



**VEMU INSTITUTE OF TECHNOLOGY**  
**P.KOTHAKOTA, PUTHALAPATTU (M), CHITTOOR DIST - 517 112**

**3.2.1 Number of papers published per teacher in the Journals notified on UGC website during the year (2020-21)**

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**Consolidated Papers published per teacher in the Journals**

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<b>COMPUTER SCIENCE AND ENGINEERING</b>							
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2.	Vehicle License Plate Localization And Recognition System For Intelligent Transportation Applications	Dr. K Venkata Ramana	International Journal of Advanced Research in Engineering and Technology (IJARET)	0976-6499	Scopus	<a href="http://www.iaeme.com">http://www.iaeme.com</a>	11
3.	Automatic Motorcyclist Helmet Rule Violation Detection Using Tensor Flow & Keras In Opencv	Mrs. P Nirupama	International Journal of Advanced Research in Engineering and Technology	0976-6499	Scopus	<a href="http://www.iaeme.com">http://www.iaeme.com</a>	12
4.	Cloud Security: Data Security and Privacy Protection for Cloud Storages	Dr. S Raj Anand Dr. K Venkata Ramana	Design Engineering (Toronto)	0011-9342	SCOPUS	<a href="http://www.thedesignengineering.com">www.thedesignengineering.com</a>	13
5.	Data Mining Methods to predict student performance Analysis Decision Making System in University Admission Management Systems	P. Murali Dr. K Venkata Ramana	Design Engineering (Toronto)	0011-9342	SCOPUS	<a href="http://www.thedesignengineering.com">www.thedesignengineering.com</a>	14

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23.	Design and Implementation of Flash ADC Using Precise Comparator	R.Sindhu	International Journal of Modern Electronics and Communication Engineering (IJMECE)	2321-2152	Others	<a href="http://ijmece.resindia.org/">http://ijmece.resindia.org/</a>	32
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25	IOT Based Plant Health Monitoring System using Arduino Microcontroller	Mr.P.H.Chandra Mouli	Journal of Emerging Technologies and Innovative Research (JETIR)	2349-5162	Others	<a href="https://www.jetir.org/view?paper=JETIR2010489">https://www.jetir.org/view?paper=JETIR2010489</a>	34
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27	Smart Medicine Time Indication Container Using IOT	Mrs.R.Rani	Journal of Emerging Technologies and Innovative Research (JETIR)	2349-5162	Others	<a href="https://www.jetir.org/index.html">https://www.jetir.org/index.html</a>	36
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41	Durability characteristics of fly ash /silica sand with full factorial design	Sarumathi, K., Elavenil, S., Satish Reddy, M.	Revista Romana de Materiale/ Romanian Journal of Materials	2457-502X	Science Citation Index Expanded	<a href="https://solacolu.chim.upb.ro/index.htm">https://solacolu.chim.upb.ro/index.htm</a>	53
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**Department wise consolidated papers published per teacher in the Journals**

**DEPARTMENT OF CIVIL ENGINEERING**

<b>Sl. No.</b>	<b>Title of Paper</b>	<b>Name of Author</b>	<b>Name of Journal</b>	<b>ISSN Number/ DOI</b>	<b>UGC care list/Scopus/ Web of Science/ Others</b>	<b>Link website of the Journal</b>	<b>Page No.</b>
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2.	Durability characteristics of fly ash /silica sand with full factorial design	Sarumathi, K., Elavenil, S., Satish Reddy, M.	Revista Romana de Materiale/ Romanian Journal of Materials	2457-502X	Science Citation Index Expanded	<a href="https://solacolu.chim.upb.ro/index.htm">https://solacolu.chim.upb.ro/index.htm</a>	11

  
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## TRAFFIC SIGNAL VIOLATION DETECTION USING ARTIFICIAL INTELLIGENCE AND DEEP LEARNING

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### ABSTRACT

*The number of new vehicles on the road is increasing rapidly, which in turn causes highly congested roads and serving as a reason to break traffic rules by violating them. This leads to a high number of road accidents. Traffic violation detection systems using computer vision are a very efficient tool to reduce traffic violations by tracking and penalizing. The proposed system was implemented using YOLOV3 object detection for traffic violation detections such as signal jump, vehicle speed, and the number of vehicles. Further, the system is optimized in terms of accuracy. Using the Region of interest and location of the vehicle in the duration of frames, determining signal jump. This implementation obtained an accuracy of 97.67% for vehicle count detection and an accuracy of 89.24% for speed violation detection.*

**Key words:** Convolutional neural network, speed violation, signal jump, traffic violation, YOLOV3

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<http://www.iaeme.com/IJARET/issues.asp?JType=IJARET&VType=12&ITType=2>

## VEHICLE LICENSE PLATE LOCALIZATION AND RECOGNITION SYSTEM FOR INTELLIGENT TRANSPORTATION APPLICATIONS

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### ABSTRACT

*Traffic surveillance systems play an important role in the improvement of traffic safety. Several traffic problems need to be controlled, due to the huge number of vehicles that increases daily, such as traffic accidents, the theft of vehicles and traffic violation. License Plate detection and recognition system (LPDRs) in natural scene images is one of the challenging systems in traffic surveillance. In this paper the LPDRs is the main goal. The proposed method follows two principal steps: hypothesis generation step and hypothesis verification step. In the first step, an adaptive threshold method is used to cope with the dynamic changes of illumination conditions during the binarization of the image. Therefore, the otsu's algorithm is applied which is an efficient and simple method. Followed by performing the Connected Component Analysis technique (CCAT) to detect the rectangles which are the generated license plate candidates. In the second step, the edge detection is applied inside the generated candidates then the close curves method is performed to ensure that the candidate is a license plate and to segment the character. Followed by performing the cross-correlation method between the segmented characters and the templates to define the license plate characters. The proposed method has a good performance in term of robustness where the experiment results show that our system achieves a good accuracy.*

**Key words:** License Plate detection and recognition system, hypothesis generation, hypothesis verification, otsu's algorithm, Connected Component Analysis technique

## AUTOMATIC MOTORCYCLIST HELMET RULE VIOLATION DETECTION USING TENSOR FLOW & KERAS IN OPENCV

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### ABSTRACT

*Motorcycle accidents have been hastily growing throughout the years in several countries because road safety is often neglected by riders worldwide leading to accidents and deaths. To address this issue, most countries have laws which mandate the use of helmets for two-wheeler riders so, it is very important for motorcyclists to understand the risks of riding without a helmet. Riders who do not wear helmets are at greatest risk of suffering a traumatic brain injury; if they met with an accident without protection, the head is susceptible to a harrowing impact in an accident. In India, there is a rule that mandate helmet only for riders but not even for passengers. Anyone may suffer from accident or head injuries whom are using motorcycle without helmet. It should be mandatory for everyone to wear helmet, even for children. So, to mandate this we have developed a system which is based on Tensor flow & Keras in the field of Computer Vision. System is able to detect whether motorcyclists wear helmet or not even at real time. If anyone of them is present with no helmet then system will precisely observed the situation and declare the rule violations. The system can be implemented in malls, offices, markets, school and college that only allows people to enter the premises only after detecting helmet with automated barrier. It will definitely affect the use of helmet that will save humans life at all.*

## Cloud Security: Data Security and Privacy Protection for Cloud Storages

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### ABSTRACT

The new development trends including the Internet of Things (IoT), smart cities, enterprise's digital transformation the world's digital economy is at the top of the tide. The continuous growth of data storage pressure drives the fast development of the entire storage market on account of huge data generated. By providing data storage and conduct, cloud storage system becomes an important part of the new period. Such a large amount of data can create great wealth. There are some studies on data security and privacy protection, there is still a lack of regular surveys on the subject in a cloud storage system. we first make an overview of cloud storage, including definition, classification, architecture, applications. Secondly, we give a detailed research of the requirements of data security and privacy protection in cloud storage systems. Thirdly, data encryption technologies and protection methods are summarized. Finally, we talk about open research topics of data security for cloud storage.

### INTRODUCTION

With the growth of the Internet of Things (IoT), the large amount of data sensing tools connected to the Internet is increasing to provide communication among people, devices, and "things". A new update by IDC [80] estimates that there will be 41.6 billion internet of things devices in 2025, producing 79.4 zettabytes (ZB) of data. Not only that, people are decided to improve the security of data collection of devices in IoT, see, [59], [79]. An unmatched amount of data is created and provided on the cloud service provider platform.

Cloud computing is a fast-growing technology that has established itself in the next generation of the IT industry and business. Cloud computing promises reliable software, hardware, and IaaS delivered over the Internet and remote data centres. Cloud services have become a powerful architecture to perform complex large-scale computing tasks and span a range of IT functions from storage and computation to database and application services. The need to store, process, and analyse large amounts of datasets has driven many organizations and individuals to adopt cloud computing. A large number of scientific applications for extensive experiments are currently deployed in the cloud and may continue to increase because of the lack of available computing facilities in local servers, reduced capital costs, and increasing volume of data

# Data Mining Methods to predict student performance Analysis Decision Making System in University Admission Management Systems

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## Abstract—

An admissions system based on valid and reliable admissions criteria is very important to select candidates likely to perform well academically at institutions of higher education. This study focuses on ways to support universities in admissions decision making using data mining techniques to predict applicants' academic performance at university. A data set of 2,039 students enrolled in a Computer Science and Information College of a Saudi public university from 2016 to 2019 was used to validate the proposed methodology. The results demonstrate that applicants' early university performance can be predicted before admission based on certain pre-admission criteria (high school grade average, Scholastic Achievement Admission Test score, and General Aptitude Test score). The results also show that Scholastic Achievement Admission Test score is the pre-admission criterion that most accurately predicts future student performance. Therefore, this score should be assigned more weight in admissions systems. We also found that the Artificial Neural Network technique has an accuracy rate above 79%, making it superior to other classification techniques considered (Decision Trees, Support Vector Machines, and Naive Bayes).

**Index Terms—** Decision Making System, Data Mining Techniques, pre-admission criterion, Decision Trees, Support Vector Machines, and Naive Bayes.

## I. INTRODUCTION

Today, all higher education institutions, especially computer and engineering colleges, face challenges in the admissions process. Each university should strive for an admissions system based on valid and reliable admissions criteria that select candidates likely to succeed in its programs. In addition, each university should use the best possible techniques for predicting applicants' future academic performance before admitting them. This would support university decision makers as they set efficient admissions criteria. However, most higher education institutions face challeng-

## Software quality prediction using different Machine Learning methods

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### Abstract—

Software quality estimation is an activity needed at various stages of software development. It may be used for planning the project's quality assurance practices and for benchmarking. In earlier previous studies, two methods (Multiple Criteria Linear Programming and Multiple Criteria Quadratic Programming) for estimating the quality of software had been used. Also, C5.0, SVM and Neural network were experimented with for quality estimation. These studies have relatively low accuracies. In this study, we aimed to improve estimation accuracy by using relevant features of a large dataset. We used a feature selection method and correlation matrix for reaching higher accuracies. In addition, we have experimented with recent methods shown to be successful for other prediction tasks. Machine learning algorithms such as XGBoost, Random Forest, Decision Tree, Logistic Regression and Naive Bayes are applied to the data to predict the software quality and reveal the relation between the quality and development attributes. The experimental results show that the quality level of software can be well estimated by machine learning algorithms.

