible D-STATCOM (Distribution Static COMPensator) and its new controller system, that be able to both mitigate all types of faults and operate as a Distributed Generation (DG), when it supplies power to sensitive loads while the main utility source is disconnected (i.e. it is under islanded operating condition). Thus D-STATCOM operates same as a flexible DG (FDG) and consequently, it is called Flexible DSTATCOM (FD-STATCOM). This paper validates the performance of FD-STATCOM system to mitigate power quality problems and improve distribution system performance under all types of system related disturbances and system unbalanced faults, such as Line-to-Line (LL) and Double Line to Ground (DLG) faults and supplies power to sensitive loads under islanding condition. The work had been carried out in MATLAB environment using Simulink and SIM power system tool boxes. The proposed D-STATCOM model is very effective to enhance the power quality of an isolated distribution system feeding power to crucial equipment in remote areas. The simulations were performed and results were found to be satisfactory using MATLAB/SIMULINK.

**Keywords:** Statcom, Facts Controllers, D-Statcom, Voltage Source Converter, Total Harmonic Distortions.

### I. INTRODUCTION

An increasing demand for high quality, reliable electrical power and increasing number of distorting loads may leads to an increased awareness of power quality both by customers and utilities. The most common power quality problems today are voltage sags, harmonic distortion and low power factor. Voltage sags is a short time (10 ms to 1 minute) event during which a reduction in rms voltage magnitude occurs. It is often set only by two parameters, depth/ magnitude and duration. The voltage sags magnitude is ranged from 10% to 90% of nominal voltage and with duration from half a cycle to 1 min. Voltage sags is caused by a fault in the utility system, a fault within the customer's facility or a large increase of the load current, like starting a motor or transformer energizing. Voltage sags are one of the most occurring power quality problems. For an industry voltage sags occur more often and cause severe problems and economical losses. Utilities often focus on disturbances from end-user equipment as the main power quality problems. Harmonic currents in distribution system can cause harmonic distortion, low power factor and additional

losses as well as heating in the electrical equipment. It also can cause vibration and noise in machines and malfunction of the sensitive equipment. The development of power electronics devices such as Flexible AC Transmission System (FACTS) and custom power devices have introduced and emerging branch of technology providing the power system with versatile new control capabilities. There are different ways to enhance power quality problems in transmission and distribution systems. Among these, the D-STATCOM is one of the most effective devices. A new PWM-based control scheme has been implemented to control the electronic valves in the DSTATCOM. The D-STATCOM has additional capability to sustain reactive current at low voltage, and can be developed as a voltage and frequency support by replacing capacitors with batteries as energy storage.

### II. CONCEPT OF POWER QUALITY

#### A. Introduction to Power Quality

Power quality is the set of limits of electrical properties that allows electrical systems to function in their intended manner without significant loss of performance or life. The term is used to describe electric power that drives an electrical load and the load's ability to function properly with that electric power. A perfect power supply would be one that is always available, always within voltage and frequency tolerances and has a pure noise-free sinusoidal wave shape. Without the proper power, an electrical device (or load) may malfunction, fail prematurely or not operate at all. There are many ways in which electric power can be of poor quality and many more causes of such poor quality power. Many power problems originate in the commercial power grid, which, with its thousands of miles of transmission lines, is subject to weather conditions such as hurricanes, lightning storms, snow, ice, and flooding along with equipment failure, traffic accidents and major switching operations. Also, power problems affecting today's technological equipment are often generated locally within a facility from any number of situations, such as local construction, heavy startup loads, faulty distribution components, and even typical background electrical noise. Widespread use of electronics in everything from home electronics to the control of massive and costly industrial processes has raised the awareness of power quality. The study of power quality, and ways to control it, is a concern

## Voltage Control with Electric Springs

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**Abstract:** The concept of electric spring (ES) has been proposed recently as an effective means of distributed voltage control. The idea is to regulate the voltage across the critical (C) loads while allowing the noncritical (NC) impedance-type loads (e.g., water heaters) to vary their power consumption and thus contribute to demand-side response. In this paper, a comparison is made between distributed voltage control using ES against the traditional single point control with STATic COMPensator (STATCOM). For a given range of supply voltage variation, the total reactive capacity required for each option to produce the desired voltage regulation at the point of connection is compared. A simple case study with a single ES and STATCOM is presented first to show that the ES and STATCOM require comparable reactive power to achieve similar voltage regulation. Comparison between a STATCOM and ES is done. In both cases, it turns out that a group of ESs achieves better total voltage regulation than STATCOM with less overall reactive power capacity. Dependence of the ES capability on proportion of critical and NC load is also shown.

**Keywords:** Demand Response, Electric Springs (ES), Static Compensator (STATCOM), Voltage Control, Voltage Regulation.

### I. INTRODUCTION

Voltage control in medium voltage (MV) or low voltage (LV) distribution networks is typically exercised through transformer tap-changers and/or switched capacitors/reactors. Sometimes a STATic COMPensator (STATCOM) is used for fast and precise voltage regulation, especially for the sensitive/critical loads [1]. The novel concept of electric spring (ES) has been proposed as an effective means of distributed voltage control [2]. The idea is to regulate the voltage across the critical loads while allowing the noncritical (NC) impedance-type loads (e.g., water heaters) to vary their power consumption and thus contribute to demand-side response [3], [4] as well. This would allow and facilitate large penetration of intermittent renewable energy sources without requiring huge amounts of energy storage to act as a buffer between supply and demand [5]. The basic proof of concept of ES has already been demonstrated through hardware experimentation with the developed prototypes [2], [6]. Distributed voltage regulation through collective action of a cluster of ESs, each employing droop control has also been illustrated [7]. In this paper, the focus is to compare the effectiveness of single point voltage control using STATCOM against distributed voltage control using a group of ESs.

The basis for comparison is total voltage regulation [root mean square of the deviation of the actual voltages from the rated (1.0 p.u) values] achieved and the overall reactive capability required for each option in order to achieve that [8], [9]. A number of papers [2], [5]–[7] have been published recently on the ES concept and its control. However, none of

those papers have focused on the collective performance of multiple of ESs considering realistic distribution networks. This paper demonstrates the effectiveness of multiple ESs working in unison through case studies on an IEEE test feeder network and also a part of a real distribution system in Hong Kong. The voltage regulation performance and total reactive power requirement of a group of ESs in case of distributed voltage control is compared against the single-point control using a STATCOM. In both cases, it turns out that a group of ESs achieves better total voltage regulation than STATCOM with less overall reactive power capacity. The converter output voltage can be controlled using various control techniques. Pulse Width Modulation (PWM) techniques can be designed for the lowest harmonic content. When sinusoidal PWM technique is applied turn on and turn off signals for GTOs are generated comparing a sinusoidal reference signal  $V_r$  of amplitude  $A_r$  with a triangle carrier waveform  $V_c$  of amplitude  $A_c$  as shown in Fig 5.5 The frequency of the triangle waveform establishes the frequency at which GTOs are switched. Consider a phase-leg as shown in Fig.5.6(a) In this case  $V_r > V_c$  results in a turn on signal for the device one and gate turn off signal for the device four and  $V_r < V_c$  results in a turn off signal for the device one and gate turn on signal for the device four.

### II. ELECTRIC SPRING (ES) CONCEPT

Voltage control in LV and MV distribution networks and demand-side management (DSM) have traditionally been treated and tackled separately. Voltage control is usually achieved by control devices discussed in the previous section. DSM, on the other hand, is employed in a





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## Control Algorithm for Grid Connected Solar Inverter with Improved Inc MPPT Method

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**Abstract:** Variable-step incremental conductance (Inc. Cond.) technique, for photovoltaic (PV) maximum power point tracking, has merits of good tracking accuracy and fast convergence speed. Yet, it lacks simplicity in its implementation due to the mathematical division computations involved in its algorithm structure. In this study, an enhancement is introduced to Inc.Cond. algorithm in order to entirely eliminate the division calculations involved in its structure. Hence, algorithm implementation complexity is minimised enabling the utilisation of low-cost microcontrollers to cut down system cost. Moreover, the required real processing time is reduced, thus sampling rate can be improved to fasten system response during sudden changes. Regarding the applied step-size, a modified variable-step size, which depends solely on PV power, is proposed. The latter achieves enhanced transient performance with minimal steady-state power oscillations around the MPP even under partial shading. For proposed technique's validation, simulation work is carried out.

**Keywords:** Maximum Power Point Tracker (MPPT), Incremental Conductance (Inc.Cond.) Solar PV Panel.

### I. INTRODUCTION

Energy is absolutely essential for our life and demand has greatly increased worldwide in recent years. The research efforts in moving towards renewable energy can solve these issues. Compared to conventional fossil fuel energy sources, renewable energy sources have the following major advantages: they are sustainable, never going to run out, free and nonpolluting. Renewable energy is the energy generated from renewable natural resources such as solar irradiation, wind, tides, wave, etc. Amongst them, solar energy is becoming more popular in a variety of applications relating to heat, light and electricity. It is particularly attractive because of its abundance, renewability, cleanliness and its environmentally-friendly nature. One of the important technologies of solar energy is photovoltaic (PV) technology which converts irradiation directly to electricity by the PV effect. However, it can be realized that the solar PV panels have a few disadvantages such as low conversion efficiency (9% to 17%) and effects of various weather conditions [1]. In order to overcome these issues, the materials used in solar panel manufacturing

as well as collection approaches need to be improved. Obviously, it is particularly difficult to make considerable improvements in the materials used in the solar PV panels. Therefore, increasing of the irradiation intensity received from the sun is an attainable solution for improving the performance of the solar PV panels. One of the major approaches for maximizing power extraction in solar PV systems is a sun tracking system. The sun tracking systems were introduced in [2], [3] using microprocessor, and in [4] using a programmable logic controller respectively.

The closed-loop control schemes for automatic sun tracking of double-axis, horizon single-axis, and fixed systems were presented and compared in [5]. Furthermore, the idea of designing and optimizing a solar tracking mechanism was also proposed in [6]. Additionally, it can also be realized that the V-I characteristic of the solar cell is non-linear and varies with irradiation and temperature [1]. Generally, there is a unique point on the V-I or V-P curve which is called the maximum power point (MPP). This means that the solar PV panel will operate with a maximum efficiency and produce a maximum output power. The MPP is not known on the V-I or V-P curve, and it can be located by search algorithms such as the perturbation and observation (P&O) algorithms [7]–[12], the incremental conductance (InC) algorithm [13], [14], the constant voltage (CV) algorithm [15], [16], the artificial neural network algorithm [17], [18], the fuzzy logic algorithm [19], [20], and the particle swarm optimization algorithm [21]–[24]. These existing algorithms have several advantages and disadvantages concerned with simplicity, convergence speed, extra-hardware and cost. This paper proposes an improved InC algorithm for tracking a MPP on the V-I characteristic of the solar PV panel. Based on the ST and MPPT, the solar PV panel is always guaranteed to operate in an adaptive and optimal situation for all conditions.

The remainder of this paper is organized as follows. The mathematical model of solar PV panels is described in Section II-A proposal for adaptive and optimal control strategy of a solar PV panel based on the control combination of the solar tracker (ST) and MPP tracker (MPPT) with the improved InC algorithm is presented in Section III. The simulation and experimental results then

# ANN CONTROL OF A DC GRID-BASED WIND POWER GENERATION SYSTEM IN A MICROGRID

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**ABSTRACT:** The design of a dc grid-based wind power generation system with ANN controller is proposed. The proposed system allows flexible operation of multiple parallel-connected wind generators by eliminating the need for voltage and frequency synchronization. A control scheme which uses separate controllers for the inverters during grid-connected and islanded operation is proposed. A model predictive control algorithm that offers better transient response with respect to the changes in the operating conditions is proposed for the control of the inverters. ANN is nonlinear model that is easy to use and understand compared to statistical methods. ANN is nonparametric model while most of statistical methods are parametric model that need higher background of statistic. To increase the controller's robustness against variations in the operating conditions ANN based controller is introduced the fluctuations of the micro grid are controller with the constant regulated power a separate controller is introduced to the wind power to maintain the fixed power to mitigate the varitional errors. To demonstrate the operational capability of the proposed micro grid when it operates connected to or islanded from the distribution grid, and the results obtained are discussed.

## I. INTRODUCTION

IN reality, every human being needs electricity which the most flexible form of energy. In that case electrical energy is central to concerns about sustainable development and poverty reduction. It affects practically all aspects of social and economic development, including livelihoods, water supply, agriculture, population growth, health, education, job creation and environmental concerns. Energy demand [1] in developing countries is growing rapidly. In order to meet this demand and at the same time to achieve sustainable development objectives on a global scale, conventional approaches to energy must be reoriented towards energy systems

based on renewable energy and energy efficiency. Worldwide, there is an increasing adoption of distributed generation (DG) in the form of Renewable Energy Sources (RES) [2] that form Minigrid and/or Microgrids. In this direction, many issues related to economics, electrical system optimization and long-term viability have been focused and researched. The control of dc-dc regulator and inverter interfaced microgrid network that combines diversity of RES is the structure tackled by this research work. This research focuses on integration and control of RES microgrid where, architecture and controller for dc-dc converter and dc-ac inverter interfaced microgrid will be designed and developed.

This particular focus on renewable energy research has been motivated by unavailability of electricity in grid isolated areas (mainly rural areas) while there are various electrification options from locally available and plenty diversity of unexploited RES. The proposed microgrid architecture extends the traditional integration use of solar and wind generation systems to include other diversity of RES such as solar, mini/micro hydro generation, biofuel generation, biomass, biogas and oceanic (waves and tides) generation instead of fossil fuels to increase power density and maintaining reliability and sustainability. The proposed control is envisaged to allow the behavior aspects of a system to be considered simultaneously and thus improve stability and power quality of the micro/mini-grid for linear and nonlinear loads during grid connected and islanding operation modes.

## Cost Effective Solution for a Shunt Hybrid Filter Using Enhanced Current Controller

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### ABSTRACT

The increasing demand of energy and development of distributed generation systems have led to great progress in medium voltage high-power inverters. On the other side, due to more intransigent regulations in the area of power quality and appearance of new grid codes, which limit the harmonics' amounts in ac grids, special attention has to be made to restrict the harmonics. The recently proposed selective harmonic mitigation pulse width modulation method reduces the values of specific harmonics to meet the grid codes, instead of making them zero. In this way, there are much more solutions for mitigating the same harmonics which in the Selective Harmonic Eliminated Pulse-Width Modulation (SHEPWM), are completely eliminated. The SHMPWM was first introduced in, where a waveform having 750 Hz switching frequency was employed to mitigate harmonics up to 49th to satisfy the grid codes EN 50160 and CIGRE WG 36-05 without using any filtering system. In this contribution a solution to the parallel resonance problem that can be present in practical applications of shunt Active Power Filter (APF) compensation is proposed. The proposed solution involves turning the shunt APF scheme of compensation into a Shunt Hybrid Filter (SHF) configuration. A Linear Quadratic Regulator (LQR)-based switching controller was specifically designed for this hybrid scheme of compensation, maintaining stringent performance requirements on the tracking of filtering currents and the draining of the harmonic ripple currents.

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### 1. INTRODUCTION

With the continuous increase in the incorporation of nonlinear loads in the power network, the harmonic distortion of voltage and current waveforms, among other power quality problems, has become a great concern. This paper focuses on the use of shunt filtering techniques such as shunt Active Power Filter (APF) and shunt hybrid filter (SHF), to mitigate harmonic distortion and to compensate reactive power. In conventional inverters which use sinusoidal pulse width modulation, there are heavy losses due to presence of harmonics [1]. Upcoming smart grid paradigm enabling maximum power throughputs and near-instantaneous control of voltages and currents in all links of the power system chain [2]. The series capacitor provides the majority of the power pulsation decoupling through a wide voltage swing, and the buffer converter only needs to process a small fraction of the total power of the entire architecture, allowing a very small active circuit volume and very high system efficiency [3]. Inverter effectiveness is evaluated by comparing the performance based on SHE PWM and based on the conventional constant switching frequency PWM technique [4]. By installing DG in the transmission system, voltage stability and voltage profile can be



# IDENTIFICATION OF THE OPTIMAL CONVERTER TOPOLOGY FOR SOLAR WATER PUMPING APPLICATION

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## ABSTRACT

*This paper envisages to identify an optimal topology of DC-DC converter for the solar pump application, by comparing the performance indices of the three advanced non-isolated converters namely Landsman converter, Luo converter and Zeta converter. The identified best topology of the non-isolated DC-DC converter, which basically operates in the mode of buck-boost converters cascaded to a three phase voltage source inverter (VSI), which is connected to a permanent magnet brushless DC (PMBLDC) motor. The whole system is front ended to a PV panel. In order to obtain the maximum power transfer to the load, a popular maximum power point tracking (MPPT) technique, Perturb and Observe (P&O) has been implemented. The whole system is simulated under the environment of PSIM.*

**Keywords:** PV system, Perturb and Observe, MPPT, PMBLDC, DC-DC converter

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## 1. INTRODUCTION

Extinction of the fossil fuels globally making world to concentrate on the renewable energy sources. Non-conventional energy sources being pollution-free, almost does not affect the environment. The initial installation cost may be more, but the running cost will be very low compared to the non-renewable energy sources. Upcoming concepts like distributed generation, smart grid and micro grid can be easily implemented with the renewable energy sources.

Solar energy being more economical and stable compared to the remaining sources of renewable energy, may be the scope of power for the future [11]. The solar power generated

## Modelling and Comparative THD Analysis of Cascaded H-Bridge Multi-Level Inverters

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### ABSTRACT:

Multilevel Inverters in recent years have more development and deployment in different industrial applications. Moreover, more research is being done on multilevel inverters by developing different switching and constructional topologies to get more power quality for DC-AC appliances. Total Harmonic Distortion is one of the major aspects in power quality. In this paper cascaded H-bridge with three, five, seven and nine level multilevel inverters are modelled. Sinusoidal Pulse Width Modulation (SPWM) technique is used as a control methodology for all the cascaded H-bridges modelled. Analysis of total harmonic distortion is done by using Fast Fourier Transform, where the nine-level cascaded H-bridge multilevel inverter has less harmonic distortion than the other three. Simulation is done, the results are obtained on MATLAB\Simulink software and a comparative analysis is done among the four different level inverters.

**Keywords:** Multilevel Inverters, Cascaded H-bridge Multilevel Inverters, Total Harmonic Distortion, Control Methodology, Sinusoidal Pulse Width Modulation (SPWM), Comparative Analysis, MATLAB/Simulink.

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### I. INTRODUCTION

Inverters were developed in three categories based on motor drives, power supply and active filters. Among these Multilevel Inverters (MLIs) are treated as the preferred choice for academia and industries due to their high-power application capability. Multilevel Inverters were first introduced in the year 1975, which have come from three-level inverter. Basically, MLI, a power electronic device that gives the desired waveform of the output voltage as several levels of dc input voltages. It is because as the number of input dc voltage sources increases the output voltage becomes sinusoidal by fundamental frequency switching mechanism. The voltage stresses on the switching devices is less than the on overall operating voltage. Nowadays MLIs have small, medium and high power range applications.

H-bridge series design is the first topology for MLIs, following H-bridge, Diode Clamped topology has been developed. In diode-clamped topology, series capacitor banks are used to split the DC bus voltage. Later on Capacitor Clamped (flying capacitor) topology is used instead of series capacitors to clamp dc voltage at various levels. Researchers have also developed another design of MLIs, which comprise parallel connected inverters through interphase reactors. Various fundamental topologies cascaded to form hybrid topologies, which help to the improvement in power quality due to the multiplying effect of levels number that the fundamental topologies. Soft-switching schemes developed can also be used to reduce the switching losses, with obvious increase in efficiency [1-22].

Increase in power quality happens with reducing the Total Harmonic Distortion (THD) in MLIs as it lessens the lower level harmonics with a multi-stepped output waveform. In addition to THD, reduction in dv/dt stress and electromagnetic compatibility and stress reduction on drive bearings. One of the main disadvantage in MLIs is more switching devices are required. As the switching devices increase in number, the firing and control circuit becomes complex. Additionally, accumulation of voltage drop at each device can reduce the output voltage and higher power loss (heat loss) due to more switching devices.

This paper's aim is exhibit the advantage of reduction in THD with the increase in the levels of Cascading H-bridge MLIs. The paper is framed in a way that II section gives a brief description of MLIs. Following this, in III section control strategies of MLIs is described. Later on Simulation Results of the Cascaded H-bridge 3-level, 5-level, 7-level and 9-level are shown along with THD analysis in each.

## Sign language recognition with multi feature fusion and ANN classifier

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**Abstract:** Extracting and recognizing complex human movements such as sign language gestures from video sequences is a challenging task. In this paper this kind of a difficult problem is approached with Indian sign language (ISL) videos. A new segmentation algorithm is developed by fusion of features from discrete wavelet transform (DWT) and local binary pattern (LBP). A 2D point cloud is formed from fused features, which represent the local hand shapes in consecutive video frames. We validate the proposed feature extraction model with state of the art features such as HOG, SIFT and SURF for each sign video on the same ANN classifier. We found that the Haar-LBP fused features represent sign video data in better manner compared to HOG, SIFT and SURF. This is due to the combination of global and local features in our proposed feature matrix. The extracted features input the artificial neural network (ANN) classifier with labels forming the corresponding words. The proposed ANN classifier is tested against state of the art classifiers such as Adaboost, support vector machine (SVM) and other ANN methods on different features extracted from the ISL dataset. The classifiers were tested for accuracy and correctness in identifying the signs. The ANN classifier that produced a recognition rate of 92.79% was obtained with maximum training instances, which was far greater than the existing works on sign language with other features and ANN classifier on our ISL dataset.

**Key words:** Indian sign language identification, artificial neural network, Adaboost classifier, multifeature fusion, discrete wavelet transform, local binary patterns

### 1. Introduction

Automatic sign language recognition is a complicated problem for computer vision scientists, which involves mining and categorizing spatial patterns of human poses in videos. Sign language created from human action is defined as a temporal variation of human body in a video sequence, which is characterized by moving hands with respect to body, face, and head including hand shapes. The problem is to extract, identify a human pose, and classify into labels based on trained human signature action models [1]. The objective of this work is to extract the signature of Indian sign language poses from the videos giving a specific sign as input.

However, the constraints are video resolution, frame rate, background lighting, scene change rate and blurring to name a few. The analysis on video content is a complicated process as most of the users end up with constraints which act as a hindrance in automation of video object segmentation and classification. Automatic sign extraction from sign video sequence is complicated due to complex hand poses and body actions performed at different speeds depending on the signer. Figure 1 shows a set of lab captured Indian sign videos for training and testing the proposed algorithm.

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# FLOWER IMAGE SEGMENTATION USING WATERSHED AND MARKER CONTROLLED WATERSHED TRANSFORM DOMAIN ALGORITHMS

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## ABSTRACT

Watershed and marker-controlled watershed transform domain methods are the one of the powerful tools for image segmentation. Segmentation and recognition are two primary stages in the development of a fully digitized flower identifier for real time use. This paper limits the following discussion to flower image segmentation only. The objective of this work is to study and explore flower detection and segmentation algorithms with watershed transform. Two variants of watershed transform with morphological gradients and wavelet coefficients are proposed. The flower segmentation problem uses watershed and marker-controlled watershed algorithm during the initial phases. This transformed into a wavelet based fusion model with binary flower images in the later stages giving reasonable segmentation outputs. The segmentation results are analysed both visually and mathematically. The average segmentation distance error (SDE) and structural similarity index (SSIM) on Oxford university flower dataset is around 0.485 and 0.786 respectively.

**Keywords:** flower image segmentation, watershed transform, marker controlled watershed transform, segmentation distance error, structural similarity index.

## 1. INTRODUCTION

Flowers induce instantaneous and elongated effects on emotions, mood, behaviours and memory of both male and female human beings [1]. The authors studied extensively about the reactions flowers cause during their contact with humans in three different ways and concluded that human happiness is directly linked to flowers.

This is the reason for a 30% increase in world floriculture market every year and a 25% in India per annum [2]. The other side of the story is the losses incurred as they don't last long after they are cut from the plant. The storage, temperature, sorting, packaging and transportation are some of the causes for a market loss of nearly 25% every year [3].

The world consists of close to 250,000 species of flowers. Classification of these species is largely at the discretion of the botanists. Even the people involved in floral trade are unable to classify them correctly. An image is enough to classify the floral content with the help of a guide book and an expert botanist.

People still find it difficult to identify a flower species when they come across one. If they have a name of the flower it is easy to find information about the flower species using google search engine. But the link between the photographed flower picture and the name of the flower is missing. Hence, this thesis investigates the first two steps in the process of automatic classification of flora from images of flowers captured by digital cameras.

Computer vision based algorithms can determine the quality of flower during its journey from blossoming to final consumer market. In this work we limit ourselves to the first two stages of development of a complete floral quality tester using computer vision models.

The first and most complicated task is to extract the flower to lower dimensional subspace for classification. The binary segmentation of the flower is

performed by using a higher dimensional feature subspace consisting of colour, texture and shape characteristics of the image objects.

The second task is to classify the segmented flowers which are represented as features. Classification can be attempted using multiple algorithms such as K-Means, fuzzy C-Means, support vector machines (SVM), artificial neural networks (ANN) [4] [5] and deep learning architectures.

Vision computing applications are growing at an enormous pace in the last decade and agriculture [6] is no exception. Pest detection, grading [7], lesion estimation [8], yield prediction [9] and flower quality estimation [10] leading to good harvesting are the major areas [11]. For floral image processing, very little research progress is observed.

This work exclusively uses standard image processing techniques for flower segmentation. The objective of this paper is to study and explore flower detection and segmentation algorithms with watershed transform. Two variants of watershed transform with morphological gradients and wavelet coefficients are proposed.

Segmenting a flower image captured in the wild poses many challenges in the form of brightness, contrast, scale, resolution, orientation and occlusions. The objective is to test the robustness of the segmentation algorithms on flower images and design methods to make them immune to such capturing effects.

The watershed transform is simple, intuitive and always gives full division of the regions in the image. However, when applied to complex images like flower images captured in the wild, it is affected over segmentation and high noise sensitivity. This paper presents an improvement to the watershed transform by involving pre-knowledge in its calculations.



## Efficient Clustering Protocol Using Fuzzy K-means and Midpoint Algorithm for Lifetime Improvement in WSNs

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**Abstract:** Due to shortage of power source, energy is the significant concern part in Wireless Sensor Systems. Wireless Sensor Networks (WSNs) are currently used in numerous kinds of WSN simulators have been established to visually illustrate the coverage, energy consumption status and expected lifetime of WSN sensors. Most of the Researchers have proposed and develop routing algorithm to increase the network lifetime. Among them clustering is the best technique and it is well known for accomplishing energy effectiveness in WSNs. In this paper, Energy Efficient Multi-hop Routing Clustering Protocol (EEMRCP) based on Fuzzy K-Means and Centralized Mid-point Algorithm (FKM-CMA) is proposed for network lifetime improvement. An existing and frequently used algorithm is K-means algorithm in WSN. The main limitation of this K-means algorithm is random initial centroid selection. To improve K-means algorithm, a Midpoint method in initial centroid selection is used. This is named as FKM-CMA. There are two main considerations for cluster head selection in proposed work, one is it's residual energy, and another one is Euclidean distance used in basic Fuzzy K-means algorithm. Finally, Multi-hop communication is performed for transmitting the packets from CHs to Base Station depending on the distance between them. Furthermore, stimulated outcomes showed that the total network performance of the proposed approach is improved than the other existing approaches.

**Keywords:** Wireless sensor network, Fuzzy k-means, Midpoint algorithm, Energy consumption, Network lifetime.

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### 1. Introduction

WSNs equipped with a group of various sensor nodes with limited sensing, computing and communication abilities. These sensors nodes are set up over a big area with one or more than one Base Station [1]. Each node contains a detecting part, a processing part, a transmission part, a battery, and a power harvester. WSN has extensive application possibilities, which includes environmental monitoring, health monitoring, terrestrial and underwater habitat monitoring, disaster management, military surveillance, forest fire-tracking, security surveillance, etc. Rapid developments in wireless communications system, low-power electronics, battery technology, and power harvesting abilities have facilitated the improvement of low-cost WSNs [2]. The routing methods selection is a vital problem for the effective delivery of the packets to their

target point. Furthermore, in such networks, the applied routing scheme should confirm the lowest of the energy consumption and hence extension of the lifetime of the network [3]. From few years, researchers have demonstrated that the clustering is an effective approach in expanding lifetime and reduces energy consumption of Wireless Sensor Networks. In each cluster, there are several nodes, among them one will be act as a cluster head (CH) and others will be numerous cluster members. Cluster members sense and collects the information from surrounding environment and forward the information to cluster head (CH). Moreover, CHs function as fusion point for data aggregation, so that the actual data transferred to the BS is abridged [4]. Clustered WSNs also utilizes single-hop technique and multi-hop technique for communication between the nodes. The CHs utilizes multi-hopping technique to reach the BS when they are far away



## Wideband Defected Ground Structured Monopole Antenna with Electromagnetic Band Gap Loading

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**Abstract:** Two monopole antenna models are designed in this research with defected ground structure and Electromagnetic BandGap (EBG) loading. Antenna model 1 is the combination of monopole on front side and Defected Ground Structure (DGS) on back side. Antenna model 2 is the combination of monopole on front side and EBG loaded DGS on back side. Monopole antenna with DGS is resonating at dual band and monopole with EBG and DGS is resonating in the wideband. Both the designed antennas are covering operational bands of Worldwide interoperability for Microwave Access (WiMAX) and Wireless LAN (WLAN) with omni directional radiation pattern and stable gain. The proposed antennas are having the advantages of simple fabrication, compactness and excellent radiation characteristics which can be applied to wireless mobile communication system.

**Key words:** Compact antenna, Defected Ground Structure (DGS), Electromagnetic Band Gap (EBG), monopole, Wireless LAN (WLAN), Worldwide interoperability for Microwave Access (WiMAX)

### INTRODUCTION

The applications with microstrip patch antennas are increasing day by day with demand in advanced communication technology. These structures are very simple and compact models can be generated with little effort. The main advantages includes planar structure, easiness in the construction, placement with Microwave and Millimetre wave Integrated Circuits (MMIC) and Radio Frequency Integrated Circuit (RFIC) possibility and impedance matching achievability, etc. Wide variety of narrowband, wideband and broadband antennas with this microstrip technology was experimented by researchers and achieved desired results according to their specifications (Fu and Yuan, 2005; Yang and Rahmat-Samii, 2009; Madhav *et al.*, 2014, 2015a, b; Srinivas *et al.*, 2015).

Dual, triple and multiband antennas are very useful in the communication applications especially in the mobile communication to cover different applications like global position system, Bluetooth, Wi-Fi, WLAN, etc. Wideband antennas are also needed in commercial communication applications (Madhav *et al.*, 2015a, b; Raman *et al.*, 2016). Design and development of such antennas with desired results involves lot of effort in modelling and material based construction. Modern days researchers are working on specific structures like EBG's and metamaterials to improve the performance characteristics of the advanced antennas and to reduce the losses associated with the operation (Lin and Wen, 2008; Kim *et al.*, 2011). The

electromagnetic band gap structures are used to reduce the surface wave related problems and to improve the gain and directivity of the antenna models. These are also called as photonic band gap structures and are using in different domains of engineering. The periodic structures will provide band stop and band gap characteristics when electromagnetic waves passes through them (Kim *et al.*, 2013; Yang *et al.*, 2005).

The present research deals with the design and implementation of two antenna models, one is based on defected ground structured monopole antenna designed to operate at dual band. Second one is based on the electromagnetic band gap structured model which is the modified structure of antenna model 1. In the first model design rectangular radiating element with DGS is used and in the second model DGS with EBG is proposed. Both the antenna models are designed on both High Frequency Structure Simulator (HFSS) and Computer Simulation Technology (CST) softwares and examined their performance characteristics and outcomes are presented in this study.

### MATERIALS AND METHODS

**Antenna geometry:** The radiating patch elements of the antenna model are constructed with rectangular shaped conducting elements and are printed on a dielectric substrate with relative permittivity of 2.6 and height of 1.6 mm. The total dimension of the antenna is around 35×35×1.6 mm. Figure 1 shows the rectangular monopole



## Bandwidth Enhancement of CPW-Fed Elliptical Curved Antenna with Square SRR

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**Abstract:** The objective of this article is to design a novel coplanar waveguide fed elliptical curved antenna with split ring resonators to improve the bandwidth characteristics. Split ring resonators are etched on the ground plane nearer to the feed line, which exhibiting metamaterial properties to enhance the bandwidth. The metamaterial loading invoking the negative refractive index transmission line concept. A huge bandwidth of 17.9 GHz and an impedance bandwidth of 56% are attained from the current antenna model. The overall dimension of the antenna is around 40X44X1.6 mm on FR4 substrate material with permittivity 4.4. A peak realized gain of 6.2 dB and an average gain of 2.8 dB is attained in the operating band for the designed antenna model. The measured results are providing excellent correlation with simulation results obtained from HFSS and CST tools.

**Keywords:** Bandwidth enhancement, Coplanar waveguide (CPW), Elliptical antenna, Split ring resonator (SRR), High frequency structure simulator (HFSS), Computer simulation technology (CST).

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### 1. Introduction

Generally wideband systems require compact antenna models with large bandwidth. The known fact is that the printed antennas are very much suitable for such kind of requirements and which enable to design the models at small size, simple orientation and low cost. The main drawback is the narrow bandwidth and which opposing the choice of printed antennas in specific applications. Many techniques are been proposed during last decade to improve the bandwidth characteristics of the antenna. Increase of substrate thickness [1], usage of stacked elements [2] and using magnetic dielectric materials will improve the bandwidth to certain extent [3]. In certain cases the impedance bandwidth is improved, but overall gain and size is not good [4-5]. Defected ground structure is one of the techniques to resonate additional bands and to improve the bandwidth of the antenna [6]. By using defected ground structure, we can attain better bandwidth, but considerable

gain will be reduced. To improve the gain and directivity of the antenna, recently new types of composite structures are going to be used in the design. These new materials are called as metamaterials [7-8]. Metamaterials are engineered to provide material characteristics that cannot be found in nature.

Patch antennas with metamaterial characteristics offer many benefits including miniaturization, wide bandwidths and good radiation characteristics. The negative permittivity, permeability and negative refractive index are the properties of these materials [9]. The negative refractive index transmission line concept enabled design and development of advanced antennas with enhancement in performance characteristics [10]. The key deciding factors of refractive index are permittivity and permeability. Metamaterials are artificial structured materials, which possesses unnatural properties in the materials with negative permittivity and permeability. Split ring resonators and

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# Malicious Node Identification In Energy Efficient Trust Node Based Routing Protocol (M-Eetrp) For Lifetime Improvement In Wsn

Nandoori Srikanth, Muktyala Siva Ganga Prasad

**Abstract:** *Uneven Deployment of sensor nodes, Irregular terrains, energy limitations, malicious attacks, and interfered wireless links, are the key parameters which degrades the performance of WSN. To improve lifetime of the network sensor nodes are driven into sleep states, once they complete their sensing task. Irregular Terrains like military areas, plateaus suffers with uneven deployment of sensor nodes, and malicious attacks. Mobile node based data gathering is the efficient technique for lifetime maximization in WSN fixed up in irregular terrains like plateaus and also to avoid security based issues. The mobile node based data gathering techniques also suffer from energy limitations of mobile nodes. This paper explores an effective method of utilizing energy resources of mobile nodes without any malicious attacks by proposing "Malicious node identification in energy efficient trust node based routing protocol". Malicious node identification is the key parameter in WSN to make the network more energy efficient. This Protocol gives better results compared with existing algorithms with the Improvement of Network lifetime by 67% and energy consumption as 30%.*

**Index Terms:** *WSN, Data aggregation, Trust Node, malicious node, Built in Self-Test.*

## I. INTRODUCTION

The WSN has opened an attracting possibility of transforming gross mechanical actions into subtle sensory responses [1]. WSN is an arrangement of group of sensor nodes to sense the physical environment and communicate through wireless links. These sensor nodes has less maintenance, and their energy resources follows scavenging principle. The performance parameters of WSN depend on terrain structure, quality of wireless links, energy resources, uneven deployment etc. [2]. Irregular terrain structure is also one of the key parameter which degrades the performance of WSN. To overcome this problem, mobile nodes are introduced among clusters for data collection, due to mobile based data gathering high end data isolation can be provided to sensor nodes. The data gathered from various sensor nodes are aggregated and send to the base station and these smart sensors nodes works on command controlled strategies that have one or more memory unit, sensors, processor, and an actuator and power supply [3]. Energy efficiency is the key research area in WSN which leads to improve network

lifetime, link quality, and throughput. In this paper efficient utilization of energy resources is greatly enhanced by improving cluster based routings; these cluster based routings can be improved by introducing mobile data collectors in sub clusters for data collection. These mobile nodes (Mobile Data Collectors - MDC) collect data individually from each node and forward to cluster head after data aggregation [4]. Along with MDCs some high energized nodes (Trusted nodes) are deployed in sub clusters for data transmission to MDCs in even number of rounds. These sensor nodes can maintain in sleep state up to a long time, until the mobile node gives wake up notification.

### Motivation of the Paper:

Even mobile node based data aggregation gives better results in irregular terrains [5], it suffers from energy limitations. The mobile node (MDC) has to move around the sub cluster, and collect data from each sensor node, and forward to cluster head [6]. The selection of mobile node is based on its threshold level, if mobile node energy is less than threshold level, then the mobile node is not used for data collection [9]. To overcome this problem, and also to improve energy efficiency, A Malicious Node Identification in energy efficient trust node based routing protocol (M-EETRP) is proposed, in which cluster is divided into sub clusters and each sub cluster is assigned with at least one mobile node.

### Contributions of the Paper:

In this research, all nodes are organized into clusters, again each cluster is divided into sub clusters, and each sub cluster is assigned with a mobile node for data collection. In each sub cluster some high energy nodes are assigned as trusted nodes. These trusted nodes are used to minimize the energy consumption of mobile nodes during data aggregation.

- Malicious node identification in energy efficient trust node based routing protocol (M-EETRP) is proposed, which aims to minimize energy consumption for data gathering and transmission in WSN.
- M-EETRP protocol is utilized to optimize the sub clustering algorithm rules to upsurge the network lifetime, based on the applications like plateaus and military areas.

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## Efficient Energy Clustering Protocol Using Genetic Algorithm in Wireless Sensor Networks

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### Abstract

Nowadays, Wireless Sensor Networks (WSNs) are pondered as an exploration subject. Currently, progress in electronic communications has directed to multi-purpose Sensor Nodes (SNs) with less price and power consumption. Energy efficiency is a major concern in WSNs as the sensor nodes are battery-operated devices. Clustering based techniques are implemented through data aggregation to make equal energy consumption among SNs for energy efficient data transmission. The existing clustering techniques make use of distinct Harmony Search Algorithm (HSA), Low-Energy Adaptive Clustering Hierarchy (LEACH) and Particle Swarm Optimization (PSO) algorithms. However, these algorithms have exploration exploitation trade-off and local search constraint individually. In order to obtain a global search with faster convergence, Efficient Energy Clustering Protocol (EECP) based on Genetic Algorithm (GA) is recently proposed to detect their immediate neighbors, balance energy consumption load among data transmission routes and energy efficient cluster head selection. The proposed algorithm exhibited high search efficiency and dynamic capability that improves lifetime of SNs. The presentation of the proposed algorithm was assessed using throughput, packet delivery ratio, energy consumption and end to end delay. The proposed algorithm showed an improvement in energy consumption and throughput by 95 and 90 Mbps respectively than existing clustering algorithm.

**Keywords:** Wireless Sensor Networks (WSN), Efficient Energy Clustering Protocol (EECP), Base Station (BS), Genetic Algorithm (GA).

### 1. Introduction

Sensor technologies and wireless communication in recent years have made wonderful evolution. Wireless Sensor Networks (WSNs) has used in an extensive diversity of utilizations and have appeared as an auspicious study field [1]. They have been utilized in environmental [2], smart home-field [3] and health field [4]. Complex environmental or physical circumstances can be monitored by using sensors in WSNs. Such sensors are normally furnished with the communication competences and data processing in order to assemble data and to track information back to Base Station (BS) [5]. Power source includes a limited energy budget battery which outcomes in determinate nodes lifetime in WSN. Moreover, it might be improbable or difficult for recharging the battery because nodes may be organized in an aggressive or impracticable environment [6]. The characteristic WSN scenario is given in Fig. 1.

Scholars are deeply intricate in energy efficient solutions planning, in the same way energy efficient network methods are the important parameters for improving network lifetime. The distributed WSNs saves energy by using Cluster based Hierarchical approach [7], which improves life of network by successfully using the node energy and supports lively environment of WSNs. Sensor nodes (SNs) in WSN are cluster based which is separated into numerous sets recognized as clusters with a group leader identified as *Cluster Head* (CH). All sensor nodes sense data and propel it to reliable CH which lastly

sends to the BS for extra processing. Clustering has many important gains over classical systems [8]. First, data aggregation is applied on data received from numerous SNs Within a cluster; to decrease the quantity of data transmitted to BS, consequently energy necessities reduces abruptly. Secondly, spin of CHs assistances to ensure balanced energy consumption within the network, which prevents receiving particular nodes famished because of absence of energy [9].