**Index Terms** — Estimation, Machine Learning, Software Quality, Extreme Gradient Decent, Boosting.

### I. INTRODUCTION

Software applications may contain defects, originating from requirements analysis, specification and other activities conducted in the software development. Therefore, software quality estimation is an activity needed at various stages. It may be used for planning the project based quality assurance practices and for benchmarking. In addition, the number of defects per unit is considered one of the most important factors that indicate the quality of the software. The quality of a software product can be defined as the measure of performance of a system on which the software is implemented in terms of execution time, memory capacity utilized and probability of errors, etc. In addition to this, the amount of effort contributed by the software developer also represents a key factor while assessing the quality of a software product. The quality of a software product can be considered to be internal as well as external. The internal quality of a software can be assessed in course of development during software development life cycle (SDLC), whereas, the external quality can be measured during its implementation and can be assessed with respect to its level of functionality. The external quality also depends upon its

# FINGERPRINT AUTHENTICATION BASED SMART VEHICLE SECURITY SYSTEM

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**Abstract:** Vehicle theft has become the major problem in any country. This project focuses on preventing vehicle theft by incorporating some verification modules. This system uses GSM and GPS technologies which enables user to track the vehicle from any remote location. It includes biometrics, i.e. Fingerprint and RFID to verify the registered user. A person can start the vehicle, but only upon fingerprint and RFID authentication the person can put the vehicle into motion. On recognition of the fingerprint and RFID, ignition will be given to start the bike and bike will be getting into the motion. In case of wrong access owner will get message with location and owner can give access or stop the bike.

**Index Terms** – RFID, GSM, GPS, Vehicle, Finger Print Module.

## 1. INTRODUCTION

Automobile security is one of the growing concerns in India. Safeguarding of vehicle against theft is one of the major issues confronting developing countries. Various techniques have been tried and tested to protect and secure the automobiles. Embedded computing is an emerging technology widely used in improving and enhancing security against the theft of vehicles. The main aim of this project is to prevent the vehicle from probable theft. To achieve this we are incorporating security by including biometrics, i.e. a fingerprint and RFID. In the beginning the owner of the vehicle must store his/her own fingerprint in the fingerprint module. The RFID is also used for even more security and also convenient to access the vehicle in urgency. Smart phone is used to send and receive messages to and from the owner. The owner's mobile number has to be set fixed during the coding. For theft prevention, we can also trace the two-wheeler from the smart phone which is embedded on the system. Then real time tracking begins and the location of the vehicle is sent to the owner by SMS. In this proposed project we are using smart phone to find the present location. Then, either owner can give access if his authorized person or bike can be stopped by locking brakes if it is motion.

## 2. RELATED WORK

In [1] this paper, GSM and GPS technology are used. Two wheeler position is obtained by GPS module this data is given to microcontroller hardware which sends message to user mobile phone through GSM module.

In [2] this paper, system alerting owner by SMS to user whenever theft attempt, allowing user to control vehicle remotely by SMS also provide engine immobility

and alarm.

In [3] this paper, hardware is implemented to prevent theft from stealing vehicles and fuel of vehicle. About a theft attempt owner is alerted by SMS allowing user to control system remotely.

In [4] this paper, proposed design uses Global Positioning system (GPS) and Global system mobile communication (GSM) system constantly watches a moving vehicle through GPS and sends data when demanded. About a theft attempt, we have to send SMS to the microcontroller, then microcontroller issue the control signals to stop the engine motor. Then we have to treat the password and restart the vehicle.

## 3. METHODOLOGY

### A. Existing System

Like how many vehicle security systems incorporated in which almost security lacks.

1. Design and development of GPS-GSM based tracking system with Google map-based monitoring. In this system they have incorporated GSM & GPS using which the vehicle can be tracked after the theft occurrence. The major drawback in this system is the vehicle cannot be protected before theft.

2. Anti-theft system for vehicles using fingerprint sensor. In this system the probable vehicle theft can be prevented. To achieve this they have incorporated biometrics, i.e. a fingerprint. The major drawback in this system is, if the user wants to give his vehicle to his friend he cannot come and access the vehicle by using fingerprint every time.

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## Enhance Sensitivity Of Bangla Handwritten Digit Recognition Using Ten Layered D-CNN Model

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**Abstract:** This algorithm is hardly ever used in Knowledge of handwritten digits like bangla. This mission proposes a deep convolution neural network (D-CNN) primarily based Bangla hand written digits recognition. This D-CNN has seven layers. Mainly three convolution layers, three pooling layers and thoroughly related layer. Deep convolution neural network has these days received recognition due to the fact of its improved Performance over the typical computer learning algorithms. However, it has been very not often used on cognizance of bangla handwritten digit. The proposed method can decorate layers to ten or twelve layers via using deep CNN architecture for recognizing bangla hand written digits with excessive sensitivity/specificity.

### I. INTRODUCTION

The principle challenge in manually written character characterization is to manage the large assortment of handwriting styles by various essayists in various languages. A portion of the intricate penmanship contents contains various styles for composing words. In some different cases, they are cursive and some of the time the characters are associated with one another (e.g., English, Bangladeshi and Arabic). These difficulties are as of now perceived by numerous specialists in the field of Natural Language Processing (NLP). Handwritten character recognition is more difficult comparing to printed forms of characters. This is because characters written by different people are not identical and varies in different aspects such as size and shape. The similarities in different character shapes, the overlaps, and the interconnections of the NEIGHBORING characters further complicate the character recognition problem. Therefore, here in our project we are able to recognize hand written CHARACTERS OF DIFFERENT STYLES BY USING D-CNN METHOD. WE USED BANGLA LANGUAGE CHARACTERS AS EXAMPLE TO WORK WITH OUR METHODS.



FIG:2 DEEP CNN ARCHITECTURE



FIG 1.3 CONVOLUTION OPERATHIN



Fig 1.4 Average polling operation

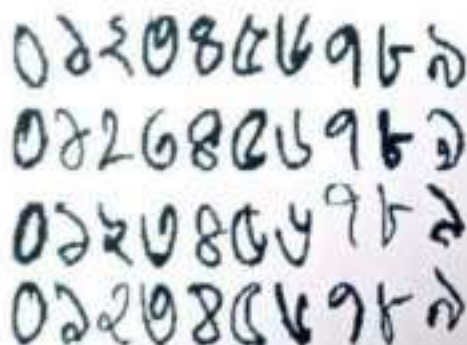


FIG1 : BANGLA LANGUAGE DIGITS USED AS REFERENCES

### II. LITERATURE REVIEW

C. Saha, R. H. Faisal, and M. M. Rahman: Optical Character Recognition (OCR) especially for handwritten characters is an important task for its numerous applications in daily life including data digitizing, robotics vision,



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## Design and Implementation of Image fusion using PCA algorithm using Xilinx System Generator

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**Abstract:** Image fusion is a data fusion technology which keeps images as main research contents. Magnetic Resonance Imaging (MRI) and Computer Tomography (CT) scan images are used to identify the tissues in various organs of the human body. In brain medical imaging, the brain structural information without functional data will be given by MRI scan. But, CT scan image includes the functional data with brain activity. To improve the low dose CT scan, Principal Component Analysis (PCA) algorithm is used in this paper which is implemented on FPGA. The Maximum Selection Rule (MSR) is used to select the high frequency component from the image.

**Keywords:** Application specific integrated chips, Field programmable gate array, Principle component analysis, Maximum selection rule

### I. INTRODUCTION

The term fusion means in general an approach to extraction of information acquired in several domains. The goal of image fusion (IF) is to integrate complementary multi sensor, multi temporal and/or multi view information into one new image containing information.

Image fusion is the process of combining relevant information from two or more images into a single image. Image fusion techniques are widely used in various applications such as remote sensing, medical imaging, military and astronomy. Image fusion is a process of combining two or more images to enhance the information content.

### II. LITERATURE SURVEY

S.K. Hussain, C.L. Reddy, and V.A. Kumar, "Implementation of Medical Image Fusion Using DWT Process on FPGA," Image fusion is a data fusion technology which keeps images as main research contents. It refers to the techniques that integrate multi-images of the same scene from multiple image sensor data or integrate multi images of the same scene at different times from one image sensor.

H.B. Kekre, V. Sarode, and E. Dhannawat, "Implementation and comparison of different transform techniques using kekre's wavelet transform for image fusion," Image fusion combines several images of same object or scene so that the final output image contains more information.

Favithra, and Dr S. Bhargavi, "Fusion of two images based on wavelet transform," In this paper we have presented a method for fusing two dimensional multi-resolution 2-D images using wavelet transform under the combine gradient and smoothness criterion.

### III. PRINCIPAL COMPONENT ANALYSIS

Principal Component Analysis is a quantitatively rigorous method for achieving simplification. Often, its operation can be thought of as revealing the internal structure of the data in a way which best explains the variance in the data. The method generates a new set of variables called Principal Components (PC). Each principal component is a linear combination of the original variables and all the PCs are orthogonal to each other, and as a whole form an orthogonal basis for the space of the data; thereby removing redundant information.

The multidimensional space is mapped into a space of fewer dimensions by transforming the original space using a linear transformation via a principal component analysis.

### IV. THE STEPS INVOLVED IN THE PCA TRANSFORM ARE

Calculate the covariance matrix or the correlation matrix of the data sets to be transformed. The covariance matrix is used in the case of the unstandardized PCA, while the standardized PCA uses the correlation matrix.

Calculate the Eigen values and the Calculate eigenvectors from the correlation / covariance matrix.

Principal Components of the given data set are the eigenvectors of the covariance matrix of the input.

### V. XILINX SYSTEM GENERATOR:

The name MATLAB stands for Matrix Laboratory. MATLAB was written originally to provide easy access to matrix software developed by the LINPACK (Linear system package) and EISPACK (Eigen system package) projects. MATLAB is a high-performance language for technical



## DESIGN OF POWER AND AREA EFFICIENT APPROXIMATE MULTIPLIERS

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### ABSTRACT

Energy consumption has become one of the most critical design challenges in integrated circuit design. Arithmetic computing circuits, in particular array-based arithmetic computing circuits such as adders, multipliers, squarers, have been widely used. In many cases, array-based arithmetic computing circuits consume a significant amount of energy in a chip design. Hence, reduction of energy consumption of array-based arithmetic computing circuits is an important design consideration. To this end, designing low-power arithmetic circuits by intelligently trading off processing precision for energy saving in error-resilient applications such as DSP, machine learning and neuromorphic circuits provides a promising solution to the energy dissipation challenge of such systems. To solve the chip's energy problem, especially for those applications with inherent error resilience, array-based approximate Multipliers circuits (AAMC) circuits that produce errors while having improved energy efficiency have been proposed. Specifically, a number of approximate adders, multipliers and squarers have been presented in the literature. However, the chief limitation of these designs is their un-optimized processing accuracy, which is largely due to the current lack of systemic guidance for array-based AAC circuit design pertaining to optimal tradeoffs between error, energy and area overhead.

### 1. INTRODUCTION

In recent years, a new research field was established to investigate how computer systems can be made more energy efficient, faster and less complex by relaxing the requirement that they are correct. This field, denoted as approximate computing, exploits the fact that many applications are error resilient and the errors in computing are thus either invisible or acceptable. The concept of approximation has intensively been studied, developed and applied not only in computer science, but also in mathematics and engineering disciplines. However, it has never been applied in the areas in which only accurate implementations have traditionally been accepted. Nowadays, the designers intentionally introduce errors into computation to satisfy the never-ending requirement for lowering of power consumption. As one of the most promising energy-efficient

computing paradigms that is able to cope with current challenges of computer engineering, approximate computing has gained a lot of research attention in the past few years. We can identify two main directions in approximate computing: energy-efficient computing with unreliable components and approximation of systems implemented on common platforms. In the first case, the problem is that the exact computation utilizing nanometer transistors provided by recent technology nodes is extremely expensive in terms of energy requirements and reliable behavior. An open question is how to effectively and reliably compute with a huge number of unreliable components. The second research direction is motivated by the fact that many applications (typically in the areas of multimedia, graphics, data mining and big data processing) are inherently error resilient. This resilience can be exploited in such a way that the error is exchanged for improvements in power consumption, throughput or implementation cost.

As the CMOS technology and VLSI design complexity scale, delivering desired functionalities while managing chip power consumption has become a first-class design challenge. To remedy this grand energy-efficiency challenge, approximate arithmetic circuits, in particular array-based approximate Multipliers circuits (AMC) circuits, have been introduced as a promising solution to applications with inherent error resilience including media processing, machine learning and neuromorphic systems. AMC may allow one to trade off accuracy for significant reduction of energy consumption for such error tolerant applications.

To this end, approximate multipliers and squarers have been a focus of a great deal of past and ongoing work. Two types of approximate multipliers exist: approximate AND-array multipliers, which utilize AND gates for partial product generation and approximate Booth multipliers, which use the modified Booth algorithm to reduce the number of partial products. For squarer units, a series of approximate squarer's have been proposed. While a diverse set of array-based approximate arithmetic unit designs exist, what is currently lacking is systemic design guidance that allows one to optimally tradeoff between error, area and energy. While the area and energy of a given design can often be easily reasoned or estimated, getting insights on error and thereby providing a basis for optimally trading off



## DESIGN OF ADVANCED EMBEDDED REMOTE CONTROL ROBOT NAVIGATION SYSTEM USING RFID

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### ABSTRACT

In an autonomous navigation of smart card sensing robots, which is intended to guide the robot through the workspace to a predetermined target point instead of incomplete information without colliding with unknown obstacles. An autonomous navigation of smart card sensing robots, we have autonomous robot which carries a smart card reader, and we have different cards for which each card will hold a unique path which robot has to move. A smart card, chip card or ICs which can process information. In this project we are using a contact smart card where the information inside the card is communicated with the card reader by inserting a card into the card reader. When we show the smart card to the robot, it moves according to the predefined path set for that card number. This project is built on 8051 micro controller. This project is applicable in industries where the products need to be sent from one place to another place in a defined path. Here we are using a regulator 7805 which avoids noise spikes in power supply. Smart card is connected to micro controller through serial port.

### I. INTRODUCTION

In general, a smart card is an integrated circuit card with memory capable of making decisions. A smart card, chip card or integrated circuit card (ICC), is defined as any pocket-sized card with embedded integrated circuits which can process information. In this project, we are using a contact smart card where the information inside the card is communicated with the card reader by inserting card into the card reader. The card reader in this project used is an SR-99 SDK of 1KB memory size.

This project is built on 8051 micro controller. In this project we have autonomous robot which carries a smart card reader, and we have different cards for which each card will hold a unique path which the robot has to move. When we show the card to the robot, it moves according to the predefined path set for that card number. This project is applicable in industries where the products need to be sent from one place to another in a defined path. Smart card reader is interfaced to the micro controller using serial communication interface.

In this project 7805 is a regulator and it avoids noise spikes in power supply. Smart card modem is connected microcontroller through serial port. These smart card modem works under 9600 or 4800 baud rates. 16X2 LCD connected to microcontroller through digital I/O lines.

An embedded system can be defined as a computing device that does a specific focused job. Appliances such as the air-conditioner, VCD player, DVD player, printer, fax machine, mobile phone etc. are examples of embedded systems. Each of these appliances will have a processor and special hardware to meet the specific requirement of the application along with the embedded software that is executed by the processor for meeting that specific requirement. The embedded software is also called "firm ware". The desktop/laptop computer is a general purpose computer.

### II. EXISTING SYSTEM AND NEW APPROACH

Many people are always move towards new places due to business demands. Some people cannot know the navigation of the new place. Some times they have no route maps to define their way so they face many problems due to miscommunication in the new place. Therefore we propose to design an smartcard based autonomous navigation system which will enable use to remotely manage his/her navigation from anywhere, anytime. Requires an individual to manually attend to each of the devices independently from time to time. All such monitoring and control can be done without necessarily being by that smartcard.



Fig.1: Existing Autonomous Navigation of smart card sensing robot

*S. Munirathnam*

## Chip Design for Turbo Decoder Module for In-Vehicle System

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### ABSTRACT

The EU emergency Call (eCall) system is designed to be used as a vehicle emergency telematics system to reduce the fatality and save lives in vehicle accidents. In-Vehicle System (IVS) is a built-in modem to process the eCall functionality in vehicles. The IVS employs multiple modules for signal processing including cyclic redundancy check (CRC), Turbo Encoder, Hybrid automatic repeat-request (HARQ), BCH Decoder, Modulator and Demodulator. Designing of the IVS modem on a chip requires a lot of challenging and efforts. Field programmable gate array (FPGA) is the state-of-the-art and a modern solution to develop the very large scale integrated circuit (VLSI) of the IVS chip. This dissertation presents the chip design procedures for the eCall in-vehicle system (IVS) modules. The modules of the IVS transmitter modem are designed as a single chip. Also, a single chip is developed to process the IVS receiver modem. The eCall related works are summarized. The FPGA technology is utilized to develop the IVS modules. Xilinx ISE tool and Verilog HDL are used to develop the register transfer level (RTL) of the designed modules. The developed IVS transmitter and receiver are compiled, synthesized, and simulated. An FPGA device is employed as a hardware solution to implement the developed modems. The employed algorithms and hardware interfaces of the IVS modem are analyzed and discussed. A complete set of the input signals are used to simulate and verify the designed modules. The developed chips are tested and verified for different frequencies. Furthermore, the future works and research plans to develop the IVS modem on a single chip are proposed.

### 1. INTRODUCTION

Telematics systems are crucial for vehicle safety. There are expectations from car company observers that the electronic parts, including vehicular communication systems, in vehicle manufacturing will cost up to 40% of the total cost of car productions in the next few years. Future telecommunication technologies in vehicular safety systems provide a lot of advantages in vehicular industry, including road safety and traffic control. The traffic accidents are leading causes of human fatalities around the world. In 2014, the European Commission (EC) revealed that 25,900 people died in car accidents. Also, the U.S. National Highway

Traffic Safety Administration has recorded 32,675 fatalities due to the road accidents in 2014. The car accidents have also resulted in losing billions of dollars each year. Therefore, the transportation agencies have been concerned to decrease the human life loss in road incidents. To reduce the fatality of car incidents, the European Commission has agreed to develop a built-in emergency call (eCall) system in vehicles that are used in European Union (EU) countries. Responding to car accidents in the first moments from the emergency centers to rescue the involved people can reduce the life loss by 15% and the disability probability by 12%. The EU eCall system has a vital role in shortening the arriving time before the emergency treatment in traffic accidents. The system activates a voice call and data channel between an emergency center and the car involved in an accident in up to 4 seconds.

The activation can be done manually through a specified button or automatically through the installed sensors in the vehicle. There are three crucial parts in the EU eCall system, including the In-Vehicle System (IVS) to be installed in every vehicle, Public Safety Answering Point (PSAP), and the GSM cellular communication system. The IVS collects data about the accident and the vehicle to build the Minimum Set of Data (MSD). It also uses a cellular module to activate a voice call with the PSAP. There will be multiple stations of the PSAP around EU countries. The most appropriate PSAP will be chosen by the IVS according to its location and facilities. The mobile carriers should provide a dedicated emergency channel for the eCall system. Therefore, the system can use the channel anytime. The IVS employs multiple sophisticated modules to process the MSD data. The MSD data is read via CAN communication in the vehicle. The IVS transmitter uses a cyclic redundancy check (CRC) algorithm and a scrambler system. Then it encodes MSD data by a Turbo encoder module. The transmitter employs a modulator to modulate the encoded MSD in a Bipolar Pulse Position Modulation (BPPM) system. The IVS transmitter needs the interface solution to read the MSD data from the vehicle and to transmit the modulated data via a GSM module. Developing all the modules of the IVS on a single module is challenging and needs a lot of effort to be optimized as a System-On-Chip transmitter. As soon as the IVS activates the eCall uplink channel, it monitors the downlink channel to receive the feedback messages for the PSAP. The PSAP



## VLSI design of low cost and high precision floating point reconfigurable FFT processors another design of low cost reconfigurable FFT processors

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### ABSTRACT

For scientific computing and high-resolution imaging applications, this paper presents a pipelined reconfigurable processor to implement variable-length single-precision floating-point FFT/IFFT and DCT/IDCT computations compatible with the IEEE 754 standard. In order to minimize the total hardware overhead and power consumption, a reconfigurable radix-4 butterfly (RR4BF) is proposed to reduce 75% adders in comparison to the conventional parallel radix-4 butterfly, and the partially shaded Ping-Pong structured register bank (PSPRB) provides an efficient and specific intermediate data caching mechanism to realize the maximized adder resource utilization ratio in RR4BF and to guarantee the high throughput for the pipelined design. Moreover, fused floating-point 4-input adder and fused floating-point 2-term dot product unit are proposed, which can not only improve about 3 dB signal-to-quantization-noise ratio (SQNR), but also save 28% and 19% hardware overhead compared with discrete implementations and previous state-of-the-art design, respectively. Simulation results show that the latency for FFT computations is about 23% of the R4SDF design without any throughput loss, and over 139 dB SQNR is achieved. Logic synthesis results in a 65 nm CMOS technology show that the power consumption ranges from 43.5 mW to 572.3 mW for 18- to 1024-point FFTs at 300 MHz, and the total hardware overhead is equivalent to 543k NAND2 gates.