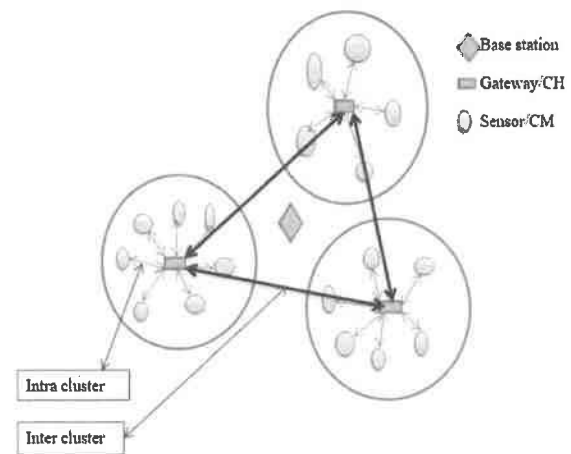


Fig. 1. Intra-cluster and Inter-cluster communication in WSN.

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# Energy Efficient Trust Node Based Routing Protocol (EETRP) to Maximize the Lifetime of Wireless Sensor Networks in Plateaus

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**Abstract**—Wireless sensor networks (WSNs) can extant the individual profits and suppleness with regard to low-power and economical quick deployment for numerous applications. WSNs are widely utilized in medical health care, environmental monitoring, emergencies and remote control areas. Introducing of mobile nodes in clusters is a traditional approach, to assemble the data from sensor nodes and forward to the base station. Energy efficiency and lifetime improvements are key research areas from past few decades. In this research, to solve the energy limitation to upsurge the network lifetime, energy efficient trust node based routing protocol is proposed. An experimental validation of framework is focused on packet delivery ratio, network lifetime, throughput, energy consumption and network loss among all other challenges. This protocol assigns some high energy nodes as trusted nodes, and it decides the mobility of data collector. The energy of mobile nodes, and sensor nodes can save up to a great extent by collecting data from trusted nodes based on their trustworthiness and energy efficiency. The simulation outcome of our evaluation shows an improvement in all these parameters than existing clustering and routing algorithms.

**Keywords**—WSN, EETRP, Mobile Node, Trust Node, Sub-Cluster (SC)

## 1 Introduction

The main objective of wireless sensor network (WSN) is to observe physical or ecological conditions, such as sound, temperature, pressure, vibration, motion or contaminants and to co-operatively pass their data by the network to a central position (i.e., base station or sink) [1]. WSNs are developing as an important and popular ways of provided that prevalent computing environments for several applications and harshly challenged by limited energy. It's essential to use available energy in efficient manner to maintain sustainability in networks [2]. In WSNs, the deployment of sensor nodes (SN) is performed whichever in the arbitrary manner. Firstly, WSNs was similar in nature, i.e. all the SN and cluster-heads are undistinguishable with reference to power consumption, storage capacity and computing capability [3]. WSN is an arrangement of several nodes for efficient performance of WSN; we have required

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## GREEN COMP BASED ENERGY EFFICIENT DATA AGGREGATION ALGORITHM WITH MALICIOUS NODE IDENTIFICATION (GEED-M) FOR LIFETIME IMPROVEMENT IN WSN

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**Abstract:** Random deployment of sensor nodes, energy limitations, interference of wireless links, and exposed nodes, are the major reasons of performance degradation in WSN. Energy efficiency, Lifetime improvements are the key research areas from last few decades. Even a high level of research is going on; still there are several issues which reduce the network lifetime and its throughput. For diminishing the energy consumption, the sensor nodes are driven into sleep mode once they finished their sensing round. Introducing mobile nodes in sub clusters is an efficient technique to make the network energy efficient in irregular terrains like plateaus. The energy limitations of mobile nodes, and malicious behaviour are big issues in mobile node based sub clustered sensor networks. These issues can be clear up by introducing a Green CoMP based energy efficient data aggregation algorithm with malicious node identification is proposed, which exchange messages to the cluster head through a mobile node. Malicious behaviour of mobile node is also identified by using Built-in self-Test based technique to improve network throughput. The proposed algorithm gives better results compared with existing algorithms with a lifetime improvement of 56%, energy consumption 44%.

**Keywords:** Data aggregation; Green-CoMP; Malicious node; Built-in self-test; Lifetime;

### I. INTRODUCTION

WSN is a collection of group of sensor nodes which communicate through wireless links, and can work together to sense environmental conditions. WSN has changed the way of living, and reduce the complexity situations, and giving attractive solutions to various problems in various fields. The wide range of applications of WSN includes military, medical, communication, industrial, wild life, environmental applications etc. The drastic development of WSN changed the entire communication system in many applications with high end security, throughput. The data gathered from various sensor nodes are aggregated and send

to the Base station through a cluster head. The smart sensors nodes works on command controlled strategies that have one or more memory unit, sensors, processor, an actuator and power supply [4]. In WSN, sensor nodes are controlled w.r.t communication bandwidth, processing power and storage space which are mandatory to be very efficient as a source of operation. In Wireless sensor networks, the sensor nodes are organized into clusters. It is more advantageous to use clustering in WSNs, Due to clustering, reducing the complete energy consumption and decreasing the interferences between sensor nodes. The major issues of WSN are Energy efficiency, lifetime, and security. There

# Optimal Design and Synthesis of Linear Antenna Array Using Social Group Optimization Technique

Abdul Rahiman Sheik, Kalva Sri Rama Krishna

**Abstract:** In the recent past many evolutionary computing algorithms are proposed for linear array synthesis with several objectives adopting many available synthesis techniques. Every synthesis technique has its unique performance on each objective. It is evident from the literature that incorporating newly proposed heuristic approaches which are widely accepted in other disciplines for antenna array synthesis is a predominant part of research in electromagnetics. This consistently helped antenna engineers to take on the challenges of pattern synthesis for wireless applications. Accordingly in this paper a new algorithm namely Social Group Optimization Algorithm (SGOA) has been chosen and applied for optimally designing linear array synthesis. Further a comparative study is performed to analyze the performance of this algorithm over existing popular numerical technique called Chebyshev technique. Several objectives are considered for synthesis of LA in this work. Obtaining a very low SLL of -50dB with narrowest possible BW that is equal to the Chebyshev BW (TBW) for the same SLL is one of the major objective of investigation. The other objectives are to study the synthesis process using both amplitude only and amplitude-space techniques. Symmetrical LA is considered in all the cases mentioned in this paper.

**Index Terms:** SLL, SGOA, BW, ARRAY FACTOR

## I. INTRODUCTION

Efficient design of LA is an important issue in the field of array antenna engineering. LAs are characterized by simple geometrical description ie; all the elements in the array are oriented on a straight line as shown in Fig.4.1. More detailed description of the LAs is given in the previous Chapter along with the formulation of the array factor (AF). These LAs have wide applications in wireless communications. It is concerning fact that any new approach or technique in array synthesis is first applied to LAs.

LA synthesis involves in finding coefficients or weights for amplitude, spacing or phase distribution of the elements of the array that yields the required specifications of the radiation patterns. Proper determination of the non-uniform amplitude distribution for the linear array elements produces suppressed SLL while maintaining main BW unaltered. Evolutionary computing algorithms like the GA are used to solve several multi-objective problems involving conflicting

objectives like the SLL minimization while observing beam scanning in

a LA synthesis using amplitude-position technique. Similarly PSO is applied to greatest advantage in many electromagnetic problems especially for LA synthesis [137-140] with the most concerned objectives of SLL reduction and BW control using amplitude only technique. Each technique employed exhibits specific characteristics in achieving the desired beam patterns.

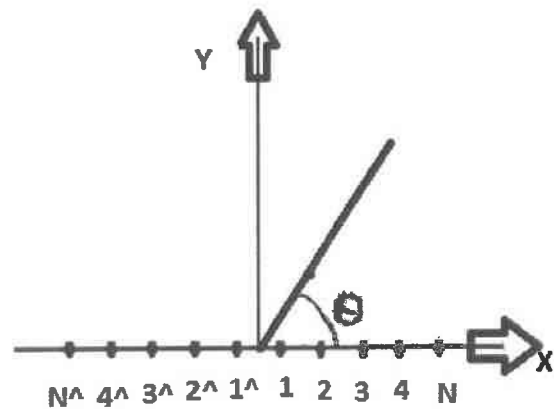


Fig.1.1: Linear array geometry

In this work, a novel algorithm called the FPA is applied to LA synthesis problem with objectives like the SLL reduction and BW control and compared with an improved version of PSO known as APSO. In brief, the objective of the work presented in this Chapter is to suitably use the novel algorithm known as SGOA that have lesser complexity in arriving at the optimal solution. To assess the suitability, the radiation patterns obtained for SGOA is compared with patterns obtained using the conventional numerical technique for LA synthesis known as "Chebyshev technique". The conventional Chebyshev technique goes through many computational steps to optimize the LA and considered to be the best numerical optimizer that could produce lowest possible BW for desired lower SLL.

The rest of the paper is organized as follows. Fitness function formulation is given in the next section, followed by brief discussion on the "Chebyshev" method of linear analysis. The simulation based experiment referring to performance study of SGOA are presented. These results and analysis is mentioned in the subsequent sections. The LA synthesis using amplitude

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## Statistical analysis of spinal cord injury severity detection on high dimensional MRI data

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### ABSTRACT

Staggered Segmenting on the programmed spinal rope form is a vital advance for evaluating spinal line decay in different infections. Outlining dark issue (GM) and white issue (WM) is additionally helpful for measuring GM decay or for extricating multiparametric MRI measurements into WMs tracts. Spinal line division in clinical research isn't as created as cerebrum division, anyway with the considerable change of MR groupings adjusted to spinal line MR examinations, the field of spinal rope MR division has progressed extraordinarily inside the most recent decade. Division strategies with variable exactness and level of multifaceted nature have been produced. In this paper, we talked about a portion of the current strategies for line and WM/GM division, including power based, surface-based, and picture based and staggered based techniques. We likewise give suggestions to approving spinal rope division systems, as it is essential to comprehend the inborn qualities of the strategies and to assess their execution and constraints. In conclusion, we represent a few applications in the solid and neurotic spinal string. In this task, an Automatic Spinal Cord Injury (SCI) is identified utilizing a staggered division technique.

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### 1. INTRODUCTION

Exact arranging of radiation treatment involves the meaning of treatment volumes and a reasonable delimitation of ordinary tissue of which pointless presentation ought to be counteracted this is possible with segmentation [1]. The spinal rope is a radiosensitive organ, which ought to be unequivocally distinguished because an Overexposure to radiation may prompt undesired inconveniences for the patient, for example, neuronal disfunction or loss of motion. In this work, an information-based way to deal with distinguishing the spinal rope in figured tomography pictures of the thorax is exhibited. The approach depends on an information base which comprises of an assumed anatomical structure delineate and an assignment arranged design called the automatic SCI [2]. The ASM (automatic spinal cord injury finding mechanism) contains a casing like learning portrayal of the full-scale life structures in the human thorax. The arrangement solver oversees deciding the position, introduction and size of the structures important to radiation treatment. The arrangement solver depends on various picture preparing administrators. Some are alleged nuclear (e.g., thresholding and snakes) though others are composite. The entire framework has been actualized on a standard PC. Examinations performed on the picture material from 3 patients demonstrate that the approach brings about a solid acknowledgment of the spinal rope (92% precision) and the spinal trench (85% exactness) [3-4]. The lamina is riskier to find accurately (precision 72%). The situation of the external thorax is constantly decided effectively. For a couple of therapeutic pictures, it isn't possible to set division

# A CPW-Fed Elliptically Curved Antenna Design for Multiband Operation with Metamaterial Loading

M Purna Kishore, B T P Madhav, M Venkateswara Rao

**Abstract:** In this article, a multi elliptical structured antenna is designed in which its ground plane is etched with different radius of elliptical SRR. The antenna size is  $44 \times 40 \times 1.6 \text{ mm}^3$ , the substrate used is FR-4 substrate which is having a dielectric constant of 4.4. The proposed antenna approach is determined using four iterations achieve the maximum radiation performance. The antenna is working under 1.96GHz -3.74GHz, 3.95GHz - 7.48GHz, 8.42GHz - 11.47GHz and 13.41GHz - 18.93GHz bands, the antenna can work for the WLAN, Wi-Fi & Wi-MAX applications. The design and analysis of the proposed radiating structure is carried out using ANSYS EM desktop and metamaterial unitcell setup validation is carried out is an added advantage to the proposed antenna

**Index Terms:** CPW, metamaterial loading, elliptical split ring, unit cell.

## I. INTRODUCTION

The wireless communication technology has been emerging since past and expanded providing numerous technologies that may have variation in their applied techniques. The wave propagation among the antenna systems in the wireless medium is an important aspect for an efficient communication system. Efficient antennas that support the multi-standard communication technologies are beneficial and there are many techniques to develop such antennas which is available in literature. The parallel study of substrates and the electrodynamics [1] helps to enrich the metamaterial technology which supports further development in the antenna design to yield desired improvements. Usually the multiband operation in the planar antennas are achieved by the perturbation of currents through the surrounding the etched slots. In [2], a CPW fed quasi-yagi antenna obtains the multiband operation by the odd-mode E-fields caused by the CPW-to-CPS transition. There are some effects occurred due to the metamaterial-H-shaped loading within the antenna structure which can be interpreted in [3] causing the beam tilting and a reactive metamaterial loaded in the monopole antenna yields multiband phenomenon in [4,18] by shifting of resonant frequency towards low end. Metamaterials are spreading their applications in bolometers, thermal imaging by developing the absorber to detect the polarization of wave as demonstrated in [5]. These structures impart miniaturization when used as rectangular CSRR in [6] in combination with L and T-shaped slot and multiband characteristics, and can provide notch bands to the antennas by SRR resonators within a circular ring monopole as in [7]. Other techniques to enhance the obtained bandwidth are mentioned in [8] by using the trident shaped structure, tapered

ground with EBG structure in [9], implementing asymmetric DGS in [11]. Few designs with liquid crystal polymer material are reported in [10,25]. The notch band characteristics within the wideband response of the antenna techniques are discussed in [12-14, 16], with the array configuration in [19] by sequential rotation concept. Few designs are reported with different defected ground structures and feeding methods such as coplanar feeding for achieving the multiband and broadband are discussed in [20-24].

In this article the metamaterial loaded elliptical antenna is studied and analyzed to get multiband characteristics. SRR slots are etched in the CPW ground plane in three levels. The design approach is explained in Section-II with unit-cell analysis, which is continued with results discussed in Section-III with the field distributions. The parametric effects discussed in Section-IV and finally concluded in Section-V.

## II. ANTENNA DESIGN

### A. UNIT-CELL ANALYSIS

The metamaterial unit cell analysis is carried using the Floquet mode of analysis. In This setup includes that at the slit side is generated with the perfect electric conductive material and those edges are connected with the waveguide port assignment. Other two sides of the box are connected to the magnetic fields of the antenna.

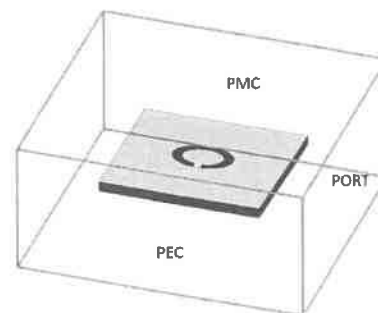


Fig 1: Elliptical unit-cell

# PAPR Reduction in OFDM Using Hybrid Genetic and Tone Injection Algorithm's

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## Abstract:

Orthogonal Frequency Division Multiplexing (OFDM) is a Multicarrier Modulation (MCM) procedure which is by all accounts an appealing possibility for fourth era (4G) remote Communication frameworks. OFDM offer high unearthly productivity, safe to the multipath delay, low Inter-Symbol Interference (ISI), resistance to recurrence specific blurring and high power proficiency. Be that as it may, OFDM framework experiences major issue of high Peak-to-Average Power Ratio (PAPR). The high PAPR can cause between balance and out-of-band radiation because of energy enhancer nonlinearity. So as to battle the issue, the transmission intensifier must work inside its direct area to counteract ghastly twisting and the corruption of the Bit Error Rate (BER). Numerous strategies have been proposed to lessen PAPR, among them Partial Transmit Sequence (PTS) and Selective Mapping (SLM) are two promising methods since they are easy to execute, no contortion in the transmitted flag and can altogether enhance the insights of the PAPR. The PTS and SLM experience the ill effects of higher computational unpredictability. In the meantime with a specific end goal to recoup the first OFDM flag effectively, the transmitter needs to send side data, to the collector utilizing additional sub-bearer. It will debase the OFDM framework's range proficiency and expands bit mistake rate. A novel stochastic advancement strategy called Genetic Algorithm (GA) is proposed in PTS with various channels. This strategy is utilized to get the ideal stage factor for the PTS procedure to lessen computational multifaceted nature and enhance PAPR execution. Reproduction comes about demonstrate that the proposed PAPR diminishment plan can altogether diminish the PAPR and computational intricacy over the PT.

**Keywords:** Support Vector Machine (SVM), classifier, Texture Classification, Fake Currency Detection, Canny Edge Detection.

## INTRODUCTION

Over the most recent couple of years, remote correspondences have encountered a quick development because of the high portability that they permit. Notwithstanding, remote channels have a few impediments, as multi-way blurring that make them hard to manage. With the consistently developing interest of this age, requirement for rapid correspondence has turned into a most extreme need. Different multicarrier regulation strategies have advanced so as to meet these requests, couple of

eminent among them being Code Division Multiple Access (CDMA) and Orthogonal Frequency Division Multiplexing (OFDM). Orthogonal Frequency Division Multiplexing is a Frequency Division Multiplexing (FDM) conspire used as a computerized multi bearer regulation strategy. Countless dispersed orthogonal sub-transporters are utilized to convey information. The information is partitioned into a few parallel surges of channels, one for every subcarriers. Each sub-transporter is regulated with a customary adjustment plot at a low image rate, keeping up add up to information rates like the ordinary single bearer tweak conspires in a similar transfer speed.

A regulation that proficiently manages particular blurring channels is OFDM. OFDM is a well-known strategy for high-rate information transmission over recurrence particular channels. The OFDM has been utilized in remote applications, for example, Digital Audio Broadcasting (DAB), Terrestrial Digital Video Broad-throwing (DVB-T), and the characterized by the European Telecommunications Standards Institute. As of late, the capability of electrical cable as a capable medium to convey fast information and sight and sound substance has been investigated. The benefit of utilizing electric electrical cables as the information transmission medium is that each building and each house is as of now outfitted with the electrical cable and associated with the power framework. A multipath show for the electrical cable station has been proposed. The model will be founded on physical flag engendering impacts in mains systems including various branches and impedance bungling. Other than multipath proliferation joined by recurrence particular blurring, flag weakening of average power links expanding with length and recurrence will be considered. Electrical cable station is likewise influenced by indiscreet clamor. OFDM adjustment strategy has been proposed for transmission at high information rates in an electrical cable condition.

High information rate is attractive in numerous current remote sight and sound applications [1]. Customary single transporter adjustment systems can accomplish just constrained information rates because of the confinements forced by the multipath impact of remote channel and the beneficiary multifaceted nature. In single bearers frameworks, as the information rate in correspondence framework builds, the image length gets diminished. In this way, the correspondence frameworks utilizing single transporter adjustment experience the ill effects of extreme between image impedance (ISI) caused by dispersive-channel motivation reaction, and along

# Reversible Data Hiding in Encrypted Images by Reversible Image Transformation

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## Abstract

Now a day's data hiding and data encryption is more popular. People seek more security for day to day life styles. Here we presents an approach for data hiding in encrypted images at cloud server based on reversible data hiding in encrypted images by reversible image transformation. This approach is different from previous data hiding and encryption based frame works, in which we presents the cipher texts that are used embedding image and stores at cloud it may attract to allows the user to transform the content of user original image data into another target image with same size and format. We realize an RIT based method by improving the image transformation technique to be reversible data hiding model approaches.

**Keywords:** Reversible data hiding, PSNR, Target image, embedding image

## I. INTRODUCTION

Internet is a common way for data transmission. More and more data is available on the internet due to growth in information technology. With growth in digital data there have some security problems. To release the burden of data management user preferred outsourcing of data to the cloud. For data privacy and security many user utilized cryptography techniques for data encryption before uploading it on cloud. In order to confidentially convey secret messages stenography is the efficient way used by user for multimedia data hiding. In stenography, carrier can be images, audio or video. Original image is treated as cover image and the other image in which data is embedded known as stego image. Trust and security have prevented businesses from fully accepting cloud platforms. To protect clouds, providers must first secure virtualized datacenter resources, uphold user privacy, and preserve data integrity. The authors suggest using a trust-overlay network over multiple data centers to implement a reputation system for establishing trust between service providers and data owners.