### 1. INTRODUCTION

It is possible to build a dedicated circuit for a specific Coating point using application specific integrated circuit (ASIC) technology, which offers the potential to achieve the highest performance with the least power consumption and area. However, the associated fabrication cost and design time preclude their use in low to medium volume applications, and ASIC designs are not flexible since the circuits can-not be changed once they are fabricated. Another way of implementing Coating point is to use field programmable gate array (FPGA) technology. An FPGA contains an array of logic gates and storage elements, in which the

functionality and interconnection can be configured by downloading a bit stream into its configuration memory. The proposed architectures capture the common pattern appearing in Coating point data paths such as bus-based logic and routing. In addition, we adopt synthesizable design flow allowing user customization. We propose an FPGA device which consists of island-style fine grained fabric for general purpose computations and data path style coarse grained fabric for Coating point computations. The coarse-grained fabric contains dedicated circuitries for Coating point operation and is customizable according to domain specific requirements. A high level design flow is proposed which can translate a high level description of an application into a reconfigurable implementation. The key component in the high level design flow is a technology map per which can map a given data flow graph of an application into reconfigurable devices with different architectural parameters.

### II. BACKGROUND

The need for new generation of digital processor identified as floating point fast Fourier transform (FFT) that is capable of handling new requirement in signal processing has mobilized the world of high performance digital signal processing (DSP). The FFT processor (Cooley & Tukey 1965) is the heart of signal processing which is widely used in multi-media applications (Hever et al. 1990, Jeong & Choon 1995), telecommunication systems (Lu et al. 1995, Nen & Prasad 2000, Zhiqiang & Nassar 2005) and DSP processor. In the field of DSP processor, there are specific applications such as fast finite impulse response (FIR) filtering (Eniscetis et al. 1997), spectral analysis, synthesis and correlation (Jont et al. 1977). Among DSP processors, FFT algorithm is most practical processor. High performance FFT is required in this particular study due its efficient algorithm. The current prevalent practice, there is the digital hardware with finite word-length to present and analyze DSP system. Realistic FFT implementation requires special attentions due to potential quantization and arithmetic errors as well as the possibility of overflow and round off. These effects must constantly be taken into consideration in DSP system design and the implementation for sensibly applications. A FFT Processor's data format determines its ability to handle signals of different



## DESIGN AND IMPLEMENTATION OF LOW POWER AUTOMATIC TEST GENERATION FOR SCAN BASED SEQUENTIAL CIRCUITS

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### ABSTRACT

Because of the technological advancements in the semiconductor industry, we are now able to design ICs with as many as billion transistors while improving the performance and power. However, new challenges arrive with new technologies. The complexity increases with new technologies, and with shrinking size transistors access to internal nodes has reduced and it is now more difficult to diagnose and locate faults. The solution to this problem is designing a testable design so that they function reliably throughout their lifetime. Considering the time and money put in the development of an IC, it becomes very crucial to test it and get a maximum possible yield before handing it over to the customer. This is why around 40% of overall product cost consists of testing of chip. The field responsible for making design testable at an early stage is Design for Testability (DFT). This report explains DFT in detail; techniques involved in carrying out DFT process, like scan insertion, pattern generation and simulating those patterns on wetlists.

### 1. INTRODUCTION

Design for testability (DFT) in modern technologies is very important in VLSI industries. In this era of technology, industries focus more on the advancement of DFT technologies. It is getting very important to test a design with more accuracy before the fabrication starts. DFT has made its necessary place. The scale of electronics is more than a hundred million transistors per square millimeter. Hence, the manufacturing of these chips has become very complex and expensive. If there is any malfunctioning in the design it can cause a huge loss. So, testing is necessary at almost every level of the ASIC design flow. DFT will make sure that the design is going to work in every case. The rapid advancement in integration technologies enables us to fabricate millions of transistors in a single integrated chip (IC) or chip. Integration of millions of transistors on one chip is not an easy task. System of systems can be implemented on a single small chip. However, this leads us to bigger design problems and complexity. This leads to manufacturing defects and all the chips need to be physically tested by giving input signals from a pattern generator and comparing the output using a logic analyzer. This process is called testing. A

fault is an unexpected difference between implemented hardware and expected design. A representation of a defect at a functional level is known as a fault. Taking an example of two input NAND gate, considering that inputs of NAND gate are A and B and output is Z. If A is logic 1 and B is logic 0, then our expected output will be logic 1. But in case the gate is faulty, there is a probability that output comes out to be logic 0. This is not the intended output. Hence, there can be possibly two faults or less.

In scan insertion, scan chains are added to the design. These chains consist of flip-flops called scan cells. Input test patterns are injected serially through these chains and output data is also retrieved from these chains. There can be many chains in the design. These scan cells are slightly different from the traditional flip-flops. But if we are adding something to the design, this will cost us in increasing area of the chip. To avoid this, the flip-flops which are already used in the design are converted into scan cells and then connected to each other to make scan chains. This process of converting traditional flip-flops into scan chains is called Scan Insertion. There are many advantages of scan insertion over the BIST but also have some disadvantages. These advantages and disadvantages will be discussed in the next chapter. There will be other factors about scan based ATPG that will be discussed in the next chapters. For example, the difference between scan cells and traditional flip-flops, other test techniques, and their efficiency, etc.

### II. SCAN BASED ATPG

Scan-based automatic test pattern generation (ATPG) is a technique used for the testing of designs. The first step in this technique is to add scan cells into the design and connect them with combinational circuits. These scan cells are used to put logic values at the internal nodes and also to capture output values of the combinational logic of the design. These scan cells are also connected with each other and form a chain-like structure. The values captured by these cells are shifted out and compared with the expected values. The second step is to generate test patterns according to the scan chain connections with the combinational circuits. After generating patterns, they are simulated to check the reliability of the design. In this chapter, the working of scan chains



# IoT Based Garbage Monitoring System Using Arduino Microcontroller

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**Abstract:** The Internet of Things (IoT) shall be able to incorporate transparently and seamlessly a large number of different and heterogeneous and systems, while providing open access to selected subsets of data for the development of a plethora of digital services. One of the main concerns with our environment has been solid waste management which in addition to disturbing the balance of the environment also has adverse effects on the health of the society. The detection, monitoring and management of wastes is one of the primary problems of the present era. The traditional way of manually monitoring the wastes in waste bins is a complex, cumbersome process and utilizes more human effort, time and cost which is not compatible with the present day technologies in any way. This an advanced method in which waste management is automated. This project IoT Garbage monitoring system is a very innovative system which will help to keep the cities clean. This system monitors the garbage bins and informs about the level of garbage collected in the garbage bins via a web page. This web page also sends all information to garbage collection vehicles.

**Index Terms** – Arduino, IoT, IR Sensor, UV Sensor etc.

## 1. INTRODUCTION

Garbage Monitoring System:- Garbage may consist of the unwanted material left over from City, Public area, Society, College, home etc. This project is related to the "Smart City" and based on "Internet of Things" (IOT). So for smart lifestyle, cleanliness is needed, and cleanliness begins with Garbage Bin. This project will help to eradicate or minimize the garbage disposal problem. The Internet of Things (IoT) is a recent communication paradigm that envisions near future, in which the objects of everyday life will be equipped with Arduino, transceivers for digital communication, and suitable protocol stacks that will make them able to communicate with one another and with the users, becoming an integral part of the Internet.

This paper IOT Garbage Monitoring system is a very innovative system which will help to keep the cities clean. This system monitors the garbage bins and informs about the level of garbage collected in the garbage bins via a cloud server. For this the system uses ultrasonic sensors placed over the bins to detect the garbage level. The system makes use of Arduino family microcontroller, LCD screen, GPRS for sending data and a buzzer. The system is powered by a 12V transformer. The LCD screen is used to display the status of the level of garbage collected in the bins. Whereas a cloud server is built to show the status to the user monitoring it. The cloud server gives a graphical view of the garbage bins and highlights the garbage collected in color in order to show the level of garbage collected. The LCD screen shows the status of the garbage level. This system helps to keep the city clean

by informing about the garbage levels of the bins by providing graphical image of the bins via a cloud server.

## 2. LITERATURE SURVEY

1. Navghane S.S, Killedar M.S., Rohokale Dr.V.M, *IoT Based Smart Garbage and Waste Collection Bin, International Journal of Advanced Research in Electronics and Communication Engineering (IJARECE) 5(5) (2016).*

The employees of Municipal Corporation often shows irregularity in inspection of The employees of Municipal Corporation often shows irregularity in inspection of dustbins of different areas as it made them to do a lot of manual effort. Hence to reduce their manual effort technology of IOT based embedded devices is used to introduce the smart garbage collection systems is that majorly have two units one is master unit to undertake allocation of work to available truck drivers for respective area and slave unit that keep record of all the garbage collection in different areas. However the task of allocation of work and keeping records is done with the help of a device equipped with these dustbins. These devices generally consist of sensors like weight sensor for getting level of dustbin, Arduino UNO board for controlling device functioning, and Wi-Fi module so that status of dustbin can be updated on government's web server. Further advancement is done in the system where the GSM module is used in addition, to above proposed system to introduce a feature according to which the device will send the message to the respective truck drivers when dustbin is

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# FACTORY AUTOMATION AND SAFETY CONTROL SYSTEM USING IoT

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**Abstract:** The present paper investigates the possibility to control working and stepping of machines (comprising a factory, an irrigation process and so on) controlled by a website via the internet from any place in the world. The idea is to send commands from a website to a factory (irrigation process) computer program control via a shared database in IoT environment. The attempt has shown very successful results both in factory (ar productivity for converting a panel board control to a computer program control and in a model irrigation system control from a website via a shared database. In this paper propose the safety control system in factories using Internet of things (IoT). The use of IoT is that to monitor the status of machines in factory via internet from any place in the world. Today, Automation plays an important role in human life, Industrial Automation allows us to monitor and control industrial appliances like machines, motors, fans, lights and AC etc. It also provides security to the industries, Industrial Automation is not only meant for human efforts but also for energy efficiency and time saving. The main objective of industrial automation is to monitor and control all the industrial appliances and to alert the employees in critical situations. This paper put forwards the design of industrial Automation using Arduino mega processor with the help of Internet of Things (IoT). The industrial appliances are connected to the Arduino processor and the communication is done through internet. The status of the appliances can be viewed in a webpage. The cost of the system is very low.

**Index Terms** – Industrial Automation; Internet of Things; Arduino.

## 1. INTRODUCTION

Recently, human's work and life are increasingly tight with the rapid growth in the development of communications and information technology. The society has changed human being's way of life as well as challenged the traditional residence and also living standard keeps raising up day by day that people have a higher requirement for abode functions. Industrial automation is the use of control systems that handles different processes and machineries in an industry to replace a human efforts. The purpose of automation was to increase productivity and to reduce the cost associated with human operators. Nowadays, the focus of automation has shifted to increasing quality and flexibility in a manufacturing process. Industrial automation eliminates healthcare costs and paid leave and holidays associated with a human operator. Although it is associated with a high initial cost it saves the monthly wages of the workers which leads to substantial cost savings for the industry. The maintenance cost associated with machinery used for industrial automation is less because it does not often fail. If it fails, only computer and maintenance engineers are required to repair it. Industrial automation fulfills the aim of the industry to run a manufacturing plant for 24 hours in a day 7 days in a week and 365 days a year. This leads to a significant improvement in the productivity of the industry. Automation alleviates the error associated with a human being. It produces better outcomes because of less errors. Industrial automation can make the production line safe for the employees by deploying robots to handle hazardous conditions.