Data coloring and software watermarking techniques protect shared data objects and massively

distributed software modules. These techniques safeguard multi-way authentications, enable single sign-on in the cloud, and tighten access control for sensitive data in both public and private clouds.[1]The Cloud Security Alliance has identified a few critical issues for trusted cloud computing, and several recent works discuss general issues on cloud security and privacy. Public and private clouds demand different levels of security enforcement. We can distinguish among different service-level agreements (SLAs) by their variable degree of shared responsibility between cloud providers and users. Critical security issues include data integrity, user confidentiality, and trust among providers, individual users, and user groups. The three most popular cloud service models have varying security demands [2].Reversible data hiding (RDH) has been intensively studied in the community of signal processing. Also referred as invertible or lossless data hiding, RDH is to embed a piece of information into a host signal to generate the marked one, from which the original signal can be exactly recovered after extracting the embedded data. The technique of RDH is useful in some sensitive applications where no permanent change is allowed on the host signal. In the literature, most of the proposed algorithms are for digital images to embed invisible data or a visible watermark. So far, many RDH methods on images have been proposed. In essence, all these methods can be viewed as a process of semantic lossless compression [3], [24], in which some space is saved for embedding extra data by losslessly compressing the image. Here in, "semantic compression" means that the compressed image should be close to the original image, and thus one can get a marked image with good visual quality. Because the residual part of images, e.g., the prediction errors (PE), has small entropy and can be easily compressed, almost all recent RDH methods first generate PEs as the host sequence [5]–[7], and then reversibly embed the message into the host sequence by modifying its histogram with methods like histogram shifting or difference expansion. To evaluate the performance of a RDH algorithm, the hiding rate and the marked image quality are important metrics. There exists a trade-off between them because increasing the hiding rate often

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# **ADAPTIVE STREET LIGHT MONITORING USING INTERNET OF THINGS**

**Ramya Nimmagadda<sup>1</sup>, V.Srinivasarao<sup>2</sup>, A.V.Kiranmai<sup>3</sup>, Yalamanchili Arpitha<sup>4</sup>**

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## **ABSTRACT**

Streetlights are an integral part of any developing locality. They are present on all major road-ways and in the suburbs too. Every day, streetlights are powered from sunset to sunrise at full strength, even when there is no one around. On a global scale, millions of dollars are spent each day on these street lights to provide the required electrical energy. This paper gives the best solution for electrical power wastage. Also, the manual operation of the lighting system is completely eliminated. The energy consumption in entire world is increasing at a faster rate due to population growth and economic development and the availability of energy sources remains woefully constrained. The word "smart" is used because the system not only provide power to the street lights but also helps in detecting the direction of movement of the pedestrian and helps him by means of illuminating the path of movement till the near next street light. A simple and effective solution to this would be dimming the lights during off peak hours. Whenever presence is detected, the lights around it will glow at the normal (bright) mode. This would save a lot of energy and also reduce cost of operation of the streetlights. The status of street lights can be checked on internet using IOT (Internet of things) from anywhere in real time and solve the issues happening during the process.

## **INTRODUCTION**

This work proposes an intelligent wireless street light control, which integrates new technologies, offering ease

of maintenance and energy savings. Using solar panel at the lamp post by using LDR it is possible to save some more power and energy. The street lights also can be monitored and controlled using GUI application, which shows the status of the lights on street or highway lighting systems. This paper suggests an intelligent management of the lamp posts by sending data to a central station by wireless communication. With this proposed system, maintenance can be easily and efficiently planned from the central station, allowing additional savings. This street light control system helps in energy savings, detection of faulty lights and maintenance time and increase in life span of the system. Automatic street lights are necessary to survive in this era of smart world as automation provides perfection and efficiency. This method focuses on automated street lighting, as current system is facing many problems. A user must deal with numerous problems like maintenance problem, timer problem, connectivity problem, display problem.

The Internet of Things may be a hot topic in the industry but it's not a new concept. The concept was simple but powerful. If all objects in daily life were equipped with identifiers and wireless connectivity, these objects could be communicating with each other and be managed by computers. The size and cost of wireless radios has dropped tremendously. IPv6 allows us to assign a communications address to billions of devices. Electronics companies are building Wi-Fi and cellular wireless connectivity into a wide range of devices.

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## 16x16 VEDIC MULTIPLIER USING REVERSIBLE LOGIC GATES

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**Abstract**— Multiplier design is always a challenging task; how many ever novel designs are proposed, the user needs demands much more optimized ones. Vedic mathematics is world renowned for its algorithms that yield quicker results, be it for mental calculations or hardware design. Power dissipation is drastically reduced by the use of Reversible logic. The reversible Urdhva Tiryakbhayam Vedic multiplier is one such multiplier which is effective both in terms of speed and power. In this paper we aim to enhance the performance of the previous design. The Total Reversible Logic Implementation Cost (TRLIC) is used as an aid to evaluate the proposed design. This multiplier can be efficiently adopted in designing Fast Fourier Transforms (FFTs) Filters and other applications of DSP like imaging, software defined radios, wireless communications.

**Keywords**— Quantum Computing, Reversible Logic Gate, Urdhva Tiryakbhayam, Optimized Design, TRLIC.

### I. INTRODUCTION

Vedic Mathematics is one of the most ancient methodologies used by the Aryans in order to perform mathematical calculations. This consists of algorithms that can boil down large arithmetic operations to simple mind calculations. The above said advantage stems from the fact that Vedic mathematics approach is totally different and considered very close to the way a human mind works. The efforts put by Jagadguru Swami Sri Bharati Krishna Tirtha Maharaja to introduce Vedic Mathematics to the commoners as well as streamline Vedic Algorithms into 16 categories or Sutras needs to be acknowledged and appreciated. The Urdhva Tiryakbhayam is one such multiplication algorithm which is well known for its efficiency in reducing the calculations involved.

With the advancement in the VLSI technology, there is an ever increasing quench for portable and embedded Digital Signal Processing (DSP) systems. DSP is omnipresent in almost every engineering discipline. Faster additions and multiplications are the order of the day. Multiplication is the most basic and frequently used operations in a CPU. Multiplication is an operation of scaling one number by another. Multiplication operations also form the basis for other complex operations such as convolution, Discrete Fourier Transform, Fast Fourier Transforms, etc. With ever increasing need for faster clock frequency it becomes imperative to have faster arithmetic unit. Therefore, DSP engineers are constantly looking for new algorithms and hardware to implement them. Vedic mathematics can be aptly employed here to

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**Keywords**— Quantum Computing, Reversible Logic Gate, Urdhva Tiryakbhayam, Optimized Design, TRLIC.

### I. INTRODUCTION

Vedic Mathematics is one of the most ancient methodologies used by the Aryans in order to perform mathematical calculations. This consists of algorithms that can boil down large arithmetic operations to simple mind calculations. The above said advantage stems from the fact that Vedic mathematics approach is totally different and considered very close to the way a human mind works. The efforts put by Jagadguru Swami Sri Bharati Krishna Tirtha Maharaja to introduce Vedic Mathematics to the commoners as well as streamline Vedic Algorithms into 16 categories or Sutras needs to be acknowledged and appreciated. The Urdhva Tiryakbhayam is one such multiplication algorithm which is well known for its efficiency in reducing the calculations involved.

With the advancement in the VLSI technology, there is an ever increasing quench for portable and embedded Digital Signal Processing (DSP) systems. DSP is omnipresent in almost every engineering discipline. Faster additions and multiplications are the order of the day. Multiplication is the most basic and frequently used operations in a CPU. Multiplication is an operation of scaling one number by another. Multiplication operations also form the basis for other complex operations such as convolution, Discrete Fourier Transform, Fast Fourier Transforms, etc. With ever increasing need for faster clock frequency it becomes imperative to have faster arithmetic unit. Therefore, DSP engineers are constantly looking for new algorithms and hardware to implement them. Vedic mathematics can be aptly employed here to



STABILITY INDICATING RP-HPLC METHOD FOR THE SIMULTANEOUS ESTIMATION OF IMIPENEM AND CILASTATIN IN INJECTION FORMULATIONS

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ABSTRACT

Reverse Phase High Performance Liquid Chromatographic forced degradation method have been developed and validated for the simultaneous estimation of Imipenem (IPM) and Cilastatin (CSN) in Injection formulations. Both drugs and their degradation studies were conducted by using Inertsil- C18, BDS (250 mm x 4.6;5µm particle size) column and the separation was achieved by using methanol : acetonitrile (80:20) as mobile phase and flow rate was 1.0ml/min with runtime 8mins at ambient temperature, and the retention time for both drugs was 2.930 mins for IPM and 4.215 for CSN respectively. This method was linear at the concentration range of 20-80µg/ml (R2=0.9990 & R2=0.9991) for both IPM and CSN respectively. The

stability indicating studies of the method was developed by subjecting both drugs to various stress conditions like acid, base, oxidation, heat and photo light. There were no interfering peaks from excipients or degradation products have developed due to variable degradation conditions. Degradation products produced as a result of forced degradation studies did not interfere with the detection of Imipenem and Cilastatin and the method can thus be considered stability indicating.

KEYWORDS: Imipenem, Cilastatin, Stability indicating, Injection, RP-HPLC, Simultaneous, Forced degradation.

## SPECTROPHOTOMETRIC METHODS FOR THE QUANTIFICATION OF CARISOPRODOL USING FERRIC CHLORIDE, *O*-PHENANTHROLINE, AND *P*-NITROANILINE, SODIUM NITRITE AS ANALYTICAL REAGENTS

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### ABSTRACT

**Objective:** The present study represents the development of two spectrophotometric methods for the determination of carisoprodol (CCP) in pure and formulations using ferric chloride, *o*-phenanthroline, and *p*-nitroaniline (PNA), sodium nitrate as analytical reagents.

**Methods:** The proposed spectrophotometric methods were developed based on oxidation of Fe<sup>3+</sup> by CCP, and then, the resultant product was reacted with *o*-phenanthroline in acidic condition forms an orange-colored complex and diazotization of PNA followed by coupling with CCP in an alkaline medium forms yellow-colored complex.

**Results:** Under the optimized conditions, the absorbance of CCP concentration obeyed the Beer's law in the ranges of 10–60 µg/mL with good correlation coefficient values of 0.9992 and 0.9990 with the limit of detection values of 1.286 and 2.408 µg/mL, respectively.

**Conclusion:** The proposed methods were successfully applied for the determination of CCP in pure and in their formulations.

**Keywords:** Ferric chloride, *o*-Phenanthroline, *p*-Nitroaniline, Sodium nitrate, Spectrophotometry, Analysis.

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### INTRODUCTION

Carisoprodol (CCP) is a skeletal muscle relaxant belonging to monocarboxylic acids and derivatives class of organic compounds [1] that have both sedative and skeletal muscle relaxant effects [2]. The mechanism of CCP is not known exactly. Along with rest and physical therapy, CCP is also used in the treatment of injuries and painful musculoskeletal conditions [3,4]. CCP chemically known as [2-(carbamoyloxymethyl)-2-methylpentyl] N-propan-2-ylcarbamate (Fig. 1). The detailed survey of literature revealed that few methods have been reported for the estimation of CCP by liquid chromatography-tandem mass spectrophotometry [5], gas chromatography [6,7], homogeneous immunoassay [8], high-performance thin-layer chromatography [9], liquid chromatography/mass spectrophotometry [10], and ultraviolet (UV)-high-performance liquid chromatography [11]. The above reported chromatographic methods employed sophisticated and expensive instrumentation. Hence, UV-visible spectrophotometric methods are preferred for the precise, accurate, and cost-effective determination of pharmaceutical substances. There are three extractive spectrophotometric methods that have been reported for the assay of CCP in pure and pharmaceutical formulations [12]. However, the above methods were suffered from one or the other disadvantage such as poor sensitivity, unstable color, and rigid experimental conditions.

By considering into the above disadvantages of the reported methods, the present investigation was aimed to develop and validate some simple, sensitive, precise, accurate, and economical visible spectrophotometric methods.

In the present investigation, two simple and sensitive visible spectrophotometric methods (method-A and method-B) were developed and validated for the analysis of CCP with broad linearity, good precision, and accuracy. These methods could be applied for the quantitative determination of the CCP in their tablet formulations.

### METHODS

#### Instrumentation

An ELICO (Hyderabad, India) double beam model SL 244 digital spectrophotometer with 1 cm matched quartz cell was used for the spectral and absorbance measurements. A Coslab (Ambala Cantt, India) CLE-105 model water bath was used to control the temperature and a Shimadzu (Tokyo, Japan) electronic weighing balance, model BL 220 H, was used for weighing the samples.

#### Chemicals and reagents

All reagents and chemicals were of analytical reagent grade and used as received. All the solutions were prepared fresh daily using double distilled water. Aqueous solutions of 0.2% (*w/v*) *o*-phenanthroline, 0.54% (*w/v*) ferric chloride, 0.2 M (*v/v*) orthophosphoric acid (Merck Specialties Pvt, Ltd., Mumbai, India), 0.2 M HCl (*v/v*), 0.1% *p*-nitroaniline (PNA), and 0.4% (*w/v*) and 4% (*w/v*) sodium hydroxide (SD-Fine Chemicals Ltd., Mumbai, India) prepared in the usual way.

#### Stock and working standard solutions

Analytically pure CCP was obtained as a gift sample from the Aurobindo Laboratories Pvt, Ltd., (India) and was used as received. The stock solution of CCP was prepared by dissolving 100 mg of CCP in 20 ml of methanol in a 100 ml volumetric flask and then make up to the mark with distilled water (1.0 mg/ml). The stock solution was diluted stepwise with the same distilled water to obtain working standard solutions of concentration of 200 µg/mL for methods A and B, respectively.

#### General assay procedure

##### Method-A

Delivered aliquots of standard CCP (0.5–3.0 ml, 200 µg/ml) into 10 ml calibrated tubes. To each tube, 1.0 ml of 0.2% *O*-PHEN was added followed by 1.0 ml of 0.54% FeCl<sub>3</sub> solution. The contents of the tubes were mixed well and the resulting solution was heated for 15 min at 100°C, and then,

## ISOLATION AND CHARACTERISATION OF RAPAMYCIN, TEMSIROLIMUS REGIOISOMER (MONOESTER) AND TEMSIROLIMUS DIESTER IN TEMSIROLIMUS DRUG

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### ABSTRACT

**Objective:** Separation and identification of the process impurities in the manufacture of temsirolimus drug viz., rapamycin regioisomer (monoester) (TS monoester), and temsirolimus diester (TS diester).

**Methods:** During the process development of temsirolimus (TS), three process impurities-rapamycin, temsirolimus regioisomer, temsirolimus diester-were detected by high-performance liquid chromatography (HPLC). Impurities were isolated by medium Chromatography (MPLC) and characterized by ESI-MS/MS, <sup>1</sup>H NMR, FT-IR spectral data.

**Results:** These impurities are characterized with the help of ESI MS/MS, <sup>1</sup>H NMR, and FT-IR data. The impurities are identified and the process impurities. One of them is the starting material i.e. rapamycin and the other two are formed during the manufacture method offers advantages over using photodiode-array UV detection (LC-PDA) for the determination of peak purity, viz. compon UV spectra can be distinguished.

**Conclusion:** The structures of these impurities were characterized as rapamycin, TS Monoester, and TS Diester. Out of these rapamycin has been previously identified while the other two are previously unreported.

**Keywords:** Temsirolimus, Rapamycin, Temsirolimus regioisomer (monoester), Temsirolimus diester, Process impurities, Characterization

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### INTRODUCTION

The most common malignancy of the kidney and accounts for 2%-3% of all adult cancers is renal cell carcinoma (RCC) [1]. Though surgical resection can be curative in localized disease, prognosis of advanced renal cell carcinoma is poor with a 5-years survival rate of 5%-10%. Immunotherapy with interferon- $\alpha$  (IFN) has produced modest survival benefit in clinical trials [2-7] but high dose interleukin-2, though active in highly selected patients, is associated with toxicity [8, 9]. Since 2007 Phase III studies have emphasized the importance of targeting angiogenesis through vascular endothelial growth factor receptor (VEGFR) tyrosine kinase inhibition with sunitinib [10] and sorafenib [11] or direct VEGF inhibition with bevacizumab in combination with IFN [12, 13]. The mammalian target of rapamycin (mTOR), a member of the phosphatidylinositol 3 kinase family, is a multifunctional serine-threonine kinase that acts as a central regulator of cell growth, proliferation, and apoptosis [14, 15]. It modulates the expression and stability of hypoxia-inducible factor (HIF)-1 $\alpha$ , which regulates expression of VEGF. Temsirolimus (CCI-779) is a potent and selective inhibitor of mTOR. It has demonstrated its efficacy as first-line immunotherapy in poor prognosis metastatic RCC in comparison with IFN [16]. Temsirolimus (sirolimus-42-[2,2-bis-(hydroxymethyl)]-propionate) is an ester analog of rapamycin, a natural macrolide antibiotic with antifungal, antitumor, and immunosuppressive activities. Temsirolimus has demonstrated significant inhibition of tumour growth both *in vitro* and *in vivo*. Temsirolimus is currently in phase III clinical development for the treatment of renal cancer.

The method development of a drug is very important [17] to the pharmaceutical industry as the development of a method is essential for the discovery, development, and evaluation of medicines in the

temsirolimus drug [20-22]. All the impurities were detected by MPLC, characterized by mass spectral data and additional evidence. The impurities TS monoester with hydroxyl ester moiety in the side chain appear previously not reported. Impurities in active ingredient (API) are highly undesirable and in some cases can be harmful to the patient. The ICHQ7 and ICHQ3 API manufacturers, mentions that impurities are kept below the set limits. Thus, it is pertinent to identify the impurities in API to develop suitable process control levels can be kept within permissible limits. The study should be carried out for any bulk drug to characterize all the unknown impurities that are present above 0.1%. A comprehensive study has been undertaken and characterize these impurities by chromatographic, spectral studies and NMR spectroscopic techniques. This paper describes the separation, identification, and characterization of three process impurities that are present in a range of 0.08%-0.12% of peak area of the bulk drug. The monitoring of these impurities is important for drug development and quality control of drug substance.

Molecular formula of temsirolimus is C<sub>56</sub>H<sub>87</sub>NO<sub>16</sub> and its molecular weight is 1030.28. Systematic (IUPAC) name is (1R,2R,3S,6R,7E,9R,10R,12R,14S,15E,17E,19E,21S,23S,26R,27R)-2,2-bis[4-(4-hydroxy-2-methoxyphenyl)-4-oxo-1,4,5,6,9,10,11,12,13,14,21,22,23,24,25,26,27,28-octadecahydro-3H-23,27-epoxyprido[2,1-c]pyridin-3-yl]propanoate. The molecular structure of temsirolimus is given in table 1.



## POWER CHAINS IN A DIVISOR GRAPH

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### ABSTRACT

The divisor graph of an associative ring  $R$  (denoted as  $DG(R)$ ) was introduced by Satyanarayana, Srinivasulu [9]. In this paper, we introduce a simple concept "Power Chain in a Divisor Graph". We prove that if  $0 \neq a \in R$  is nilpotent, then the power chain starting with  $a$  is of finite length. If  $DG(R)$  (the divisor graph of  $R$ ) contains a power chain starting with  $a \in R$  which is of infinite length, then  $0 \neq a \neq 1$ ,  $a$  is non-idempotent and non-nilpotent element. We announce some basic results. Finally, we deduce that if  $R$  be an integral domain and  $a \in R$ , then  $0 \neq a \neq 1$  if and only if the power chain starting with  $a$  (in  $DG(R)$ ) is of infinite length.

**KEYWORDS:** Associative Ring, Divisor Graph of a Ring, Complete Graph.

**Mathematics Subject Classification:** 05C07, 05C20, 05C76, 05C99, 13E15

### 1. INTRODUCTION

Beck [2] related a commutative ring  $R$  to a graph by using the elements of  $R$  as vertices and two vertices  $x, y$  are adjacent if and only if  $xy = 0$ . Anderson and Livingston [1] proposed a modified method of associating a commutative ring to a graph by introducing the concept of a zero-divisor graph of a commutative ring. Satyanarayana Bhavanari, Syam Prasad K and Nagaraju D [26] introduced "Prime Graph" of a ring and later studied by several authors. These concepts are different bridges connecting the two theories: Ring Theory & Graph Theory.

Now we introduce a concept called "Power Chains in a divisor graph" of a ring. This idea motivates us to prove the following results: (i)  $DG(\mathbb{Z}_n)$  contains a chain of length  $\varphi(n) - 1$ . (ii) If  $p$ -prime, then  $DG(\mathbb{Z}_p)$  contain a max chain of length  $p - 2$ .

Now we review some definitions and results for the sake of completeness.

#### 1.1 Definitions

Let  $G = (V(G), E(G))$  be a graph where  $V(G)$  is the set of vertices of  $G$  and  $E(G)$  the set of edges of  $G$ . An edge between two vertices  $x, y \in V(G)$  is denoted by  $\overline{xy}$ .



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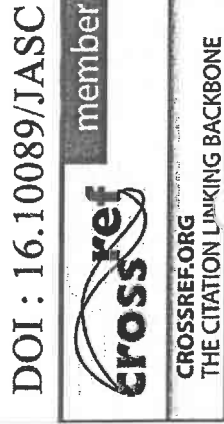
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## AN INTERVIEW WITH LAVANYA SANKARAN: A VOICE FOR THE VOICELESS

*Srihari Rao Bathula, Research Scholar, Andhra University, Faculty in English,  
Sri Viswasanthi Educational Institutes, Vuyyuru, Near Vijayawada, AP*

### **Abstract:**

*Indian women writers have been exploring feminine subjectivity and dealing with themes that range from childhood to complete womanhood. The women wings started to fight against the atrocities done to them. The modern women groups have started only to fight for the reason of quest for their identity as equal members of the men dominated society. Women's writing in India has seen a galaxy of women writers with much more quality and depth in projecting a vision of their own. One is aware that patriarchal traditions of India have kept feminism from becoming a widely apprehended phenomenon. The new women writers have moved away from traditional portrayals of enduring self-sacrificing women, towards searching for identity. A major preoccupation in recent Indian women's writing has been a delineation of inner life and subtle interpersonal relationships.*

**Key Words:** *Feminine, subjectivity, womanhood, identity.*

### **WHO IS LAVANYA?**

Lavanya Sankaran has joined the galaxy of these women writers as a voice for the voiceless. Her works, *The Hope Factory* (2013) and *The Red Carpet* (2005) have got several awards and were world-wide acclaimed. Her writing style is compared to that of Charles Dickens by the British Press. Lavanya Sankaran seeks to establish equal opportunities for women on par with men economically, personally and socially. All her characters reveal her passion for identity. Her writing remains a living example and her characters move around one sometimes making him/her be part of those characters.

She travels into the lives of the common man, industrialists, their families, labourers, children deprived of care and love, slum-dwellers' pathetic conditions of living, domestic violence, the quest for identity of every educated and uneducated. *The Hope Factory* is an inspiration to women who face hurdles in making themselves fit to be a part of this patriarchal society.

She is also a social activist speaking out against the caste system, rape and political corruption in India. She writes articles in the leading newspapers and in her blog.

*This interview is carried out to deal with the quest for identity in the works of Lavanya Sankaran. Each of her women characters aims at securing a protective identity of individuality, freedom and seegender inequalities as rooted in the attitudes of the social and cultural institutions.*

**Q.1. Kamala has never succumbed to the patriarchy. Nowhere in the novel *The Hope Factory* she has expressed her sorrow for her plight. Comment.**

**Lavanya :** I think Kamala expresses a part of myself which I find very valuable. She is actually a beacon of light for me in my life. When I think of Kamala she is very much the kind of person which I would like to be.

**Q.2. Is she a beacon of light to those women who still compromise with their fate?**

**Lavanya:** So when I think it's not so much whether she is inspiration for others, for some men and some women, but she is very much inspiration for me as she struggles to live a decent life with her only son wanting to lay a good future for him.

## Separation and Quantitation of Rapamycin, Temsirolimus Regio (Monoester) and Temsirolimus Diester in Temsirolimus by Normal HPLC

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### Original Research Article

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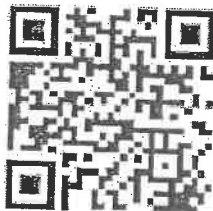
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**Abstract:** Normal-Phase High Performance Liquid Chromatography method developed for determination of Rapamycin, Temsirolimus Regio isomer (mc) and Temsirolimus diester in Temsirolimus drug and pharmaceutical formulation. Separation was accomplished on YMC Pack SIL (250 x 4.6 mm, particle size 5 μm) column under isocratic mode. The column oven temperature was set at 35°C and the injector temperature used at 5°C. The mobile phase is a mixture of n-hexane and trifluoroacetic acid in the ratio of 90:10:0.01 and PDA detector set at 280 nm for detection. The retention times of Rapamycin, Temsirolimus peak, Temsirolimus monoester and Temsirolimus diester peaks are 12.29, 21.24, 33.11 and 51.12 minutes respectively. The method has been fully validated and is linear. Results of analysis were validated statistically and by recovery studies. During the process development of Temsirolimus, three process impurities (Rapamycin, Temsirolimus monoester, Temsirolimus diester) are detected by high performance liquid chromatography (HPLC). This method offers advantages over using photodiode-array UV detector (LC-PDA) for the determination of peak purity, namely components with similar UV spectra can be distinguished, the molecular mass of the impurity can be determined and structural data can be obtained by using LC-MS. The result of studies shows that the proposed normal phase-HPLC method is found to be precise, linear, rugged, selective, specific, and robust. Hence this method may be used for the analysis in bulk drug and in its pharmaceutical dosage forms.

**Keywords:** Temsirolimus, Rapamycin, Temsirolimus Regio isomer, Temsirolimus diester, Process impurities, Normal phase Liquid chromatography, Validation.

### INTRODUCTION

Renal cell carcinoma (RCC) is the most common malignancy of the kidney and accounts for 2%-3% of all adult cancers [1]. Although surgical resection can be curative in localized disease, prognosis of advanced renal cell carcinoma is very poor with a 5-years survival rate of 5%-10%. Immunotherapy with interferon-α has produced modest survival benefit in clinical trials [2-7]. High dose interleukin-2, though active in highly selected patients, is associated with severe toxicity [8, 9]. Phase III studies since 2007 have emphasized the importance of targeting angiogenesis through Vascular Endothelial Growth Factor Receptor (VEGFR), tyrosine kinase inhibition with sunitinib [10] and sorafenib [11] or direct VEGF inhibition with bevacizumab in combination with IFN [12, 13]. These anti angiogenic agents have demonstrated improved overall survival (sunitinib) [14] or progression free survival (Sorafenib [15] and bevacizumab/IFN) [16-17] for patients with advanced RCC. The mammalian target

modulates the expression and stability of inducible factor (HIF)-1α, which regulates expression of VEGF. Temsirolimus (known as cci-779) is a potent and selective inhibitor of mTOR. It has demonstrated efficacy as first line immunotherapy in poor performance metastatic RCC in comparison with IFN [2]. Temsirolimus is a derivative of sirolimus and is sold as Torisel (250 mg/ml concentrate and diluent for an infusion) in the treatment of advanced RCC. The recommended dose of Temsirolimus is 25 mg infused over a 30 minute period once weekly. Temsirolimus (4-[[2,2-bis-(hydroxymethyl)]-propanoate]) is an analog of rapamycin, a natural macrolide with antifungal, antitumor, and immunosuppressive activities. Temsirolimus has demonstrated inhibition of tumour growth both in vitro and in vivo. It binds to the cytoplasmic protein FKBP, forming a complex that antagonizes the mammalian rapamycin (mTOR) signalling pathway [2] and consequently inhibits many of the downstream

# Stability indicating RP-HPLC method development and validation of cefepime and amikacin in pure and pharmaceutical dosage

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A simple, accurate, isocratic stability indicating RP-HPLC method was developed for the determination of cefepime and amikacin in Pure and its pharmaceutical formulations. The method consists of methanol:acetonitrile:acetate buffer 75:20:05 (v/v) mobile phase at pH 5.1 with C18 column as stationary phase. The flow rate and detection wave length were 1.0 mL/min and 212 nm respectively. The linearity range for the method was found to be 2.5-25 µg/mL for amikacin and 10-100 µg/mL cefepime respectively. The developed method was validated as per ICH guidelines and the results of all the validation parameters were well within their acceptance values. Also the forced degradation studies were conducted with standard drugs. Degradation products formed during the different stress conditions were separated from both drugs. This validated method was applied for the simultaneous estimation of cefepime and amikacin in commercially available formulation sample.

**Keywords:** Cefepime/method development and validation. Amikacin/method development and validation. RP-HPLC.

## INTRODUCTION

Cefepime is a broad-spectrum cephalosporin antibiotic with greater activity against both gram-negative and gram-positive organisms than third-generation agents (Ahavet *et al.*, 2007; Chapman, Perry, 2003). Chemical name of the cefepime is (6*R*,7*R*)-7-[[[(2*Z*)-2-(2-amino-1,3-thiazol-4-yl)-2-methoxyiminoacetyl]amino]-3-[(1-methyl pyrrolidin-1-ium-1-yl) methyl]-8-oxo-5-thia-1-azabicyclo[4.2.0]oct-2-ene-2-carboxylate – Figure 1a (<http://www.chemspider.com>). It is a fourth-generation antibiotic used for treatment of pneumonia (moderate to severe) caused by *Streptococcus pneumoniae*, including cases associated with concurrent bacteremia, *Pseudomonas aeruginosa*, *Klebsiella pneumoniae*, or *Enterobacter* species. Also for empiric treatment of febrile neutropenic patients and uncomplicated and complicated urinary tract infections (including pyelonephritis), uncomplicated skin and skin structure infections, complicated intra-abdominal

infections (used in combination with metronidazole) caused by different bacterial species.

Amikacin is an aminoglycoside antibiotic used for treatment of different types of bacterial infections. Chemical name of the amikacin is (2*S*)-2-[[[(1*R*,2*S*,3*S*,4*R*,5*S*)-5-amino-2-[(2*S*,3*R*,4*S*)-4-amino-3,5-dihydroxy-6-(hydroxyl methyl)oxy-4-[(2*R*,3*R*,4*S*,5*S*,6*R*)-6-(aminomethyl)trihydroxyoxan-2-yl]oxy-3-hydroxy-2-hydroxybutanamide – Figure 1b (<http://www.chemspider.com>, Structure.34635.html). It is a semi-synthetic derivative of kanamycin A with multidrug-resistant Gram-negative bacteria such as *Pseudomonas aeruginosa*, *Acinetobacter baumannii*, and *Enterobacter* (Grassi, Grassi, 1993; Tally and Archer, 1977). *Serratia marcescens* and *Stenotrophomonas maltophilia* are also included in the spectrum. It is used to treat non-tubercular mycobacterial infections in patients with tuberculosis (if caused by sensitive strains) when other drugs fail to control the infection (Pickering, 1981; WHO, 2013). Amikacin may be con-

## A NOTE ON UNIT GRAPH OF A RING

pp. - 30

**SATYANARAYANA BHAVANARI<sup>1</sup> & SRINIVASULU DEVANABOINA<sup>2</sup> & MALLIKARJUNA BHAVANARI<sup>3</sup>**

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18-19

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**ABSTRACT:** The zero divisor graph of a commutative ring  $R$  was introduced by Beck [1], and later studied by Vasanthakandasamy [24]. In this short note, we introduced the concept namely "Unit graph of type-1" denoted by  $UG_1(R)$  in Associative rings  $R$  and announced few important fundamental results. We proved that  $UG_1(\mathbb{Z}_n)$  contains at least one vertex of degree 1 and if  $F$  is a field with  $|F|$  is odd, then  $UG_1(F)$  contains at least one vertex of degree 1. We included some examples.

**Key Words:** Graph, Unit graph of a ring, Star graph

**Mathematics Subject Classification:** 05C07, 05C20, 05C76, 05C99, 13E15

### 1 Introduction

Let  $G = (V, E)$  be a graph consist of a finite non-empty set  $V$  of vertices and finite set  $E$  of edges such that each edge  $e_k$  is identified as an unordered pair of vertices  $\{v_i, v_j\}$ , where  $v_i, v_j$  are called end points of  $e_k$ . The edge  $e_k$  is also denoted by either  $v_i v_j$  or  $\overline{v_i v_j}$ . We also write  $G(V, E)$  for the graph. Vertex set and edge set of  $G$  are also denoted by  $V(G)$  and  $E(G)$  respectively. An edge associated with a vertex pair  $\{v_i, v_i\}$  is called a self-loop. The number of edges associated with the vertex is the degree of the vertex, and  $d(v)$  denotes the degree of the vertex  $v$ . If there is more than one edge associated with a given pair of vertices, then these edges are called parallel edges or multiple edges. A graph that does not have self-loops or parallel edges is called a simple graph. We consider simple graphs only.

**1.2 Definitions:** (i) A graph  $G(V, E)$  is said to be a **star graph** if there exists a fixed vertex  $v$  (called the center of the star graph) such that  $E = \{vu / u \in V \text{ and } u \neq v\}$ . A star graph is said to be an  **$n$ -star graph** if the number of vertices of the graph is  $n$ .

(ii) In a graph  $G$ , a subset  $S$  of  $V(G)$  is said to be a **dominating set** if every vertex not in  $S$  has a neighbour in  $S$ . The **domination number**, denoted by  $\gamma(G)$  is defined as  $\min\{|S| / S \text{ is a dominating set in } G\}$ .

(iii) (Vasanthakandasamy and FlorentinSmarandache [24]) A graph  $G = (V, E)$  is said to be the **zero divisor graph** of a commutative ring  $R$  if  $V = R$  and

$$E = \{ \overline{xy} / x \neq y, x, y \in R, x \neq 0 \neq y, xy = 0 \} \cup \{ \overline{x0} / 0 \neq x \in R \}$$

where  $\overline{xy}$  denotes an edge between  $x, y \in V$ .

This definition 'zero divisor graph' is same as that of Beck [1988].

**1.3 Notation:** (i) We denote zero divisor graph of ring  $R$  by  $ZDG(R)$

(ii) In the graph  $ZDG(R)$ , we have that  $V(ZDG(R)) = R$  and

$$E(ZDG(R)) = \{ \overline{xy} / x \neq y, x, y \in R, x \neq 0 \neq y, xy = 0 \} \cup \{ \overline{x0} / 0 \neq x \in R \}$$

**1.4 Examples(i):** (Vasanthakandasamy and FlorentinSmarandache [24]) Consider  $ZDG(R)$  with  $R = \mathbb{Z}_8$ . We know that  $R = \mathbb{Z}_8 = \{0, 1, 2, 3, 4, 5, 6, 7\}$ . So  $V(ZDG(R)) = \{0, 1, 2, 3, 4, 5, 6, 7\}$ . Since  $2 \cdot 4 = 4 \cdot 6 = 0 \pmod{8}$ , there exist edges between the vertices

2 and 4, 4 and 6. Since '0' is adjacent to all the elements in  $R$ , we get  $\overline{01}, \overline{02}, \overline{03}, \overline{04}, \overline{05}, \overline{06}, \overline{07} \in E(ZDG(R))$ .

ARTICLE



# Thermo physical, optical and spectroscopic perspectives of molecular interactions in binary mixtures of Ethyl Lactate and Dimethyl Adipate at $T = 303.15\text{--}318.15\text{ K}$ and atmospheric pressure

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## ABSTRACT

Molecular interactions are evaluated in the binaries of Ethyl Lactate and Dimethyl Adipate using experimental values of density, ultrasonic velocity and refractive index over entire composition range as a function of temperature from 303.15 to 318.15 K at atmospheric pressure. Excess thermodynamic properties: excess molar volume, excess isentropic compressibility, excess isothermal compressibility, excess free length, excess isobaric thermal expansion coefficient, excess ultrasonic velocity and refractive index deviations are computed and fitted with Redlich-Kister polynomial equation to obtain the binary coefficients and the standard deviations. The existence of specific interactions in the mixture is revealed by excess properties, and further supported by partial molar properties. FTIR analysis ascertains the dominance of packing effect in the studied mixtures. Prediction of refractive index for the mixtures and pure components is done by several mixing rules with the estimation of relative errors. In addition,  $V_m^E$  data are analysed by the Prigogine-Flory-Patterson theoretical model.

## ARTICLE HISTORY

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## KEYWORDS

Density; ultrasonic velocity; refractive index; thermo physical properties; mixing rules; PFP theoretical model

## 1. Introduction

Sustainable chemical processes orient to the usage of environmentally benign substances that reduce pollution and risk by minimising hazards associated with chemical products and transformations. Study of changes in physical, chemical environment and molecular interactions upon mixing is becoming absolutely essential and significant as mixed solvents utilisation is inevitable in most of the practical applications of industrial, biological and analytical processes. Such study can also influence the engineering design and operating conditions in most of the practical applications. Extensive literature is available on the effects caused by organic solvents upon mixing [1–4].

Binary liquid mixtures composed of benign solvents are chosen in green context view in the scope of investigating molecular interactions. Esters, Ethyl Lactate (EL) and Dimethyl Adipate (DMA) are novel green solvents [5,6] and have excellent properties for industrial applications. Usage of EL, pure or mixed, for different purposes has been found in the literature [7,8] as paint

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# Dielectric studies of dispersions of Zinc Oxide nanoparticles in p-ethoxy benzylidene-p-cyano aniline (EBCA) Nematic liquid crystals

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**Abstract:** The Nonvolatile memory effect based on ZnO nanomaterials doped p-ethoxy benzylidene-p-cyano aniline (EBCA) nematic liquid crystals has been observed. The memory effect has been analyzed by polarizing optical microscopy and dielectric spectroscopy. This experiments have reported that ZnO nanoparticles have drastic effects on nematic liquid crystals increasing the isotropic nematic transition temperature by about 10K. To understanding these effects we develop a theory for the statistical mechanics of ZnO nanoparticles in liquid crystals. Detailed studies of the dielectric parameters as a function of frequency (1Hz to 1 KHz) with temperature range (40<sup>0</sup>C - 130<sup>0</sup>C) were carried out. It was found that as ZnO concentration in NLC, the value of dielectric permittivity decreases. The dielectric loss and relaxation time have also measured in the nematic phase. Decrease in relaxation time in nanodispersed EBCA suggests the low switching times and power consumption of display devices. This is most wanting feature in the present green technology.

**Keywords:** Nematic Liquid crystals, ZnO nanoparticles, Dielectric permittivity, Dielectric loss, Relaxation time.

## I. INTRODUCTION

Anisotropy is the phenomenon where properties differ with respect to direction. This feature leads to achieve self-assembly and molecular orientations in various materials.<sup>1-4</sup> Such phenomenon is exhibited by our Liquid Crystals that find vast applications in today's technology and medical field<sup>5-9</sup>. The focus on the characteristics of Liquid Crystals is mesmerizing and research is evergreen. The anisotropic nature of Liquid Crystals is responsible for exhibiting different properties in terms of optical, electrical, magnetic, mechanical, etc<sup>10-13</sup>. In these materials mesophases exist and are named depending upon the style of arrangement of molecules, like nematic, smectic, cholesteric, etc<sup>14</sup>. The technical applications of Liquid Crystals are generally found in the Nematic phase. Ethoxy benzylidene cyano aniline is an example of nematic Liquid Crystal which was focused in the present paper to know its dielectric strength and thermal anisotropy. In addition, dispersion of microparticles and nanoparticles in the lattice of these materials (Liquid Crystals) generate interesting applications and promote them to advanced technology<sup>15-17</sup>. As nanoparticles are also anisotropic in nature and building blocks for functional materials.

The aim to present work is to report the dielectric properties as a frequency and temperature dependent for the compounds of nematic liquid crystal dispersion of ZnO nanoparticles to understand the phase transitions undergoing with temperature.

## II. EXPERIMENTAL DETAILS

### 2.1. Materials

The nematic liquid crystal material used in present investigation is p-ethoxy benzylidene-p-cyano aniline (EBCA). The compound EBCA with 99.99% purity is received from frinton laboratory U.S.A. Micro glass slides were obtained from Fisher Scientific (U.S.A.). Microscope glass slides (Paul Marienfeld GmbH & Co. KG, Germany) was cleaned using piranha solution (caution: piranha solution is extremely corrosive and must be handled carefully), washed subsequently with distilled water and dried under nitrogen. D- (β)-Glucose (Sigma) (TCI, 100%), Water was purified by using a Milli-Q system (Millipore, U.S.A.). The selected LCs molecular structures are presented below.



## Zinc Oxide Nanoparticles Dispersed *p*-(*p*'-Ethoxy benzylidene)-*p*-cyano aniline Mesogen: Statistical and Spectral Analysis

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Bathochromic shift in terms of temperature was noticed in *p*-(*p*'-ethoxy benzylidene)-*p*-cyano aniline (EBCA) on dispersion of nano ZnO particles and all the computed optical properties like birefringence, absorption coefficient, phase retardation, order parameter, etc. through statistical method of textures exhibit hypsochromic shift in their values. These changes were assigned to perturbation of lattice arrangement of host EBCA mesogen due to nano ZnO particles. The present studies also confirm the controversial behaviour of material when brought to nano size. Techniques involved in the current investigation are polarizing optical microscopy, differential scanning calorimetry, powder X-ray diffraction spectroscopy and statistical analysis using MatLab. Detailed analyses of observed changes in nano dispersed *p*-(*p*'-ethoxy benzylidene)-*p*-cyano aniline (EBCA) were reported.