## 2. INTERNET OF THINGS TECHNOLOGY

Internet of Things Technology The Internet of Things (IoT) is the network of physical objects that enables these objects to collect and exchange data through internet. The Internet of Things allows objects to be sensed and controlled

remotely across existing network infrastructure, creating opportunities for more direct integration of the physical world into computer based systems, and resulting in improved efficiency, accuracy and economic benefit; when IoT is augmented with sensors and actuators, the technology becomes an instance of the more general class of cyber-physical systems, which also encompasses technologies such as smart grids, smart homes, intelligent transportation and smart cities. Each thing is uniquely identifiable through its embedded computing system but is able to interoperate within the existing Internet infrastructure.

## 3. METHODOLOGY

### A. Existing System

Currently there are no systems at cheaper prices. Various systems are very hard to install and difficult to maintain. The various existing systems are described below have some of the demerits.

1. Java-based automation system through World Wide Web integrated into a PC-based server at home:-In this system the drawback is PC should always on & connect to the server. The implementation cost is very high.
2. Home automation system by using Bluetooth:- This system drawback is limited range and limited no of devices to be connected. The power consumption Bluetooth enabled devices was high.
3. Home automation system by using Zig bee:-This system is implemented based on Bluetooth. It overcomes some of the drawbacks of Bluetooth system but it is also lack of range.
4. Home automation system using GSM:-After rapid growth of GSM networks this system is implemented.

# Design of Sense Amplifier using Flip-Flops for Memory Applications

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**Abstract:** A novel high-speed and highly reliable sense amplifier-based flip-flop with transition completion detection (SAFF-TCD) is proposed for low supply voltage (VDD) operation. The SAFF-TCD adopts the internally generated detection signal to indicate the completion of sense amplifier stage transition. The detection signal gates the pull-down path of the sense amplifier stage and the slave latch, thus overcoming the operational yield degradation, current contention, and glitches of previous SAFFs. The operational yield, speed, hold time, energy consumption, and area of the proposed and previous FFs are quantitatively compared for a wide range of VDD with 22-nm Fin FET technology. It is shown that the minimum VDD of the SAFF-TCD is 57% lower than that of previous SAFFs, which means the SAFF-TCD can operate even when VDD is in the near-threshold or sub-threshold region. At 0.3–0.4 V, the SAFF-TCD operates twice as fast as the master-slave-based FF (MSFF) with a practical hold time.

**Index Terms** – Flip-Flop (FF), low-voltage circuit design, sense amplifier (SA) etc.

## I. INTRODUCTION

Demand for an ultralow-power system on chip (SoC) continues to increase because of the growing interest in highly energy-constrained mobile SoC applications. In particular, for applications where performance is of secondary importance, one of the simplest and most efficient methods to improve energy consumption is to reduce the supply voltage (VDD) at the expense of speed loss. As part of this trend, digital circuit design techniques for sub-threshold or near-threshold voltage operation have received increased attention [1]. The flip-flop (FF) is a key element as most modern microprocessors operate under the synchronous pipeline structure. In low-VDD regions, to minimize speed degradation, it is preferable to use a fine-grained pipeline with fewer combinational logics between FFs [2]. This means that the relative portion of the power dissipation and clock cycle time of FFs is significant. Thus, the design of low-power FFs with small input (D) to output (Q) delay, tDQ, is essential. In addition, the effect of process variations on the driving strength of a transistor dramatically increases as VDD decreases, leading to a large variation in gate delay.

As a result, the setup time, tsetup, in master-slave-based edge triggered FFs [3]–[6], which is determined by the worst case variation, is significantly increased [7]. In the pulse-triggered FFs proposed in [8]–[11], this problem is resolved. Input D of the pulse-triggered FFs starts to be sampled by the latch right after the clock rising edge, which results in near-zero or negative tsetup. However, these FFs suffer from conflicting requirements for the width of the sampling window. A very small width cannot guarantee that the input data value properly propagates into the latch, whereas a large width increases the hold time, thold. This so-called sizing problem becomes more severe as variation effects increase in low-VDD regions, because the pulse width required to reliably propagate the input into the latch and thold are determined by the respective worst variation corners. There are also approaches to achieve low-VDD operation of FFs by utilizing 28-nm fully depleted silicon on insulator (FD-SOI) with back biasing [12], [13]. With the back biasing, circuit designers are allowed to control Fin

dynamically, which enables to widen the operating voltage range. Especially in [13], it is demonstrated that nonvolatile FF based on magnetic tunnel junction can be operated with near-Fin FD-SOI circuits with the use of multiple VDD values. The sense-amplifier-based FF (SAFF) [14], which is composed of a differential SA stage followed by a slave element of NAND-based reset-set (RS) latch, is relatively unencumbered by the aforementioned large tsetup and the sizing problem. For this reason, SAFF is regarded as an appropriate choice for low-VDD applications. However, this conventional SAFF suffers from two major problems in low-VDD environments. First, the NAND-based slave latch operates slowly, because the Q delay depends on the load on Q and vice versa. Second, the SA stage may latch the wrong data because of the reduced voltage headroom and transistor mismatch. In this paper, a novel SAFF with transition completion detection (SAFF-TCD) is proposed in order to resolve these limitations at low VDD.

## II. EXISTING METHOD

The proposed SAFF-TCD is designed to resolve the problems of previous SAFFs at low VDD by adopting the transition completion detection signal, TC. Fig. 3.1 shows the structure of the SAFF-TCD.

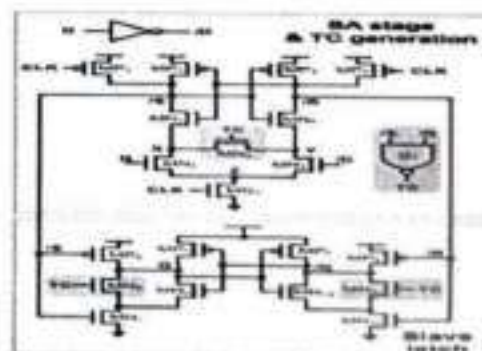


Fig.1. Structure of SAFF-TCD

*[Signature]*

# Performance Enhancement in Adiabatic Logics Using 16nm CMOS Technology

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**Abstract:** To achieve higher performance of the CMOS device circuit along with high densities, there have been reductions in supply voltages, device dimensions and transistor threshold voltages over the years. But, these reductions have also resulted in higher leakage currents that can severely affect power consumption in a circuit. Here in this paper we propose an Adiabatic logic circuits with clock gating causes performance enhancement in terms of area, delay or power. Higher switching of clock causes high power consumption, to reduce the area and power consumption we can have better logic circuits like Adiabatic logics where it results based on stored energy back to the supply. This proposed design will be implemented in Tanner EDA and the simulated results will be compared with conventional designs.

**Index Terms** – CMOS Devices, NAND Gate and ECRL Logic, Tanner EDA etc...

## 1. INTRODUCTION

To achieve higher performance of the CMOS device circuit along with high densities, there have been reductions in supply voltages, device dimensions and transistor threshold voltages over the years. But, these reductions have also resulted in higher leakage currents that can severely affect power consumption in a circuit. The power consumption of any CMOS VLSI circuit is composed of dynamic power and static power. The dynamic power dissipation is due to the switching activities of the circuit while the static power dissipation occurs due to the leakage components of the circuit during the standby mode. During submicron technology when the feature size was greater than 350nm, the leakage power dissipation was smaller than dynamic power by several orders of magnitude. With technology scaling there is a need of lowering of supply voltage and threshold voltage of VLSI circuits. However lowering of threshold voltage increases the static power dissipation. In ultra-deep submicron technology where the feature size is lesser than 100nm, static power dissipation has dominated the dynamic power. Thus there is need for reducing the static power dissipation in ultra-deep submicron technology. Domino Logic has proved to be a useful circuit in VLSI technology. Domino logic has various advantages like small area and high speed operation as compared to its static CMOS counterparts. It uses the best property of static and dynamic logic without suffering from the load capacitance sensitivity as in pure dynamic logic. Domino logic is a clocked logic family which means that there is a clock in every logic gate. The continuous switching of clock in domino logic design leads to the higher power dissipation. Many techniques have been proposed to lower the power dissipation in domino logic module like scaling the supply voltage or using low-swing clock but a little focus has been given to clock gating technique. A clock gating technique has been used in which uses clock enabler circuit. Power dissipation has become a critical design metric for an increasingly large number of VLSI circuits. The exploding market of portable electronic appliances fuels the demand for complex integrated systems that can be powered by light weight batteries with pes<sup>2</sup> for minimizing power consumption in large-scale digital integrated circuits. The power consumed by a circuit is defined as  $p(t) = i(t)$

$v(t)$ , where  $i(t)$  is the instantaneous current provided by the power supply, and  $v(t)$  is the instantaneous supply voltage. Power minimization targets maximum instantaneous power or average power. The latter impacts battery lifetime and heat dissipation system cost, the former constrains power grid and power supply circuits design. We will focus on average power in the remainder of the paper, even if maximum power is also a serious concern. A more detailed analysis of the various contributions to overall power consumption in CMOS circuits (the dominant VLSI technology) is provided in the following section. It is important to stress from the outset that power minimization is never the only objective in real-life designs. Performance is always a critical metric that cannot be neglected. Unfortunately, in most cases, power can be reduced at the price of some performance degradation. For this reason, several metrics for joint power performance have been proposed in the past. In many designs, the power-delay product (i.e., energy) is an acceptable metric.

## 2. EXISTING METHOD

A domino logic module consist of a pull down network (PDN), dynamically connected, followed by a static inverter as shown in figure 1. The non-inverting output of domino is represented by signal *out* while domino node is represented by *X*. The PDN is built exactly as that in complementary CMOS. The domino module works in two phases – precharge and evaluation, where the signal clock controls the mode of operation as shown below: 000

$$\text{clock} = \begin{cases} 0, & \text{precharge phase} \\ 1, & \text{evaluation phase} \end{cases}$$

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## Smart Vehicle for Road Safety

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**Abstract** – Nowadays, road safety is the most important in the driving aspects. Due to bad weather conditions, a road accident is rising day by day. During large weather conditions, the visibility on the road is not as much as that results in a serious accident in a moment. The technology has become a major essential part of our day to day life and it can be used to increase road safety. Using safety measurable technologies like an intelligent vehicle can facilitate to improve the safety driving and also reduce highway accidents. There is a necessity to design and develop an advanced monitoring system that will help the driver to monitor its operation using the specially designed hardware components and software. The safety monitoring system will be used to alert the car driver during heavy rainfall. This study proposes a driver assistance algorithm that it stops the vehicle and sends SMS to the near police station in a specified number and depends on weather conditions the vehicle wiper moves automatically. Based on the light intensity level the light will be ON and OFF automatically and also taking coverage is introduced.