**Keywords:** ZnO nanoparticles, *p*-(*p*'-Ethoxy benzylidene)-*p*-cyano aniline, Birefringence, Order parameter.

### INTRODUCTION

Birefringence and order parameter are key points to judge the applications of liquid crystals (LC) in various fields of science and technology. Various methods are proposed to compute these parameters for liquids and liquid crystals [1-5]. Most common method of calculating birefringence is from the measurement of refractive indices [6-10]. However, recent investigations revealed that the birefringence can be calculated simply by using mathematical methods through image analysis of liquid crystal samples [11-15]. Present study also involved calculations of various optical parameters like absorption coefficient, birefringence, order parameter, etc. through statistical methods of textural images. Here, a comparative study was taken to pure and nanoparticles dispersed mesogens. Till now various analyses were done to almost all the pure mesogens [16-21], which found little drawbacks in application point of view [22-24]. However, addition of foreign elements to the lattice of pure mesogen perturbs transition temperatures optical parameters and various thermodynamical parameters, because mesogen is a soft and sensitive matter. Research has been going on in this way and found remarkable variations in the impure mesogens [25-30].

Also, dispersion of nanoparticles especially metal oxide nanoparticles to pure liquid crystal were studied in various laboratories which found noticeable applications in terms of power consumption [31-34]. Present work was also done in the same way by considering zinc oxide nano particles and introducing them in the lattice of *p*-(*p*'-ethoxy benzylidene)-*p*-cyanoaniline (EBCA) which is pure nematic liquid crystal. Remarkable changes were found in thermodynamical and optical parameters and these helped to predict that zinc oxide nanoparticles dispersed *p*-(*p*'-ethoxy benzylidene)-*p*-cyanoaniline (EBCA) found applications in high temperature fields.

### EXPERIMENTAL

The used liquid crystals of *p*-(*p*'-ethoxy benzylidene)-*p*-cyanoaniline (EBCA, 1) is the product of Frinton Laboratory, USA. All the reagents zinc nitrate [ $\text{Zn}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$ ] and NaOH used for preparation of ZnO nanoparticles were collected from Merck Chemical Industrial company and used without any further purification. The alkali solution of zinc was prepared by dissolving in distilled water to form a 100 mL solution [ $\text{Zn}^{2+} = 0.5 \text{ M}$ ,  $\text{OH}^- = 1.0 \text{ M}$ ].

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## Study on the influence of TiO<sub>2</sub> on the characteristics of multi component modifier oxide based B<sub>2</sub>O<sub>3</sub> glass system

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### ARTICLE INFO

#### Keywords:

Borate glasses  
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Spectroscopic properties

### ABSTRACT

A series of borate glasses mixed with different modifiers (viz., PbO, BaO, CaO, MgO and ZnO of 10 mol% each) and doped with different concentrations of TiO<sub>2</sub> (1.0 to 3.0 mol% in the steps of 0.5) was prepared by melt quenching technique. The prepared samples were characterized by XRD, SEM and spectroscopic techniques. The XRD studies have confirmed the amorphous nature of the samples while the SEM pictures revealed the presence of minute fraction of crystallites (of the size < 0.1 μm) in the samples. IR spectral studies of the glasses exhibited vibrational bands due to BO<sub>3</sub>, BO<sub>4</sub>, B–O–B, PbO<sub>4</sub>, ZnO<sub>4</sub>, TiO<sub>4</sub> and TiO<sub>6</sub> structural units. The optical absorption and EPR spectral studies have revealed probable presence of Ti<sup>3+</sup> ions that act as modifiers and induce structural defects such as dangling bonds, non-bridging oxygens (NBO's) in the glass network. The observed decrease in the optical band gap with increase in the concentration of TiO<sub>2</sub> is attributed to the gradual reduction of Ti<sup>4+</sup> ions (which participate in the glass network forming) in to Ti<sup>3+</sup> ions that act as modifiers.

### 1. Introduction

B<sub>2</sub>O<sub>3</sub> is one of the strong glass forming oxides and addition of alkaline earth oxides to amorphous boron oxide influences its physical properties substantially [1,2]. Further, the insertion of heavy metal oxides like PbO, BaO, etc., the refractive index and the mechanical strength of the glasses are expected to improve remarkably and makes these glasses to be useful for wide range of applications such as optical fibers, optoelectronic devices; radiation shields and surgical lasers [3,4]. PbO in the amorphous materials, act as modifier as well as glass former with PbO<sub>4</sub> pyramidal structural units. Normally, the behavior of such oxides changes with the composition of the glass system. When present at higher contents, these oxides acts as modifiers and at low concentration they predominantly act as network formers [5–8]. BaO is a well-known modifier and may enter the glass network by BO<sub>4</sub> tetrahedra into BO<sub>3</sub> structural units and thus a BaO polyhedron is formed when it surrounded several BO<sub>3</sub> units. Such structural units behave as the defects in the borate glass network [9]. Further, the addition of barium oxide improve the applications of these glasses in the field of solid state electrolytes for the fabrication of solid state batteries and various technological applications [10].

Addition of CaO and MgO to these glasses improves the luminescence properties of the titled glass system. The presence of higher

content these glasses strongly influences the increase in the degree of disorder in glass network. The degree of depolymerization of the glass network is strongly influenced by the ionic radius of the modifier ion and its compatibility with the network forming ions in the glass network [11,12]. Finally, the variation of modifier oxide changes the symmetry and covalency of the glass network. As a result there will be strong impact on spectroscopic properties of the host glass [13]. ZnO is an another interesting oxide (which participates in the glass network both with tetrahedral and octahedral structural units) when mixed with borate glasses, the electrical resistance of this is predicted to be abnormally enhanced and as a result such glasses find wide variety of applications that include as insulating layers in the arrays of electrodes in the display panels [14].

TiO<sub>2</sub> plays a vital role as eminent mineralizer in the chosen glass system [15,16] and found to influence the physical properties to a large extent. The addition of titanium oxide to a glass matrix strongly raises the chemical durability and the nonlinear refractive index and makes the glasses useful for nonlinear optical (NLO) devices [17]. In general titanium ions exists in the glass matrix in Ti<sup>4+</sup> state and participates in the glass network with TiO<sub>4</sub>, TiO<sub>6</sub> and sometimes with TiO<sub>5</sub> structural units [18]. From previous study it is also evidenced that these ions may also exist in Ti<sup>3+</sup> valence state in various glass matrices [19]. The insertion of Ti<sup>4+</sup> ions into the borate glass network is an additional

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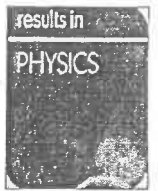
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## Spectroscopic and electrical investigations of copper ions in PbO–GeO<sub>2</sub> glasses

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### ARTICLE INFO

#### Keywords:

XRD  
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Dielectric properties

### ABSTRACT

Small concentrations of copper oxide doped PbO–GeO<sub>2</sub> glasses were prepared by melt quenching technique. The characteristics of the samples were analyzed by X-ray diffraction, scanning electron microscopy and DSC techniques. The analysis of XRD spectra established the disorderly nature of the glass composition and no specialized crystalline species are observed. The surface morphology of the glass samples has also been systematically investigated by scanning electron microscopy. The optical absorption and ESR spectral studies have revealed probable presence of Cu<sup>2+</sup> ions that act as modifiers and induce non-bridging oxygens (NBO's) in the glass network. The observed decrease in the optical band gap with the increase in the concentration of CuO is attributed to the gradual reduction of Cu<sup>2+</sup> ions into Cu<sup>+</sup> ions. The presence of GeO<sub>4</sub>, GeO<sub>6</sub>, Ge–O–Ge and PbO<sub>4</sub> structural blocks has been verified by means of IR spectral bands. The overall inference of optical, ESR and IR studies is that the Cu<sup>2+</sup> ions might have changed from ionic environment to covalent environment progressively. The dielectric parameters viz., dielectric constant,  $\epsilon'$ , loss,  $\tan \delta$ , and ac conductivity,  $\sigma_{ac}$ , were studied by varying frequency and temperature. The values of  $\epsilon'$  and  $\tan \delta$  were enhanced where as  $\sigma_{ac}$  values are dipped. It is proved that the more is the number of Cu<sup>2+</sup> ions in the samples, the higher are the values of dielectric parameters.

### Introduction

PbO is a heavy metal oxide. It has attractive optical proprieties when used in the glasses. Its atomic number is high and hence it raises density of the glasses. The structure of the glass material changes in the glass network due to its modifying nature. It has dual role in the glasses as modifier and glass former [1]. Lead oxide glasses have high refractive index and relatively low melting points [2]. The significant characteristic property of electrical conduction of the lead containing glasses with different network formers is of great interest [3]. GeO<sub>2</sub> glass has less transmission loss in optical fibers; it is an attractive property in glasses [4]. In the absence of non bridging oxygen, conversion of germanate groups [GeO<sub>4</sub>] into [GeO<sub>5</sub>]<sup>−</sup> or [GeO<sub>6</sub>]<sup>2−</sup> is possible at low modifier content [5]. Thermal stability of GeO<sub>2</sub> glasses are more, incorporation of these into lead oxide glasses increases the transition temperature of the glass [6]. PbO–GeO<sub>2</sub> glasses are widely used in high speed optical switches, broad band optical amplifiers and

non liner optical devices [7]. When the modifier PbO is added to GeO<sub>2</sub> network, it acts either as network former or as modifier; it is a modifier if Pb–O is ionic else as a glass former if Pb–O is covalent. Because of high polarizability, the Pb<sup>2+</sup> ion forms a stronger covalent bond with O<sup>2−</sup> ion [8].

CuO doped glasses exhibit semiconducting properties so these are mostly used in pure and applied science, electronics and in other potential applications [9]. The copper atom has electronic configuration [Ar] 3d<sup>10</sup>4s<sup>1</sup>. The coloring of a glass does not depend on Cu<sup>+</sup> (cuprous) ion while the color of a glass is fixed by the content of Cu<sup>2+</sup> ions [10]. Different tints (ruby, blue and emerald green) can be produced by Cu<sup>2+</sup> ions. The color also depends on coordination and composition of the glass. Colors in glass can be explained by ligand field theory [11,12]. Copper ions can influence dielectric, spectroscopic properties of glasses; generally Cu<sup>2+</sup> ions are paramagnetic in nature [13]. The degree of disorder determines the information about the local structure and properties of materials. Paramagnetic probes of copper ions are used to

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## Synthesis and *in vitro* characterization of cerium oxide mixed calcium oxy fluoro borophosphate bioactive glasses by means of spectroscopic studies

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### ARTICLE INFO

#### Keywords:

Bioactive glasses  
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Ce substituted HAP

### ABSTRACT

The main objective of this study is to achieve Ce substituted hydroxy apatite (HAp) deposition on the surface of the bio-active glasses which is more affective in antibacterial activity. Calcium oxy fluoro borophosphate glasses (with BaO as modifier) doped with different concentrations of Ce<sub>2</sub>O<sub>3</sub> were prepared by melt quenching techniques. *In vitro* bioactivity studies were performed by soaking the samples in simulated body fluid (SBF) for about 30 days. The XRD and SEM studies have revealed the deposition of cerium substituted crystalline HAp coating on the surface of the post immersed glasses. The formation of HAp layer is further confirmed by IR and Raman spectral studies. The possible site preference of cerium ions in the HAp layer has been discussed using the results of above mentioned studies. The information regarding dependence of the magnitude of HAp layer developed on the concentration of Ce<sub>2</sub>O<sub>3</sub> dopant is obtained by degradation studies *viz.*, weight loss of the samples and the variation of pH of the residual solutions. The analysis of the results of degradability together with X-ray diffraction (XRD), Infrared (IR), Raman and optical absorption spectra indicated the increasing magnitude of Ce-HAp with the concentration of Ce<sub>2</sub>O<sub>3</sub>. Some of the characterization studies have also pointed out the co-presence of Ce ions in Ce<sup>4+</sup> oxidation state along with Ce<sup>3+</sup> state in the glass samples. The simultaneous presence of cerium ions in these two states in the crystalline HAp layer is predicted to be more useful in promoting the antibacterial activity of the glasses.

### 1. Introduction

Cerium (<sup>58</sup>Ce), one of the rare earth elements, is well known due to its emission in the visible region. The ions of this element are being extensively used as luminescent activators in the glasses (because of their blue emission due to 4f (<sup>2</sup>F<sub>7/2</sub>) → 5d (<sup>2</sup>A<sub>1g</sub>) transition) and such glasses find potential applications in a variety of luminescent and phosphor devices *e.g.*, phosphors for cathode luminescence, scintillators, radiation detectors, UV absorbing filters and also in numerous industrial applications such as catalysts, fuel additives [1–3]. A considerable number of recent studies on spectroscopic properties of Ce<sup>3+</sup> doped glasses is available in the literature [4–6]. Most of the studies available on ceria based materials (substituted with other rare earth ions like La<sup>3+</sup>, Pr<sup>3+</sup>, Sm<sup>3+</sup>, Dy<sup>3+</sup> and also some transitional metal ions) are on their applications in solid oxide fuel cells and as luminescent phosphors [7–10]. However, the role of Ce<sup>3+</sup> ions in bioactive glasses (BG) is not adequately investigated, in spite of the fact, that these ions possess several antibacterial abilities especially in preventing caries [11–13]. The cerium ions were identified to play crucial role in

dissociating outer membrane of bacterial cells from cytoplasmic membrane in the human body and found to exert toxicity towards bacterial cells [14]. In some of the other studies investigated by Schubert and his group of workers [15], it was proved that Ce<sub>2</sub>O<sub>3</sub> particles act as neuro protective agents by acting as antioxidants through limiting the amount of reactive oxygen that may kill the unaffected cells. Further, ceria was identified to enhance the production of collagen (the most abundant protein in muscles, bones, skin, blood vessels, digestive system *etc.*) which helps in increasing the mechanical strength and the elasticity of the human skin [16].

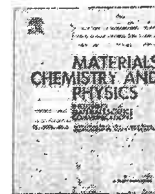
The main constituent of the hydroxy apatite (HAp) layer (that normally revokes the bone growth and also binds bones with the tissues) are Ca<sup>2+</sup> ions. The electro negativity and ionic radius of this ion are 1.01 and 0.10 nm, respectively. These values are very close to those of Ce<sup>3+</sup> ion (1.06 and 0.107 nm). In view of these coincidences, when a part of Ca<sup>2+</sup> ions is replaced by Ce<sup>3+</sup> ions in the calcium oxy fluoro bioactive glasses, it is quite possible for the cerium ions to occupy Ca<sup>2+</sup> positions in the HAp layer and there by Ce substituted HAp can be achieved. The resultant Ce-HAp is highly advantageous over pure HAp

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## *In vitro* degradation studies on bioactive calcium fluoroborophosphate glasses mixed with some modifier oxides-influence of therapeutically active vanadium ions

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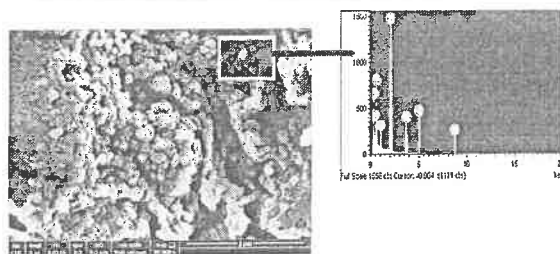
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### HIGHLIGHTS

- *In vitro* degradation of V<sub>2</sub>O<sub>5</sub>-calcium oxy fluoro borophosphate glasses is studied.
- Bioactivity dependence on ionic radii of BaO, SrO, ZnO and MgO is investigated.
- A part of V<sup>5+</sup> ions was reduced to V<sup>4+</sup> ions and formed vanadyl complexes (VO)<sup>2+</sup>.
- HAp layer formation with calcium vanadate crystal phases is established.
- The glass mixed with BaO exhibited the superior bioactivity due to larger degradability.

### GRAPHICAL ABSTRACT



SEM and EDS pictures of V<sub>2</sub>O<sub>5</sub> doped CaF<sub>2</sub>-CaO-B<sub>2</sub>O<sub>3</sub>-P<sub>2</sub>O<sub>5</sub>-ZnO glass after immersion in SBF for 30 days. The pictures indicate the deposition of HAp layer with vanadium ions on its surface.

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Vanadium ions

Modifier oxides

SBF solution

HAp layer

### ABSTRACT

The main objective of the study is to investigate the influence of therapeutically active vanadium ions on the *in vitro* bio-active properties of calcium oxy fluoro borophosphate glasses mixed with different modifier oxides viz., BaO, SrO, ZnO and MgO. The investigations mainly include the degradation studies of the chosen glasses in simulated body fluid (SBF) for a prolonged period (about 800 h). The rate of degradation was estimated by measuring the weight loss of the samples and by measuring the pH of the residual SBF solution at regular intervals of immersion time. During the immersion of the samples in SBF solution, a thin layer of crystalline hydroxy apatite layer (HAp) is observed to develop on the surface of the glass samples. The comparison of the results of XRD, SEM, EDS and IR spectral studies of pre and post immersed samples confirmed the formation of HAp layer embedded with calcium vanadate crystal phases. From the XRD studies it is understood that the magnitude of HAp layer developed on the surface of the samples is the highest for BaO modifier mixed glasses. The optical absorption as well as EPR spectral studies of pre and post immersed samples confirmed that vanadium ions existed in different oxidation states, mainly in V<sup>4+</sup> and V<sup>5+</sup> states, in the bulk glass samples. The ratio of the concentration of these two ions is predicted to be different for different modifier oxides mixed glasses and such variation is predicted to play a vital role in the variations of the magnitude of HAp layer formed on the surface of

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## ORTHOGONAL DERIVATIONS ON $\Gamma$ -SEMRINGS

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**ABSTRACT.** In this paper, we introduce the notion of orthogonal derivations on  $\Gamma$ -semirings. Some characterizations of semi prime  $\Gamma$ -semirings are obtained by means of orthogonal derivations. And also obtained necessary and sufficient conditions for two derivations to be orthogonal.

### 1. Introduction

Semiring, the best algebraic structure, which is a common generalization of rings and distributive lattices was first introduced by American mathematician Vaudiver [19] in 1934 but non trivial examples of semirings have appeared in the earlier studies on the theory of commutative ideals of rings by German mathematician Richard Dedekind in 19th century. Semiring is an universal algebra with two binary operations called addition and multiplication, where one of them distributive over the other, bounded distributive lattices are commutative semirings which are both additively idempotent and multiplicatively idempotent. A natural example of semiring is the set of all natural numbers under usual addition and multiplication of numbers. In particular, if  $I$  is the unit interval on the real line then  $(I, \max, \min)$  is a semiring in which 0 is the additive identity and 1 is the mutilative identity. The theory of rings and the theory of semigroups have considerable impact on the development of the theory of semirings. In structure, semirings lie between semigroups and rings. The study of rings shows that multiplicative structure of ring is independent of additive structure whereas in semiring multiplicative structure of semiring is not independent of additive structure of semiring. Additive and multiplicative structures of a semiring play an important role in determining the structure of a semiring. Semiring, as the basic algebraic structure, was used in the areas of

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2010 *Mathematics Subject Classification.* 16Y60; 06F35; 08A30; 03G25.  
*Key words and phrases.*  $\Gamma$ -semirings, semi prime, derivations, orthogonal derivations.

## EXTENSIONS OF FUZZY IDEALS OF $\Gamma$ -SEMRINGS

B. VENKATESWARLU, M. MURALI KRISHNA RAO, AND Y. ADI NARAYANA

**ABSTRACT.** In this paper, we introduce the notion of extensions of fuzzy ideals of  $\Gamma$ -semiring, fuzzy weakly completely prime ideals and fuzzy 3-weakly completely prime ideal of  $\Gamma$ -semiring. We study the relationship between fuzzy weakly completely prime ideals, fuzzy 3-weakly prime ideals in terms of the extension of fuzzy ideals of  $\Gamma$ -semiring.

### 1. INTRODUCTION

Semiring, the algebraic structure which is a common generalization of rings and distributive lattices, was first introduced by American mathematician Vandiver[22] in 1934 but non trivial examples of semirings had appeared in the studies on the theory of commutative ideals of rings by German Mathematician Richard Dedekind in 19th century. Semiring is an universal algebra with two binary operations called addition and multiplication where one of them distributive over the other, bounded distributive lattices are commutative semirings which are both additively idempotent and multiplicatively idempotent. A natural example of semiring which is not a ring, is the set of all natural numbers under usual addition and multiplication of numbers. In particular if  $I$  is the unit interval on the real line, then  $(I, \max, \min)$  in which 0 is the additive identity and 1 is the multiplicative identity. The theory of rings and the theory of semigroups have considerable impact on the development of the theory of semirings. In structure, semirings lie between semigroups and rings. The study of rings shows that multiplicative structure of ring is independent of additive structure whereas in semiring multiplicative structure of semiring is not independent of additive structure of semiring. Additive and multiplicative structures of a semiring play an important role in determining the structure of a semiring. Semiring, as the basic algebraic structure, was used in the areas of theoretical computer science as well as in the solutions of graph theory and optimization theory and in particular for studying automata, coding theory and formal languages. Semiring theory has many applications in other branches. It is well known that ideals play an important role in the study of any algebraic structures, in particular semirings.