**Keywords** – Microcontroller, System, I2C, GSM

### 1. INTRODUCTION

A high beam from the headlight causes a dangerous situation during night driving. It causes temporary blindness for the drivers that may lead to a collision or sometimes it may lead to an accident. Pedestrian crossing the road may get hurt. Almost 50% of accidents occurring due to headlight glare. This project helps to automatically control the headlight glare in rainy vehicles. Light Dependent Resistor (LDR) is resistance varies according to the intensity of light falling on it. The microcontroller used here is ARDUINO UNO. The microcontroller controls the high beam lighting on a. When a high beam falls on the surface of LDR, the information passes to the microcontroller. The microcontroller takes the intensity of incoming light with the desired intensity value. When the intensity value is increased beyond the desired intensity value, it reduces the intensity of light and provides great relief for the driver from the irritating situation that occurs during the night driving. Along with this wiper control is also a major issue in rainy seasons.

All four wheeled vehicles are equipped with the wipers. These wipers are used to wipe the water on the windshield during rainy seasons. When the wipers were first implemented in the vehicles, the wipers used to oscillate at a single speed. This caused a distraction to the driver's visibility. This led to the invention of different speed wipers. This increases the visibility of the driver. But the wiper activation has to be controlled by the driver himself. To provide maximum free driving, automatic wipers were introduced. For the working of the automatic wipers, the

setting of rain intensity must be provided. This can be done by using a raindrop sensor. The major issue for the cause of accidents is the consumption of alcohol. We use the MQ3 sensor to detect the alcohol intensity of the driver if he drinks. By the intensity of alcohol, we can send a message to the nearest police station. As well as the vehicle won't run as if it senses the intensity.

### II. LITERATURE SURVEY

The vehicle headlight during nighttime travel plays a major responsibility. There may be an irritating situation owing to the headlight lamp from the opposite vehicle. Sometimes it may cause discomfort loss of sight that leads to collisions or accidents. So the driver manually adjusts the headlight focus but it is difficult. To prevent road accidents due to headlight glare, Lakshmi K et al.(2019) proposed an automatic vehicle headlight management system using microcontroller. In this method, the headlight beam is automatically reduced in the vehicle according to the light intensity from the opposite motor vehicle. Here, the high beam is detected from the opposite vehicle by using LDR. He invented an automatic headlight beam controller in the motor vehicle. It will sense the value of light intensity from the opposite vehicle and automatically change the high-beam into low-beam and it will reduce the glare-effect. Similarly, he developed a graphene-coated Light Emitting Diode (LED) based automatic smart lighting system using ARDUINO microcontroller for better performance.

Hegghstad E et al.(2018) proposed a Controller Area Network (CAN) based Automatic Fog Light and Wiper Controller for motor vehicle safety. For better performance in motor vehicle, we need good communication. The vehicle has an electrical arrangement which consists of different electronic control units (ECU) for different control functions. To provide road safety, a more comfortable journey, pollution control, and reduction of fuel consumption are the requirements in the motor vehicle. However conventional systems can accomplish the same needs of vehicle automation, they cannot reduce electrical wiring complexity. For this reason, different types of automotive communication bus protocols such as Local Interconnected Network (LIN), CAN, and FlexRay is introduced in vehicle automation. Among that CAN is mostly preferred. Also, his system consists of a Rain detector module, LDR for automatic Fog light ON-OFF, wiper movement, and direction change of front light using different velocity inputs.



## Rapid Multiplier Architecture for Area and Power Optimization

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### ABSTRACT

The interest in unique devices has increased with the special development of low power, digital signal processing (DSP) systems used in mobile computers and portable multimedia applications. Multipliers play a major role including its DSP program. Operator duplication is often used not only on DSP chips but also on many public key cryptosystems such as Elliptic Curve Cryptography (ECC) and RSA. The proposed 4-bit Vedic multiplier's performance is analysed in terms of average power dissipation, delay, and also scaling effect of supply voltage.

**Keywords:** Public-key cryptosystems, Elliptic Curve Cryptography (ECC) and RSA.

### I. INTRODUCTION

The multiplier plays an important role in electronic systems where repetition can be used in Digital Signal Processing applications such as convolution and fft. There is therefore a need for high speed and dynamic dynamics on a daily basis.

In the current case there are various types of repetition available such as Array Multiplier, Wallace Tree Multiplier, Double Repeat, but retrieval of members similar to the Wallace tree multiplier will simply increase the positive numbers, so that overcoming this duplicate of booth is built but duplicate booth applies to smaller designs.

The Vedic extension has been introduced to resolve the redundancy, Vedic repetition will increase both positive as well as negative numbers. The strength and delay of multiplication are increased and

decreased respectively using Gate Diffusion Input (GDI) techniques.

Shri Bharati Krishna Tirtha Maharaja introduced the calculation of Vedic figures from the Vedas known as the Indian Sanskrit during the period 1911-1918. Vedic Mathematics relies on 16 sutras, numerical operations, arithmetic and dynamic arithmetic. The most widely used sutra is Urdhva Tiryagbhyam which provides a successful restoration. Decreased power consumption in integrated circuits has used a variety of methods. The GDI cycle has been used to reduce energy consumption and acceleration [2]. Standard CMOS circuit and GDI Mux based circuit breaker circuit and related investigations. In 2 X 2 Repetition of Vedas AND door and expansion of large parts are outstanding.



## A New Approximate Adder with Block-based Carry Speculation for High-Speed Applications

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### ABSTRACT

In any digital signal processing operation adders play an important role. Here, a high speed adder based on block-based carry speculation is proposed. Its structure is dependent on the separation of the additive from other summer blocks that are not integrated into their properties which can be selected from various additives such as broadcast carriers or parallel prefix adders. Here, the acquisition output for each block is considered based on the installation of the block itself and that of the next block. The block extension used in this case is a modified flexible extension with less space and delay compared to the Parallel Supplement connector circuit. In this case, we recommend high performance but low power / power based block-carry that carries a limited design structure called BC5A Adder. To minimize the risk, we suggest a way to predict the exit of a block based on its features and on the next block.

**Keywords:** Parallel Prefix Adder, BC5A Adder, Power/energy Consumption.

### I. INTRODUCTION

The basic operators of approximate adders in performing arithmetic operations are deliberated in this paper. Approximate/estimated adders have been acquired numerous consideration by the designers. In the cutting edge estimated adders, where a large portion of them depend on the convey spread structures, the vitality and speed gains have been accomplished by equipment controlling, rationale improvement, and voltage over scaling. Although a portion of the adders depended on a configurable precision, others had a fixed accuracy level. The precision configurability forced a few overheads regarding postponement, region, and force which could restrict their utilization in certain applications where such re-configurability isn't required.

In this paper, a high-performance but low-power structure is proposed that produces a standardized structure called the BC5A adder. In this setting, the adder is divided into several non-interlocking blocks, which, in the worst case, exit the block depends on the exit of the previous block. To further reduce the critical approach, we propose a way to predict block release on the basis of its characteristics and the next block. The structure has low hardware weight, which leads to low latency (on average, about one block) and very high quality. In order to achieve lower accuracy losses, a debugging and retrieval system is recommended, which significantly reduces operating error rate. The efficiency of this additive is compared to that of other bees. Finally, the efficiency of the adder is analysed.

# Implementation of Green House Monitoring using Arduino Micro Controller

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**Abstract:** The world climate change has brought about unpredictable weather conditions that have resulted in the global food shortage being experienced. A possible solution to this problem will likely involve households growing a reasonable percentage of the vegetables and crops they need in a greenhouse which does not require too much land space. A greenhouse will normally produce more crops per square meter when compared to open field cultivation since the microclimatic parameters that determine crop yield are continuously monitored and controlled to ensure that an optimum environment is created. The automated greenhouse control system achieves monitoring and control of a greenhouse environment by using sensors and actuators which are under the control of a microcontroller running a computer program. The system is composed of two stations: Remote monitoring station and the Actuators/Sensors Station. The controller used in the actuators/sensors station which ensures that the microclimatic parameters stay within pre-defined values as determined and set by the user is the Arduino prototyping platform. The proposed system is a remote sensing of agriculture parameters and control system to the greenhouse agriculture. The plan is to control CO<sub>2</sub>, soil moisture, temperature, and light, based on the soil moisture the controlling action is accomplished for the greenhouse windows/doors based on crops once a quarter complete round the year. The objective is to increase the yield and to provide organic farming. The result shows the remote control of CO<sub>2</sub>, soil moisture, temperature, and light for the green house.

**Index Terms:** IoT, Arduino MCU, Soil moisture, Light Sensor, Humidity Sensor, Servo Motor.

## 1. INTRODUCTION

Food shortage is one of the greatest problems confronting mankind in the 21st century. Global warming and other weather elements have claimed substantial land mass that was available for crops cultivation. In order to address the problem, greenhouse practice which has been in existence for a very long time is now modernized and deployed in many parts of the world. This technology is yet to be embraced by many developing countries. Developing plants has turned out to be innovative test in light of the fact that the field and strength of the plants are vital parameter now a day either for cash crops or food crops. One of the significant issues in the present agriculture is the less learning of the agricultural parameters, and less information about the developing innovations. In the past agricultural structure, our people of old avoid the use of a specific development for specific plant growth, they rather used regular marvel for all plants. There is continuous increase in demand for food production technology. Weather conditions are characterized by having predominantly long and hot summers and short and mild winters. Such climatic conditions put a great strain on the types of crops that could be successfully grown. This is very much true with most horticultural vegetables with medium thermal requirements (tomato, pepper, cucumber, watermelon, marrow, green bean, eggplant).

Agricultural means can satisfy the food production demand. But due to isotropic climatic conditions. This ultimately affects the plant growth. Also, there are many problems associated with it. To overcome from this problem, Pests and diseases, and extremes of heat, humidity, light and temperature, and irrigation is necessary to provide water. The farmers have been using different irrigation technique for increasing production. These techniques were done by human intervention. But due to this sometimes either the plants consume more water or the water reaches late up to the plants. The technological change in the

agriculture can develop plants under uncommon normal natural conditions, also this develops specific plants under specific conditions which in turn help to get more yield and less compost. Especially the advancement of precision agriculture is green house, for plant development has turned out to be prominent on account of less cost innovations for the agriculturists to increase yield. Greenhouses protect crops from too much heat or cold, shield plants from dust storms and help to keep out pests. Light and temperature control allows greenhouses to become suitable place for growing plants. The cultivation exhibition of plants under controlled conditions. Greenhouses also are often used for growing flowers, vegetables and fruits.

Modern greenhouse technology deploys automation in agriculture which is now common place due to the low costs of electronic components required for its implementation. A lot of efforts have been made by many researchers to automate the traditional greenhouse system.

This paper is organized in five sections. After this introduction, in Section II, motivation discussed of the paper, Section III about implementation of the project explained, as well as the novel feature of the proposed method. Finally, Sections IV and V provide the experimental results and the conclusions, respectively.

## 2. MOTIVATION

### A. Problem Statement

There is a need to provide suitable environment for the cultivation of plant in all seasons of the year. There are many disadvantages of the conventional systems such as, high effort and cost expended in the old system. Besides, plant productivity is not optimum. The conventional manual controlling of cultivation environments (greenhouse).

### B. Solution Statement

A climate control system is designed to provide a suitable environment for growing the plant by reading the temperature, humidity, lighting, CO<sub>2</sub> and the amount of

# Design and Implementation of Flash ADC Using Precise Comparator

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**Abstract:** A low-power comparator is presented. PMOS transistors are used as the input of the preamplifier of the comparator as well as the latch stage. Both stages are controlled by a special local clock generator. At the evaluation phase, the latch is activated with a delay to achieve enough pre-amplification gain and avoid excess power consumption. Meanwhile, small cross-coupled transistors increase the preamplifier gain and decrease the input common mode of the latch to strongly turn on the PMOS transistors (at the latch input) and reduce the delay. Unlike the conventional comparator, the proposed structure let us set the optimum delay for pre-amplification and avoid excess power consumption. The speed and the power benefits of the comparator were improved. A Flash ADC is designed using this proposed comparator. Flash ADC is the fastest among the entire analog to digital converters. The designed flash ADC can achieve high speed and low power consumption.

**Keywords:** ADC- Analog to Digital Converter, PMOS- P-type Metal Oxide Semiconductor, clk-clock

## I. INTRODUCTION

Nowadays, ADCs are being used in a huge range of applications such as communication systems, biomedical implants, and digitally assisted analog circuits. Needless to say, comparators are one of the most effective blocks of commonly used ADCs such as Flash, SAR, and Pipeline ADCs. Recently the need for low-power high-speed ADCs has increased dramatically and these are integral parts of a variety of applications such as handheld devices. Comparators are the key building blocks of different types of ADCs, such as SAR, pipeline, and flash ADCs. Several years ago, CMOS amplifiers were used as static comparators, although they suffer from very high power consumption (since they are always on) and inherent limited speed (since they have no positive feedback).

## II. LITERATURE SURVEY

Shilpi Singh-International Journal of Microelectronics Engineering(2015), ANOVEL CMOS DYNAMIC LATCH COMPARATOR FOR LOW POWER AND HIGH SPEED

The power problem is one of the most serious limitations in high performance VLSI's and battery backed-up systems. High speed and low power comparators are the essential building blocks of many analog circuits such as high speed analog-to-digital converters (ADCs), memory sense amplifiers and data receivers. In analog to-digital converters, the comparator plays a vital role on the overall performance of the converter. A fast and accurate comparator is a crucial element in any high resolution and high speed data converters. There are two main types of comparator based on their structure and operation: amplifier chain type and latch type.

Amplifier chain-type comparators use a set of cascade amplifiers to generate the output in response to small difference

between input signal and reference signal. On the other hand, latch type comparators provide higher speed and lower power consumption.

## III. EXISTING METHOD

The existing comparator uses a PMOS latch which is activated with a predetermined delay during the evaluation phase. This delay is supposed to be the optimum delay. At the reset phase, the clk, clkbl, and clkbl2 hold logic 1 to discharge the output voltages of both preamplifier and latch to GND. At the evaluation phase, first the clk and clkbl are toggled to logic 0 to start pre-amplification (charging the parasitic capacitors of O1+ and O1- nodes differentially). During this phase, the cross-coupled circuit increases the differential voltage ( $V_{id1} = [VO1+ - VO1-]$ ) slowly (since M4,5 are mostly in sub threshold region) and reduces the common mode voltage ( $V_{cm1} = 0.5 * [VO1+ + VO1-]$ ) to provide a strong drive for the input PMOS latch stage. Increasing  $V_{id1}$  (means larger preamplifier gain) further eliminates the effect of the latch on the input referred offset voltage. Also, larger  $V_{id1}$  results in a smaller latch delay. Decreasing  $V_{cm1}$  enhances the speed of the comparator, since PMOS transistors are used at the input of the latch.

Finally, clkbl2 is toggled to logic 0 to activate the latch. Simultaneously, clkbl is changed to logic 1 to turn off the current source of the preamplifier in order to avoid excess power consumption. Amplification of  $V_{id}$  is kept going during this phase because the cross-coupled circuit is still working independently of the current source (M8). Meanwhile,  $V_{cm1}$  is kept reducing by M3-5. The control signals are implemented





## A Novel Deep Learning Architecture for Image Hiding

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**Abstract:** Watermarking is a today's digital hiding technique within certain electronic content; for example, message, image, video, or audio recordings. Recent times, it was created as a modern copyright security tool. The pattern in zero watermarking technique isn't really inserted directly in the cover image, but has a logical relation with that cover image. In this article, we propose a powerful convolution neural Networks (CNN) and deep learning algorithm-based watermarking technique in which the CNN produces robust inherent selected features and is merged with the XOR activity of host's watermark sequence. The outcomes of our proposed method present the courage of the watermark counter to many typical image processing techniques.

**Keywords:** Convolutional Neural Network (CNN), Deep Learning, Robust Features, Watermarking.

### 1. Introduction

Image processing and the world wide web have made life simpler for digital images to be duplicated, changed, replicated and reproduced at minimal price and with virtually expected shipping without even any quality reduction. Communication system has been so rapidly evolving and growing that it challenges data security and privacy [1]. Data verification, copyright security and duplication security therefore they play a vital role in overcoming the requirements of identifying new threats to the preservation of digital data.

Digital watermarking is defined as the integrating of data or information through digital technology. Digital image watermarking is broken down as spatial and frequency domain watermarking based on encoding location [2]. Rather than directly altering image pixels, spatial domain techniques change image pixels of images and frequency domain techniques include manipulating transform coefficients.

A quick right-click and save helps anyone to download the asset/content while uploading or publishing the digital content to public servers or portals. Their absolute choice is how, when and when they use it afterwards. Companies that spend time and money for generating original content without adequate security risk their assets being exploited by others, potentially affecting market opportunities and revenue incomes [3]. Watermarks can discourage or absolutely prevent this theft of content.

In several applications, Digital Watermarks are potentially helpful. Some of them are: Broadcast Monitoring. Advertising agencies want to know that all of the air time they buy from broadcasters is earned by them. A mistake that is vulnerable and expensive is a non-technical approach in which

human interpretation is used to watch the broadcast and verify the originality by seeing or listening. Therefore, an auto-identification device should be in place that can store the broadcast identification codes. There are many methods, such as cryptography, that store the code number in the data frame, but it is unlikely that the data will survive any kind of changes, including format changes. Certainly, watermarking is a useful data control technique.

Ownership allegations, to justify his ownership, a legal owner may reclaim the watermark from digital content. With electronic copyright notices, there are restrictions, since they are easily removable [4]. It is not possible to copy the copyright notice written on a piece of paper along with the digital content. Copy protection and identity verification, these are used to avoid the creation of fraudulent copies of material by individuals. The transaction monitoring of the content is very similar to this issue. An owner may insert a watermark into digital content that identifies the copy buyer.

### 2. Related Works

In the article [1], author stated that Digital image authentication, as it is simple to corrupt with any image, is an extremely important consideration for the tech transformation. Several acceptable watermarking techniques have been developed to ease the problem, depending on the desired applications. However, achieving a watermarking method that is both stable and safe is difficult. This article describes descriptions of common device structures for watermarking and lists several basic specifications that are used for many different applications in the design of watermarking



# IoT Based Plant Health Monitoring System using Arduino Microcontroller

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*Abstract:* Plant health management is the science and practice of understanding and overcoming the succession of biotic and abiotic factors that limit plants from achieving their full genetic potential as crops, ornamentals, timber trees, or other uses. Plant monitoring is one of the most important tasks in any agriculture based environment. In this paper, we discuss about the implementation of a plant health monitoring system. This will check some environment parameters like temperature, humidity and light intensity that has effects on plants. In addition, retrieve the soil moisture. All this information is sent by Arduino Uno dev boards to the Ubidots IoT (Internet of Things) cloud platform.

*Index Terms* – Arduino Uno, Ubidots IoT cloud platform, Environmental factors, sensor, IoT, Wi-Fi.

## 1. INTRODUCTION

International Telecommunication Union defines IoT as “A global infrastructure for the Information Society, enabling advanced services by interconnecting (physical and virtual) things based on, existing and evolving, interoperable information and communication technologies.” IoT is also defined as “The network of physical objects – devices, vehicles, buildings and other items – embedded with electronics, software, sensors, and network connectivity that enables these objects to collect and exchange data. The IoT allows objects to be sensed and controlled remotely across existing network infrastructure.” At its very basic level, IoT refers to the connection of everyday objects to the Internet and to one another, with the goal being to provide users with smarter, more efficient experiences. Some recent examples of IoT products include the Nest Protect smoke detector, August door locks and Nest thermostat. One of the known examples is the Nest thermostat. This Wi-Fi connected thermostat allows you to remotely adjust the temperature via mobile device. The potential value is that we can save money on utility bill by being able to remotely turn off air condition, which we forget to do before leaving the house.

Certain important factors such as temperature, humidity, light and the level of carbon dioxide has an impact on the productivity of plant growth. Therefore, continuous monitoring of these environmental factors gives information to the user, how each factor affects growth and how to maximize the growth of plants. In recent years, precision agriculture has become the trend in agriculture. Here the focus is mainly on understanding the environment through

the interpretation of wide variety of data. The main idea of the system is to monitor the plants whether they get required amount of water and light. If there is enough moisture in the soil, the same will be reported to the user. This will help the user to give the resources to the plants every day without much manual effort and constantly monitor the health of a plant from a remote location. Improvement of agricultural field has become biggest challenge for countries like India, so new technologies are to be adopted. We have implemented a novel methodology of physical parameter monitoring, data integration to the cloud, alert generation and predicting the future values. We have used Temperature humidity sensor, Soil moisture sensor and Light intensity sensor. These sensors have been installed in the agriculture field to collect the data, and this data is stored into the cloud using Ubidots IoT cloud platform.