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*Key words and phrases.* Extension of a fuzzy ideal, Fuzzy weakly completely prime ideal, Fuzzy 3-weakly completely prime ideal,  $\Gamma$ -semiring.

## On Spectral Relaxation Approach to Radiating Powell-Eyring Fluid Flow over a Stretching Disk with Newtonian Heating

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**Keywords:** Spectral relaxation method, heated disk, Powell-Eyring fluid, Newtonian heating.

**Abstract.** In this study we use a new spectral relaxation method to investigate an axisymmetric law laminar boundary layer flow of a viscous incompressible non-Newtonian Eyring-Powell fluid and heat transfer over a heated disk with thermal radiation and Newtonian heating. The transformed boundary layer equations are solved numerically using the spectral relaxation method that has been proposed for the solution of nonlinear boundary layer equations. Numerical solutions are obtained for the local wall temperature, the local skin friction coefficient, as well as the velocity and temperature profiles. We show that the proposed technique is an efficient numerical algorithm with assured convergence that serves as an alternative to common numerical methods for solving nonlinear boundary value problems. We show that the convergence rate of the spectral relaxation method is significantly improved by using method in conjunction with the successive over-relaxation method. It is observed that CPU time is reduced in SOR method compare with SRM method.

### Nomenclature

$c_p$  - Specific heat at constant pressure (J/kg K)  
 $f$  - Dimensionless stream function  
 $r$  - Radial direction  
 $T$  - Temperature of the fluid ( $^{\circ}C$ )  
 $T_{\infty}$  - Ambient fluid temperature  
 $u_w$  - Stretching velocity along  $r$  - direction  
 $v_w$  - Stretching velocity along  $y$  - direction  
 $B_0$  - Magnetic field strength  
 $k_p$  - Permeability  
 $i$  - Time index during navigation  
 $L$  - Scale  
 $t$  - Time  
 $\bar{N}$  - Number of grid points  
 $Pr$  - Prandtl number

$Re_x$  - Local Reynolds number

$C_f$  - Skin friction coefficient

$Nu_x$  - Local Nusselt number

$q_w$  - Surface heat flux

$k$  - Thermal conductivity (W/m K)

### Greek symbols

$\mu$  - Thermal viscosity (N s/m)

$\rho$  - Fluid density ( $kg/m^3$ )

$\tau_w$  - Wall shear stress

$\nu = \mu / \rho$  - Kinematic viscosity of the fluid

$\eta$  - Similarity variable

$\bar{\tau}$  - Extra stress tensor

$\Gamma$  - Time dependent material constant

$\theta$  - Non-dimensional temperature

### Subscript

$w$  - Condition at the surface

$\infty$  - Condition at infinity

### Super script

' - Differentiation with respect to  $\eta$

# STABILITY INDICATING HIGH PERFORMANCE LIQUID CHROMATOGRAPHIC METHOD FOR THE SEPARATION AND ASSAY OF PIBRENTASVIR AND GLECAPREVIR

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## ABSTRACT

### Objective:

To develop and validate (using International Conference on Harmonization guidelines) a simple, fast and efficient stability indicating high performance liquid chromatographic method for simultaneous determination of pibrentasvir (PBVR) and glecaprevir (GCVR) in bulk and pharmaceutical formulation.

### Methods:

PBVR and GCVR were separated within 6 Min on Cosmicsil C<sub>18</sub> analytical column with 0.1M Na<sub>2</sub>HPO<sub>4</sub>: acetonitrile (60:40 v/v) with pH 4.5 at a flow rate of 1.0 ml/min. Validation was performed with respect to system suitability, linearity, sensitivity, selectivity, precision, accuracy and robustness. PBVR and GCVR combined tablet sample was subjected to stress degradation in 0.1N HCl for 30 min, 0.1 N NaOH for 30 min, 30% H<sub>2</sub>O<sub>2</sub> for 30 min, water for 30 min, in oven at 105 °C for 30 min and in sunlight for 24 hr.

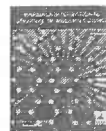
### Results:

The linearity for PBVR and GCVR were 5-80 and 12.5-200 µg/ml with regression coefficients of 0.9995 and 0.9997, respectively. Stability indicating ability of the developed method was shown by stress degradation studies. The proposed method was effectively applied for simultaneous determination of PBVR and GCVR in available tablet dosage form with good accuracy and precision.

### Conclusion:

The developed method is apt for the assay of PBVR and GCVR in the presence of their degradation products.

**Key words:** Pibrentasvir, Glecaprevir, Antiviral combination, Hepatitis C virus, Method development, Validation



# Simultaneous spectrophotometric estimation of Salbutamol, Theophylline and Ambroxol three component tablet formulation using simultaneous equation methods

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## Abstract

In this work, a sensitive and selective spectrophotometric method was first introduced for the simultaneous determination of Salbutamol (SBT), Theophylline (TPL) and Ambroxol (ABX) in their ternary mixture without preliminary separation. Quantification was performed simply by zero-order spectrophotometric method at its  $\lambda$  max of 241, 224 and 245 nm for SBT, TPL and ABX respectively. The linear range was found to be 0.1–0.6  $\mu\text{g/ml}$  for SBT, 5–30  $\mu\text{g/ml}$  for TPL and 1.5–9.0  $\mu\text{g/ml}$  for ABX that doesn't show any interference of other drugs even in low or high concentrations. The mean percentage recovery was found to be within the range of 98–102%. These methods were successfully applied to the analysis of their combined dosage form and bulk powder. The adopted methods were also statistically validated as per ICH guidelines.

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**Keywords:** Salbutamol; Theophylline; Ambroxol; Zero order Spectra; Simultaneous equation

## 1. Introduction

Salbutamol, also known as albuterol [1], is a medication used to treat asthma, exercise induced bronchoconstriction, and chronic obstructive pulmonary disease (COPD) [2]. Also it may be used to treat high blood potassium levels [3]. The drug is usually used by inhaler or nebulizer but is also available as a pill and intravenous solution [4]. Theophylline, also known as 1,3-dimethylxanthine, is a methylxanthine drug used

in therapy for respiratory diseases such as chronic obstructive pulmonary disease (COPD) and asthma [5–7]. The substance is a mucoactive drug with several properties including secretolytic and secretomotoric actions used in the treatment of respiratory diseases associated with viscid or excessive mucus. Ambroxol is a secretolytic agent used in the treatment of respiratory diseases associated with viscid or excessive mucus [8, 9]. It is the active ingredient of Mucosolvan, Lasolvan or Mucoangin. It is indicated as secretolytic therapy in bronchopulmonary diseases associated with abnormal mucus secretion and impaired mucus transport [10–12]. Ambroxol is available as syrup, tablets, pastilles, dry

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# Orthogonal Reverse Derivations on semiprime $\Gamma$ -semirings

B. Venkateswarlu \*, M. Murali Krishna Rao and Y. Adi Narayana

**Abstract**  
 In this paper, we introduce the notion of reverse derivation and orthogonal reverse derivations on  $\Gamma$ -semirings. Some characterizations of semi prime  $\Gamma$ -semirings are obtained by means of orthogonal reverse derivations. And also obtained necessary and sufficient conditions for two reverse derivations to be orthogonal.

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**Keywords:**  $\Gamma$ -semirings; semi prime; derivations; orthogonal reverse derivations.  
**AMS Subject Classification (2010):** Primary: 16Y60; Secondary: 06F35, 08A30, 03G25.

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## 1. Introduction

Semiring, the best algebraic structure, which is a common generalization of rings and distributive lattices was first introduced by American mathematician Vandiver [15] in 1934 but non trivial examples of semirings have appeared in the earlier studies on the theory of commutative ideals of rings by German mathematician Richard Dedekind in 19th century. Semiring is an universal algebra with two binary operations called addition and multiplication, where one of them distributive over the other, bounded distributive lattices are commutative semirings which are both additively idempotent and multiplicatively idempotent. A natural example of semiring is the set of all natural numbers under usual addition and multiplication of numbers. In particular, if  $I$  is the unit interval on the real line then  $(I, \max, \min)$  is a semiring in which 0 is the additive identity and 1 is the mutilative identity. The theory of rings and the theory of semigroups have considerable impact on the development of the theory of semirings. In structure, semirings lie between semigroups and rings. The study of rings shows that multiplicative structure of ring is independent of additive structure whereas in semiring multiplicative structure of semiring is not independent of additive structure of semiring. Additive and multiplicative structures of a semiring play an important role in determining the structure of a semiring. Semiring, as the basic algebraic structure, was used in the areas of theoretical computer science as well as in the solutions of graph theory and optimization theory and in particular for studying automata, coding theory and formal languages. Semiring theory has many applications in other branches. The notion of  $\Gamma$ -ring was introduced by Nobusawa [11] as a generalization of ring in 1964. Sen [13] introduced the notion of  $\Gamma$ -semigroup in 1981. The notion of Ternary algebraic system was introduced by Lehmer [5] in 1932, Lister [6] introduced ternary ring. Dutta & Kar [3] introduced the notion of ternary semiring which is a generalization of ternary ring and semiring. In 1995, Murali Krishna Rao [7, 8] introduced the notion of  $\Gamma$ -semiring which is a generalization of  $\Gamma$ -ring, ring, ternary semiring and semiring. After the paper [7, 8] was published, many mathematicians obtained interesting results on  $\Gamma$ -semirings. Murali Krishna Rao and Venkteswarlu [9] introduced the unity element in  $\Gamma$ -semiring and studied properties of  $\Gamma$ -incline and field  $\Gamma$ -semiring.

Over the last few decades several authors have investigated the relationship between the commutativity of ring  $R$  and the existence of certain specified derivations of  $R$ . The first result in this direction is due to Posner [12] in

## $(\lambda, \mu)$ -fuzzy interior ideals of ordered $\Gamma$ -semirings

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**Abstract.** In this paper we introduce the notion of  $(\lambda, \mu)$ -fuzzy ideals and  $(\lambda, \mu)$ -fuzzy interior ideals of ordered  $\Gamma$ -semiring, for all  $\lambda, \mu \in [0, 1]$  such that  $\lambda < \mu$ . We characterize the regular ordered  $\Gamma$ -semiring and the simple ordered  $\Gamma$ -semiring in terms of  $(\lambda, \mu)$ -fuzzy interior ideals.

### 1. Introduction

The notion of a semiring is an algebraic structure with two associative binary operations where one distributes over the other, was first introduced by Vandiver [20] in 1934 but semirings had appeared in earlier studies on the theory of ideals of rings. An universal algebra  $(S, +, \cdot)$  is called a semiring if and only if  $(S, +), (S, \cdot)$  are semigroups which are connected by distributive laws, i.e.,  $a(b + c) = ab + ac$ ,  $(a + b)c = ac + bc$ , for all  $a, b, c \in S$ . In structure, semirings lie between semigroups and rings. A natural example of semiring is the set of all natural numbers under usual addition and multiplication of numbers. In particular, if  $I$  is the unit interval on the real line then  $(I, \max, \min)$  is a semiring in which 0 is the additive identity and 1 is the multiplicative identity. The results which hold in rings but not in semigroups hold in semirings, since semiring is a generalization of ring. The study of rings shows that multiplicative structure of ring is an independent of additive structure whereas in semiring, multiplicative structure of semiring is not an independent of additive structure of semiring. The additive and the multiplicative structures of a semiring play an important role in determining the structure of a semiring. The theory of rings and theory of semigroups have considerable impact on the development of theory of semirings. Semirings play an important role in studying matrices and determinants. It is well known that ideals play an important role in the study of any algebraic structures, in particular semirings. Though semiring is a generalization of a ring, ideals of semiring do not coincide with ring ideals. Henriksen [4] defined  $k$ -ideals in semirings to obtain analogues of ring results for semiring. Semirings are useful in the areas of theoretical computer science as well as in the solutions of graph theory, optimization theory, in particular for studying automata, coding theory and formal languages. Semiring theory has many applications in other branches.

The notion of  $\Gamma$ -ring was introduced by Nobusawa [16] as a generalization of ring in 1964. Sen [18] introduced the notion of  $\Gamma$ -semigroup in 1981. The notion of ternary algebraic system was introduced by

2010 Mathematics Subject Classification. 16Y60; 08A72.

**Keywords.**  $\Gamma$ -semiring, ordered  $\Gamma$ -semiring,  $(\lambda, \mu)$ -fuzzy ideal,  $(\lambda, \mu)$ -fuzzy interior ideal, regular ordered  $\Gamma$ -semiring, simple ordered  $\Gamma$ -semiring.

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## Spectroscopic Investigations of Copper doped Zinc Bismuth Arsenate glass ceramics

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### Abstract

Zinc Bismuth Arsenate glasses are prepared by melt quenching technique and subsequently crystallized them with different CuO contents as nucleating agents and characterized them by XRD and SEM. The optical absorption and ESR measurements on these samples reveal the presence of copper ions mostly in octahedral distorted tetragonal positions. The analysis of this data further indicates with an increase in the concentration of CuO, there is a gradual adaptation of Cu<sup>2+</sup> ions from ionic environment to covalent environment. With the increase in concentration of Cu<sup>2+</sup> ions in the glass ceramic network, a large number of donor centers are created and subsequently the excited states of localized electrons originally trapped on Cu<sup>+</sup> sites begin to overlap with the empty 3d states on the neighboring Cu<sup>2+</sup> sites, and as a result, the impurity or polaron band becomes more extended into the main band gap. The quantitative analysis of results of spectroscopic studies indicated that the glass crystallized possess high insulating strength.

### 1. Introduction

Now-a-days lead oxide glasses have been restricted in various applications as it is hazardous to health and environment. In this context, bismuth oxide has been a suitable substitution of lead oxide in glass preparation. Bismuth oxide glasses have wide range of applications in the field of glass ceramics, layers for optical and electronic devices, thermal and mechanical sensors, reflecting windows [1]. Addition of ZnO to these glasses enhances the applications suitably in plasma display panels, computer monitors and promising candidates for large area hang-on-wall TVs. ZnO can act both as a glass former and a glass modifier. As glass former ZnO enters the network with ZnO<sub>4</sub> structural units and as network modifier, zinc ion is octahedrally coordinated and behaves like any other conventional alkali oxide modifier. As a result, the infrared transmittance of these glasses will be least affected due to the introduction of ZnO [2]. The addition of As<sub>2</sub>O<sub>3</sub> to this system may improve the optical transparency in the blue region and further, makes them suitable for the long

## Spectroscopic features of Sm<sup>3+</sup> ions in ZnO-MoO<sub>3</sub>-B<sub>2</sub>O<sub>3</sub> glass systems

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### Abstract

The objective of the study is preparation and spectroscopic studies such as IR, optical absorption and photoluminescence of zinc borate molybdenum glasses doped with varying concentration of Sm<sup>3+</sup>. IR spectral studies of these glasses indicated that there is a gradual increase in the intensity of various structural groups increases with increase of Sm<sup>3+</sup> ions upto 2.0 mol% and then decrease with increase of cerium ions. The optical absorption spectra of Sm<sup>3+</sup> doped ZnO-B<sub>2</sub>O<sub>3</sub>-MoO<sub>3</sub> glasses recorded at room temperature in the wavelength range 200-2000 nm, have exhibited the different absorption bands. The optical band gap (E<sub>g</sub>) of all the glasses are evaluated by drawing Tauc plots and found the optical band gap is lowest for 2.0 mol% of Sm<sup>3+</sup> ions. The photoluminescence emission spectra exhibited three prominent emission bands at 465.2; 619.2; 617.2; 615.2. The intensity of these bands is found to be highest for 1.0 mol% and lowest for 2.0 mol%. Summing up the work presented in this paper is felt that the study of various spectroscopic properties of ZnO-B<sub>2</sub>O<sub>3</sub>-MoO<sub>3</sub> glasses doped with Sm<sup>3+</sup> yielded some valuable information which will be useful for the practical applications.

### 1. Introduction

Zinc borate glasses are well known due to their high transparency, low melting point, high thermal stability and good rare earth ion solubility [1, 2]. However, interest in these glasses is limited as laser hosts due to their high phonon energy. Nevertheless, the addition of some transition metal oxides like MoO<sub>3</sub> to ZnO-B<sub>2</sub>O<sub>3</sub> glass makes it more moisture resistant and minimizes phonon losses. Further, ZnO-MoO<sub>3</sub>-B<sub>2</sub>O<sub>3</sub> glasses are expected to harbor a variety of fluorescence centers which can be used for modeling typical glass applications: as sensor for the spectroscopic of structural aspect of the amorphous materials [3, 4]. Further, B<sub>2</sub>O<sub>3</sub> based glasses are well known due to their larger (larger even than crystals) photo induced second order non linear optical effects that have strong bearing on luminescent efficiencies of these glasses [5]. When zinc borate glasses are mixed with different network forming/modifying transition metal ions we may expect the structural modifications and local field variations around rare-earth ions; such variations may have strong bearing on different luminescence transitions of trivalent ions.

The molybdenum may exist in least in two stable valence states viz., Mo (V) and Mo (VI) in the glass network; Mo (VI) ions act as network formers with MoO<sub>4</sub><sup>2-</sup>

ACADEMIC YEAR: 2018-2019

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# Optimization of Parameters in WEDM Using CCF Design

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## Abstract

The research work is to investigate the influence of WEDM process parameters such as pulse on time( $T_{on}$ ), pulse off time( $T_{off}$ ), peak current (IP), servo voltage (SV), and wire feed (WF) on response parameters as Material Removal Rate (MRR), Surface roughness(SR). Experimentation work carried out on Titanium 5 Grade work material with tool electrode as annealed brass wire. Every process parameter was set at three levels and the output variables were Surface roughness (SR) and Material removal rate (MRR). Central Composite Face centered (CCF) design was used to conduct the experiments. According to the experimental results the model equations for SR and MRR were developed using multiple linear regression. Modeling and optimization of process parameters had been performed with the help of model equations, level means and response graphs. From the analysis it was identified that the effect of servo voltage on surface roughness and pulse on time for MRR is more significant.

**Keywords:** WEDM, Modeling, Optimization, Surface Roughness (SR), Material Removal Rate(MRR).

## 1. Introduction

NTM (Non-Traditional Machining process) is one of the modern manufacturing technology, it energize economically to machining the materials which are difficult by traditional tools [1]. Newer and harder materials like advanced composites, high strength temperature resistance alloys, ceramics plays a significant role in the advanced technical industries such as tools and die making industries, aerospace, automobiles, nuclear reactors, medical ,computer and electronics [2]. WEDM is the process of NTM with unique machining technique used for specific application where dimensional accuracy, close tolerance and high degree of precision are very important for conductive materials. The basic principle in wedm is thermal energy conservation. High temperature Electrical sparks are generated between the work piece and the wire electrode, the material is eroded and vaporized form the work piece. A continuous supply of dielectric fluid is flushed out the eroded metal in the machining zone. The conductive tool electrode wire with diameter less than 300 microns is controlled and monitored by the CNC machine [3]. Titanium alloy is a material for aerospace, aircrafts, missile components and bio implants [4]. The properties of these materials have high strength maintained at high temperature, and it has excellent environment, chemical & wear resistance. Titanium and its alloy are winning materials due to their unique combination of properties high specific strength maintained at elevated temperature, high hardness, chemical wear resistance and excellent resistance to most environments is the result of its strong affinity for oxygen and tendency to form a stable, tightly adherent protective surface film [5]. WEDM is still remains an important issue regarding machining characteristics that would be very valuable information for the manufactures and to the society. Sourav et al.[ 6 ] conducted experiments for 201LN grade of 200 series stainless steel with process parameters  $T_{on}$ ,  $T_{off}$ ,

peak current, WF & Wire Tension, to obtain the maximum MRR and minimum SR. The responses are optimized by simulated Annealing followed by Response Surface Methodology. The output from the study will be useful for manufactures to select the optimal levels of parameters. Sunil et al. [7] investigated the optimum machining parameters for the AISI D2 tool steel. The input parameters such as peak current, WF,  $T_{on}$ ,  $T_{off}$ , Servo voltage are used to know the effect on response characteristics namely cutting speed, surface roughness and identified that  $T_{on}$  is the most significant parameter on response parameters. Srinivasarao et.al [8] experiments were conducted by CCF to optimize the WEDM process variables as pulse on time, pulse off time, peak current, servo voltage and wire feed for Titanium-alloy material with a brass wire as tool electrode. A mathematical model was developed to response parameters MRR and SR by SPSS software. Desirability function is used to optimize the multi response characteristics. Srinivasarao et.al [9] did experiments by using a CCF design on AISI 52100 steel as work material to know the effect of process parameters as pulse on time, pulse off time, water pressure and wire feed on response parameters. It was found that pulse on time is more significant parameter for the surface roughness rather than other machining parameters. Bharathi et al.[10]studies carried out on WEDM for SS304 the process parameters pulse on time, pulse off time, wire feed & voltage are selected for high metal removal rate & lower surface roughness as well as kerf width, a multi objective optimization method is adopted to optimize the responses & achieved better predicted result than experimental value. Liao et al. [11] used neural network to predict the relationship between process parameters and response characteristics. Optimum technique genetic algorithm is employed to get the optimal combination of machining parameters and save a substantial amount of time and cost. Ramakrishnan et al. [12] the performance characteristics like MRR and SR were optimized concurrently using multi response signal-to-noise ratio. The study carried out by assigning

## DEVELOPMENT OF GENETIC PROGRAMMING MODEL FOR PREDICTION OF CUTTING FORCES IN ROTARY MILLING

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**Abstract** - There has been huge requirement and immense interest to develop the novel technologies in the metal machining and defence industry because of the improvement of tool substances reached optimal stage. The cutting tool life was drastically reduced while machining of difficult to cut materials such as titanium based super alloys; Nickel based super alloys and structural composite materials. Here the novel technology to increase tool life is self propelled rotary machining. The manufacturers were developing such tools to increase the productivity. In this work face milling operation was carried out on Inconel 625 a Nickel based super alloy which is widely consumed in industries like aerospace and defence. After conducting experiments predictive models were developed using multi gene genetic programming (MGGP) to predict the cutting force. The cutting force which is predicted using MGGP had the better correlation with the experimental values.

**Keyword** - Rotary Machining, MGGP, Inconel 625, Nickel Based Super Alloys.

### I. INTRODUCTION

Machining of difficult to cut materials like titanium alloys, nickel based super alloys and structural composites in aerospace, defence and metal cutting industry is challenging to the researchers and manufacturers because of the excessive tool wear. The development of rotary tools is one of the novel techniques to overcome the tool wear problem. There is a speedy evaluation of modern materials like nickel and titanium alloys with enhanced characteristics like strength to weight ratio, the complexity in cutting of these alloys effectively and financially are restrict the applications of these materials. The investigations to develop modern tool materials are at final stage. The manufacturers of all over the world are concentrated on advanced designs of tools. One such design is the rotary machining i.e. self propelled rotary turning and self propelled rotary milling operations in which the life of the tool is drastically improved and advanced alloys can be machined more rapidly at lower cost of the cutting tool compared to traditional tools [1-6].

Depending on the literature, the experiments were investigated only on rotary turning and on rotary milling there is a limited focus. A model to the cutting force was developed by Baro (2005) for self propelled rotary milling cutter while investigating rotary face milling. [7]. There is limited investigations were performed on advanced materials which are widely used in aerospace industrial applications. Hence there is a requirement for future studies in the process of rotary milling particularly while machining advanced and improved materials which are widely used in aerospace industry. The present research, a rotary face milling cutter with four inclination angles was developed and

the cutting capability was investigated on Inconel 625.

The working capability of the new designed self propelled milling tool while machining Inconel 625 a Nickel based superalloys is investigated through conducting experiments using design of experiments. To predict the cutting force a soft computing model was developed in rotary face milling using Multi-gene genetic programming (MGGP) technique and it was validated. The experiments were conducted on Inconel 625 with coated carbide round insert. These investigations were conducted based on full factorial technique.

### II. EXPERIMENTATION

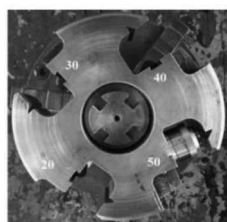


Fig: 1. Cutter for Rotary Face Milling

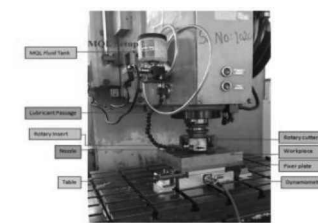


Fig: 2. Experimental Setup

Fig: 1. shows the designed and developed rotary milling cutter which was used for experimental investigations on Inconel 625.

The cutting force was measured using a six component dynamometer (make: AMTI, USA). The work piece is fixed over the dynamometer and then the generated cutting force was captured through a data acquisition system. The fig. 2 shows the experimental setup. Table 1 shows the composition of Inconel 625.



IMME17

## Surface metal matrix composites of Al5083 - fly ash produced by friction stir processing

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### Abstract

In the present study, composites of Al5083 aluminum alloy and fly ash were successfully developed by friction stir processing (FSP). The fly ash powder was dispersed by groove filling method and FSP was carried out at different speeds and feed rates. 1400 rpm speed with 20 and 25 mm/min feed were observed as optimum processing parameters. The thickness of the surface composite layer was measured as varying from 500  $\mu\text{m}$  to 2000  $\mu\text{m}$  at the surface. Higher hardness was measured for FSPed Al5083 (83.5 Hv) and the effect was observed as higher for the composite (97.2 Hv) compared with unprocessed Al5083 (68.3 Hv) due to grain refinement and the presence of fly ash. Corrosion studies were conducted using 3.5% NaCl solution. From the electrochemical studies, the corrosion current density ( $i_{\text{corr}}$ ) was measured as decreased for FSPed Al5083. Surprisingly, for the composite,  $i_{\text{corr}}$  was found to be increased compared with FSPed Al5083. The corrosion behavior of both the FSPed Al5083 and composite compared with unprocessed Al5083 can be attributed to the grain size effect as well as the presence of fly ash particles. Hence from the present study, it can be concluded that the fine grained surface composites of Al5083- fly ash can be successfully produced by FSP with improved mechanical properties. However, corrosion behavior of the FSPed surfaces must be considered as a valid input while designing the structures, if the structures are intended to work in the corroding environment.

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*Keywords:* surface MMCs, grain refinement, friction, corrosion, hardness, fly ash;

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## FOUR WHEEL STEERING SYSTEM WITH MOVABLE HEAD LIGHTS BY USING RACK AND PINION MECHANISM

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### ABSTRACT

Now a days, many researchers put their efforts on four wheel steering mechanism, implementation of this mechanism is needed in situations like low speed cornering, vehicle parking and driving at heavy traffic, tight spaces, where driving would be very difficult due to vehicle's larger wheelbase and track width. For avoiding this problem, we need a mechanism with less turning radius by implementing four wheel steering mechanism instead of two wheel steering mechanism. In a regular standard two wheel steering system, rear wheels are directed forward and do not play role in controlling the steering. In case of four wheel steering system, rear wheels play an active role for steering for guiding at any speed. If the vehicle have larger wheel base and track width in some cars, the driving would be very difficult in different situations like cornering at low speeds, parking the vehicle and city driving conditions with heavy traffic in very tight places. So, we require a mechanism, which is having less turning radius. This work also includes the hardware of movable headlight system for motor vehicles. For all the vehicles, head light control system is needed, which help the head light to rotate right and left independently, and keep the beam as parallel to the curved road to provide better visibility to the driver at night time. In the present work, we use rack and pinion mechanism to drive the optical axes, on which head lights are mounted. This result that, when tie rod arms are moving with steering arm, then it gives a predefined motion to the wheels along with head lights. In this work, for driving the optical axis, we use rack and pinion arrangement, when steering arm, tie rod arm is moved that give motion to the wheels as well as head lights.

**KEYWORDS:** Four Wheel Steering System, Rack and Pinion Mechanism & Movable Head light System

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### INTRODUCTION

The steering system allows the driver to guide the moving vehicle on the road and turn it right or left as desired. Further, such turning of the vehicle should not require greater efforts on the part of the driver. There are mainly two types of steering system.

Car safety is the avoidance of automobile accidents or the minimization of harmful effects of accidents, in particular as pertaining to human life and health. Special safety features have been built into cars for years, some for the safety of car's occupants only, and some of the safety of others.

Jack Erjavee in 2009 said that when the vehicle is in high speed with subtle steering adjustments, both the front and rear wheels are turn in the same direction. As a result, the car moves in a crab-like manner rather than in a curved path. This action is advantageous to the car while changing lanes on a high-speed road. To eliminate

# Multi Regression Analysis of Wire Electrical Discharge Machining Based on Taguchi Method

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**Abstract:** This paper presents an investigation on the effect and optimization of machining parameters on the kerf (cutting width) and material removal rate (MRR) in wire electrical discharge machining (WEDM) operations. The experimental studies were conducted under varying pulse on time, pulse off time, and open circuit voltage. The settings of machining parameters were determined by using Taguchi experimental design method. The level of importance of the machining parameters on the cutting kerf and MRR is determined by using analysis of variance (ANOVA). The optimum machining parameter combination was obtained by using the analysis of signal-to-noise (S/N) ratio. The variation of kerf and MRR with machining parameters is mathematically modeled by using regression analysis method. The optimal search for machining parameters for the objective of minimum kerf together with maximum MRR is performed by using the established mathematical models.

**IndexTerms -** WEDM, Taguchi Experimental Design, Signal to Noise Ratio, ANOVA, Regression Analysis.

## I. INTRODUCTION

The objectives of human lives are distinguished from all other forms of life. We use tools and intelligence to create goods that serve to make life easier and more enjoyable. Through the centuries both the tools and energy sources to power these tools have evolved to meet the increasing sophistication and complexity of mankind's ideas. The last century has seen the creation of products made from the most durable and, consequently, the most un-machinable materials in history. In an effort to meet the manufacturing challenges created by these materials, tools have now been evolved to include materials such as alloy steels, carbide, diamond and ceramics. Every time new tools, tool materials, and power sources are utilized, the efficiency and capabilities of manufacturers are greatly enhanced. However as old problems are solved, new problems and challenges arise.

Scientific and engineering advances have placed unusual demands on the manufacturing industry. One of the aspects of these demands is that engineering materials such as cold rolled composites with high strength-to-weight ratios have been developed to serve specific purposes. Although they have been successfully introduced in few commercial applications, their potential of wide spread application is still impeded due to the challenges in machining these materials. They are difficult to-machine due to the presence of hard and abrasive ceramic reinforcements. The issues like rapid tool wear, surface and sub-surface damage, along with high cost are associated. Therefore, these materials have attracted researcher worldwide in last decade. As a result of this lot of work has been carried in conventional machining of these materials. In addition, nonconventional machining process like electrical discharge machining has also been employed to machine these materials. This process show promise in machining of these materials. However, relatively a very few research have been undertaken in wire electrical discharge machining (WEDM) of these materials.

Since its introduction to industry in 1970, the wire electro-discharge machining (WEDM) has become a key technology for precision manufacturing of complex shapes rapidly and accurately, especially, on modern and 'difficult-to-machine' materials (like titanium, nimonics, zirconium, etc.) for aerospace, nuclear and automotive applications. However, even the state-of-the-art machine tools do not provide any technology to machine these metal matrix composites. This is attributed to lack of research in WEDM of these materials. Therefore, it is necessary to carry out comprehensive investigations into WEDM of metal matrix composites. The work reported in the present thesis is an attempt in this direction.

## II. WORKPIECE MATERIAL

Work piece is a stripped piece of a large metal sheet which has been cold rolled and gone through a tempering process to remove the residual stress and the change in chemical composition is noticeable.

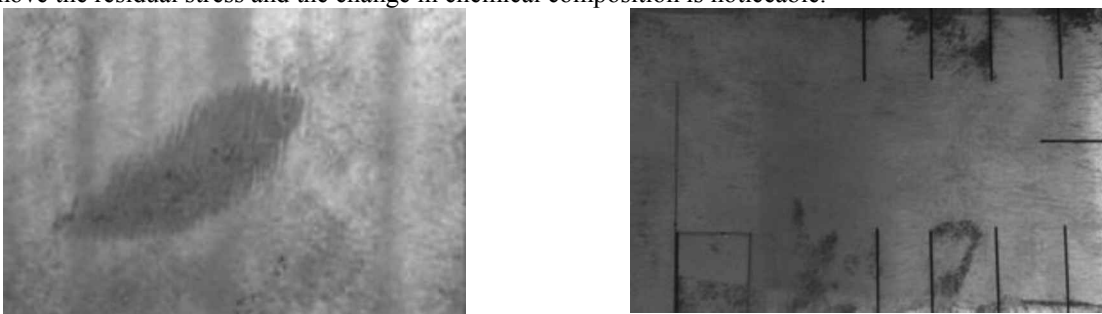


Figure 1: Workpiece before and after machining

# Fabrication of Agriculture based Smart Cultivation System

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**Abstract:** This study deals with the fabrication of the Smart Cultivation system which can plough the soil, cut the grass, and pump to spray chemical fertilizers and water, these whole systems of the vehicle works with the engine and specialized motors. The advantages of these vehicles gives better work output on the agricultural field. It is capable of performing multiple tasks at same time i.e. the developed prototype of multipurpose can plough, and spraying the water at the same time. As we observe normal tractors are able to perform only single task at a time that can be either to plough or level the land. But in our project, this vehicle performs multiple tasks and is only for the farming purpose. Farmers needs many labour to work on the agricultural field, because of this the cost of famers input is very high at the time of cropping. So, we designed this to minimize the work time of farmers and save the labour cost and for a better and efficient output. We hope that this Smart Cultivation system will be proven like a boon to farmers of India.

**Index Terms:** Component, formatting, style, styling, insert.

## I. INTRODUCTION

### A. Beginning Of Farming

Agriculture plays a vital role in India's economy. The Indian agriculture system began as early as 9000 BC. During this period techniques were developed for the settled mode of production in agriculture and wheat, barley and jujube were the popular crops that were domesticated in the subcontinent by 9000 BC. The farm sector is contributing greatly to the productivity and stability of the country's economy due to which it has been believed that agricultural prosperity is fundamental to national prosperity. It accounts for about 18% of India's gross domestic product, provides employment to 58 per cent of her working population and the rural households depend on agriculture as their principal means of livelihood. Agriculture, along with fisheries and forestry, is one of the largest contributors to the Gross Domestic Product (GDP). New techniques were developed in the Neolithic period to improve the method of agriculture system like threshing, planting crops in rows, cotton spinning and storing grains in granaries. And they passed their improved techniques of agricultural production to the next generation. This transformation of knowledge was the base of further development of agriculture and farming equipments in India.

### B. Changing Scenario In Cropping Activities

After the period of cattle farming in the agricultural fields, there is a drastic change in the agricultural areas. The scientist Benjamin Holt designed the several farming equipments for cropping purpose at that time; these machinery equipments are done a tremendous job in the agricultural fields. He invented a specially designed tractor for the agricultural purpose to do several farming activities for better production. With this farming tractor, the economy from the cropping sector increasing annually which is very helpful to the field sectors. From that invention, the cattle usage in the agricultural areas is slowly decreased day by day in the farming sectors. By this farming vehicle, which is named as agricultural tractor is really a great change in the agricultural production within the short period of time.



Fig 1: Farm productions with using tractors



# Experimental Evaluation of Performance and Emissions of Dual-Blended Bio-Diesels with Diesel as an Alternative Fuel for Diesel Engines

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**Abstract:** We know that year to year the emission standards are becoming stringent due to the air pollution caused by the usage of fossil fuels. It is difficult for the developing countries like India to meet such stringent emission standards as it involves expensive technologies. Previous researches shows that Biodiesel fuelled diesel engines emit less CO, HC and smoke emissions than diesel fuelled engines. In this paper, a dual biodiesel blend, mixture of two different kinds of biodiesel namely "palm biodiesel" (*Elaeis guineensis*) and "jatropha biodiesel" (*Jatropha curcas*) in diesel is considered for evaluation in a single cylinder direct injection diesel engine with varying loads after going through physical properties analysis. The objective of present work is to investigate experimentally the effects of Dual Biodiesel blends on performance and emissions of diesel engine under various loads at constant speed.

## I. INTRODUCTION

Environmental concerns have increased regarding vehicular pollution and also import of fuel is increasing due to high demand for the fuel year to year. Many governments have neglected this issue which has been significantly contributing to climate change and economy. The Research works carried out in this area focus on improving efficiencies and limiting emission levels. Biodiesel reportedly offers a good solution to the above- mentioned problems due to its similar properties to conventional diesel. The engine power output and the fuel consumption of the vegetable oil and its blends are almost the same when the engine is fuelled with diesel. Due to lower calorific values and higher viscosity as compared to diesel, vegetable oils are converted to biodiesel.

Previous research works found out that high kinematic viscosity and density fuels with lower calorific value tend to increase the BSFC and lower the brake power as it results in poor atomization of fuel during spraying of fuels inside the combustion cylinder. The presence of high amount of oxygen molecules in biodiesel results in complete combustion of fuel. This condition leads to lower hydrocarbons and carbon monoxide emissions. The other uses of biodiesel include its use as heating fuel in boiler furnaces, as a fuel in electricity generators to produce electricity, as a lubrication additive, as a fuel in transport industry including marine industry etc. Also it promotes agriculture as it is produced from plants and animal fats.

## II. LITERATURE REVIEW

### A. K. Srithar

The 2 biodiesels pongamia pinnata oil and mustard oil were prepared by transesterification process. The dual biodiesel blends were prepared in different proportions like D90PPB5M5, D80PPB10M10, D60PPB20M20, D40PPB30M30, D20PPB40M40 and D0PPB50M50. From the experimental analysis results, the thermal efficiency and mechanical efficiency of blends were very closer to the diesel values. The specific fuel consumption values of dual biodiesel blends were comparable to diesel. Blends produced slightly lower CO and CO<sub>2</sub> than diesel.

### B. B. Deepanraj

Tests were carried out using 10, 20, 30, 40 and 50% palm biodiesel blends. The biodiesel blends produced lower CO and unburned HC emission than neat diesel fuel due to the availability of oxygen content and produced higher NO<sub>x</sub> than diesel because of the higher temperature inside the combustion chamber. Biodiesel blends produced lower brake thermal efficiency & higher specific fuel consumption than diesel because of the low calorific value & produced higher exhaust gas temperature than neat diesel.

### C. Deepak Agarwala

Study was carried out to investigate the performance and emission characteristics of linseed oil, mahua oil, rice bran oil and linseed oil methyl ester (LOME), in a stationary single cylinder, 4-S diesel engine and compare it with mineral diesel. Straight vegetable

# Performance Test on Diesel engine by Pre – Heating the inlet air using heat recovery from Exhaust gases

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**Abstract-** In Diesel engine the air is introduced at a temperature equal to surrounding area and after combustion the gases are released into atmosphere. The heat generated in the combustion process is partially converted into work, which is used to drive the vehicle. The efficiency of the engines is 20-30%. Efficiency of the engine can be increased by sending more quantities of air like super charging and turbo charging, the Pre - heating of the inlet gases (air) is also one of the main reason for the efficiency. Here the Pre – heating of the incoming air is done by using the exhaust gas temperature. The effect of preheated air on standard diesel fuel engine indicated a good result on emission control. Higher inlet air temperature causes lower ignition delay, which is responsible for lower NO<sub>x</sub> formation. Uniform or better combustion is occurred due to pre-heating of inlet air, which also causes lower engine noise. Easy vaporization and better mixing of air and fuel occur due to warm up of inlet air, which causes lower CO emission.

**Index Terms-** Pre heater, Exhaust gases heat recovery, Techniques for increasing the Efficiency of an engine.

## I. INTRODUCTION

Engines convert's chemical energy from fuel to thermal and then thermal energy is converted into Mechanical Energy. The lightweight petrol internal combustion engine, operating on a four-stroke Otto cycle, has been the most successful for light automobiles, while the more efficient Diesel engine is used for trucks and buses. However, in recent years, turbo Diesel engines have become increasingly popular, especially outside of the United States, even for quite small cars.

Continuance of the use of the internal combustion engine for automobiles is partly due to the improvement of engine control systems (onboard computers providing engine management processes, and electronically controlled fuel injection). Forced

air induction by turbo charging and supercharging have increased power outputs and engine efficiencies. Similar changes have been applied to smaller diesel engines giving them almost the same power characteristics as petrol engines. This is especially evident with the popularity of smaller diesel engine propelled cars in Europe. Larger diesel engines are still often used in trucks and heavy machinery, although they require special machining not available in most factories. Diesel engines produce lower hydrocarbon and CO<sub>2</sub> emissions, but greater particulate and NO<sub>x</sub> pollution, than gasoline engines. Diesel engines are also 40% more fuel efficient than comparable gasoline engines.

Generally, in Diesel engine air enters into the combustion chamber at atmospheric temperature. But if the temperature does not reach the flash point the ignition doesn't takes place. Generally, this problem can be seen in winters. By pre – heating the inlet air the air that enters into the chamber gives an effective combustion and engine starts faster.

Now – a – days in a practical diesel engine “glow plugs”, some kind of “heater plugs” are used in order to attain flash point of diesel and to start engine faster. This ‘glow plugs’ or other kind of heater plugs use the external energy source to heat the inlet air entering into the chamber. Exhaust gases carries all the remaining heat after the expansion stroke. The heat carried away is useless.

An air-preheater (APH) is a general term to describe any device designed to heat air before another process (for example, combustion in a boiler) with the primary objective of increasing the thermal efficiency of the process.

The object of the intake system is to deliver the proper amount of air and fuel accurately and equally to all cylinders at the proper time in the engine cycle. Flow into an engine is pulsed as the intake valves open and close, but can be generally modeled as