## 2. INTERNET OF THINGS TECHNOLOGY

Internet of Things Technology The Internet of Things (IoT) is the network of physical objects that enables these objects to collect and exchange data through internet. The Internet of Things allows objects to be sensed and controlled remotely across existing network infrastructure, creating opportunities for more direct integration of the physical world into computer based systems, and resulting in improved efficiency, accuracy and economic benefit; when IoT is augmented with sensors and actuators, the technology becomes an instance of the more general class of cyber-physical systems, which also encompasses technologies such as smart grids, smart homes, intelligent



# IoT Based HRV Monitoring System for Hypertensive Patients in Remote Areas

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**Abstract:** Remote Health Care Monitoring System (RHCMS) has drawn considerable attentions for the last decade. As the aging population is increasing and at the same time the health care cost is skyrocketing there has been a need to monitor a patient from a remote location. Moreover, many people of the World are out of the reach of existing healthcare systems. To solve these problems many research and commercial versions of RHCMS have been proposed and implemented till now. In these systems the performance was the main issue in order to accurately measure, record, and analyze patients' data. With the advent of wireless network RHCMS can be widely deployed to monitor the health condition of a patient inside and outside of the hospitals. In this work we present a Wi-Fi based wireless healthcare monitoring system that can provide real time information about the health condition of a patient. The proposed system is able to send data related to the healthcare professional about the patient's critical condition to Cloud. In addition the proposed system can send reports to monitoring system, which can be used by the healthcare professionals to make necessary medical advices at any time. The measurement of heart rate variability is a simple test that has been in existence for thousands of years due to the low-tech requirements for measurement. Heart Rate Variability (HRV) is determined by measuring the time gap between heart beats that varies as you breathe in and out. Heart rate (HR) is measured in terms of beats per minute. HRV monitoring is highly sensitive for highly risks linked with cardiovascular disease, Diabetic Mellitus disease and Hypertension patients. Measurement of HRV by using some parameters for such cases of high risk will be useful in providing adequate medical care at needed times. Our idea in the proposed system, HRV parameters are derived using Wireless Wi-Fi based pulse sensor and the care taker and doctor are intimated through Short Message Service in order to provide adequate medical help in case of emergency situations. At present there are no HRV monitoring systems that alarm the high risk hypertensive patients along with the aid of a remote doctor; the proposed system aims to achieve the same. The proposed system combines the dual benefits of Wi-Fi technology. This idea successfully fulfills all the ideal traits of a remote health monitoring system in terms of low-cost, long range, security, promptness and easy-to-use that serves in saving lives.

**Index Terms**—Microcontroller, pulse sensor, Wi-Fi etc.

## 1. INTRODUCTION

Recently, human's work and life are increasingly tight with the rapid growth in the development of communications and information technology. The society has changed human being's way of life as well as challenged the traditional residence and also living standard keeps raising up day by day that people have a higher requirement for abode functions. Industrial automation is the use of control systems that handles different processes and machineries in an industry to replace human efforts. The purpose of automation was to increase productivity and to reduce the cost associated with human operators. Nowadays, the focus of automation has shifted to increasing quality and flexibility in a manufacturing process. Industrial automation eliminates healthcare costs and paid leave and holidays associated with a human operator. Although it is associated with a high initial cost it saves the monthly wages of the workers which leads to substantial cost savings for the industry. The maintenance cost associated with machinery used for industrial automation is less because it does not often fail. If it fails, only computer and maintenance engineers are required to repair it. Industrial automation fulfills the aim of the industry to run a manufacturing plant for 24 hours in a day 7 days in a week and 365 days a year. This leads to a significant improvement in the productivity of the industry. Automation alleviates the error associated with a human being. It produces better outcomes because of less errors. Industrial automation can make the production line safe for the employees by deploying robots to handle hazardous conditions. With the rapidly growing need for timely medical services, the traditional method of treatment

at the clinic or hospital more often falls short in accomplishing success with respect to emergency cases. A method to sense life threatening risks prior to the actual happening sounds to be the need of the hour. IoT for healthcare offers to be a vital solution in adjoining such a serious issue. IoT, the inter-networking of various real world objects has become a popular phenomenon. With the rise in advent of sensors and actuators for use with various platforms, healthcare industry is being revolutionized by breaking the traditional methods. Hypertension has become common a serious disease that remains as the root cause for major Cardiac mortality and Stroke mortality. Hypertension is a condition where the blood pressure in the arteries of the body is higher than 120/80 mm Hg (more than 120 systolic and more than 80 diastolic). Risks health events like Stroke or Heart attack related to Hypertension does not happen all of a sudden; rather it is a continued risk factor that results in such life threatening events. HRV is an important parameter that uncovers even dilates intricacies regarding health condition. The study of HRV enhances our understanding of physiological phenomenon, the actions of medications and disease mechanisms [6]. HRV parameters acts to be a predictor for Cardiovascular disease risk [7]. Thus, the proposed system aims to remote monitor us well as alert in critical situation based on the HRV parameters and Heart rate for borderline Hypertensive patients. The proposed system that is based on IoT shares the results of sensor data in terms of graph and manipulated HRV data to a remote medical practitioner through a web application. This helps in following up the patient's condition without a



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# Smart Medicine Time Indication Container Using IoT

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**Abstract:** These people apparently need the kind of care which most busy family members cannot provide. Some people may forget to take the medicines at the correct time and can forget the medicines which they have to take. So in order to help them with this liability we have developed this project. The people are provided a smart med box on which there will be a display which notifies the people about the medicine. Along with this we can alert them with an alarm and light indications. So that even if the person is sleeping or busy with some work the alarm helps in alerting him. to confirm that the person has taken that medicine or not we can put one button at the opening end of the pill box, so when the person tries to open the box the button is pressed and the alarm will be off only if the buzzer is pressed. by this data we can tell that the person has taken the medicine. It comes with one more feature that when the person is feeling unwell or in case of some emergency he can notify the people by pressing the button on the device. There are different buttons, one is used to notify the doctor and the other one is used to notify family members about the emergency.

**Index Terms** – Arduino Uno, Pill box, Buzzer, Push Button, IoT etc.

## I. INTRODUCTION

Curately, worldwide aging and regularity of persistent diseases are flustering a broad concern. Numerous examples are undergoing hospital restructuring by reducing number of hospital beds and escalating home healthcare, which is essential to perk up health care quality, has facilitated wide-ranging attention. In order to track the physical status of the elderly and, in the meanwhile, to keep them healthy, the proposed idea will be helpful. IOT expands the internet into our everyday lives by wirelessly connecting various smart objects, and will bring significant turns in the way we live and interact with smart devices. The new wave in the era of computing will be outside the sphere of the conventional desktop. Internet of Things (IOT) is a network where many of the objects that surround us will be networked to one item or another. By using this technology the health statistics of medication are observed. In this process of prescription the schedule data or doctor's prescription are send to pill box through mobile app. The LEDs are placed for indication and buzzer for alarm alerts and rest home is used to count for medicine in cloud platform. The existing techniques to the market for the reminder include a pill box. But this does not help in checking the medicine. This proposed idea is valuable solution to the medical noncompliance problem. The innovation scheme to help patient keep trail of their

medicine consumption through a series LED alarm indicator signal and audio alarm indicator signals.

## II. INTERNET OF THINGS

The Internet of Things (IOT) is an important topic in technology industry, policy, and engineering circles and has become headline news in both the specialty press and the popular media. This technology is embodied in a wide spectrum of networked products, systems, and sensors, which take advantage of advancements in computing power, electronics miniaturization, and network interconnections to offer new capabilities not previously possible. An abundance of conferences, reports, and news articles discuss and debate the prospective impact of the "IOT revolution"—from new market opportunities and business models to concerns about security, privacy, and technical interoperability.

IOT systems like networked vehicles, intelligent traffic systems, and sensors embedded in roads and bridges move us closer to the idea of "smart cities", which help minimize congestion and energy consumption. IOT technology offers the possibility to transform agriculture, industry, and energy production and distribution by increasing the availability of information along the value chain of production using networked sensors. However, IOT raises many issues and challenges that need to be considered and addressed in order for potential benefits to be realized.





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## DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

S.No	Name of the Faculty	Title of paper	Name of the Journal	Volume-No /Issue No /Page-No	Citation Index/ISSN / ISBN	Year of publication
1	Dr D.Chandra Sekhar	A hybrid optimization based energy management between electrical vehicle and electricity distribution system	<b>ITEES</b> (International Transactions on Electrical Energy Systems)	2050-7038	2319-8885	2021
2	Dr A.Hemasekhar	Enhancing the performance of transmission system by optimal location of steady state model of UPFC based on Evolutionary Algorithms	<b>IJPEPS</b> (International Journal of Power Electronics and Power Systems)	2693-6690	2455-4847	2021

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## RESEARCH ARTICLE

# A hybrid optimization based energy management between electric vehicle and electricity distribution system

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**Summary**

In this manuscript, a hybrid technique is proposed for energy management system (EMS) between electric vehicle (EV) and distribution system. The proposed hybrid system is joined execution of Fertile Field algorithm (FFA) and Gradient Boost decision tree (GBDT) hence it is named as FFA-GBDT technique. The main purpose of the proposed system is minimizing the cost of system, the power loss of the system with optimal energy management of the system. Besides, during the proposed FFA-GBDT based energy management development, this article investigates the cooperative assessment of EMS operation with various consideration such as bidirectional energy trading capabilities of EV fleet arrival time in EVs' driving plan, the PV uncertainty impact on EMS operation depends, the setting dissimilar prioritization factors effect on selling energy back to grid as resources on entire cost of system. The implementation of the proposed model is done at MATLAB/Simulink and execution is assessed using existing methods. Consequently, the outcomes illustrate that the proposed technique is effective for finding the near global optimum solution with less computation and reduces the complexity of the proposed algorithm. Thus, the simulation outcome indicates that effectiveness of the proposed technique and performance of the proposed strategy is compared to existing techniques. The energy consumption of proposed and existing techniques is also analyzed. The energy consumption of the proposed technique is 720.34 KJ.

**KEYWORDS**

electric vehicle, energy management system, energy trading capabilities, photovoltaic uncertainty

## 1 | INTRODUCTION

Recently, electric vehicles (EVs) have become extremely rapid and drawn much concentration, contributing to the improvement of electric vehicle charging stations (EVCS).<sup>1,2</sup> Obviously, the EVCSs are imperative for the energy internet rise, which offer excellent platforms for the interaction of energy between power grids and EVs.<sup>3,4</sup> Moreover, the EVs charging demands of EVs influence the temporal and spatial distribution of electric charges. Hence, it is essential for conducting the efficient management of energy among EVCSs, power grid, and EVs. Indeed, many have investigators have coordinated energy management among power grids and EVs.<sup>5,6</sup> The distribution system (DS) performs an imperative function for EVs integration, and their corresponding energy management through EVs.<sup>7,8</sup> For example,

# Enhancing the Performance of Transmission System by Optimal Location of Steady State Model of UPFC Based on Evolutionary Algorithms

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**ABSTRACT:** To be effective in regulating power flow and bus voltage in electrical power systems, Flexible Alternating Current Transmission Systems (FACTS) devices have been proposed resulting in an increased transfer capability, low system losses and improved stability. For power flow control, Unified Power Flow Controller (UPFC) is one of the most convincing FACTS devices. The concept of a Unified Power Flow Controller (UPFC) to control the power flow through the transmission line is investigated in this paper. Voltage source model is adopted to study the functional behavior of UPFC in regulating the active cum reactive power and voltage profile. In Newton Raphson algorithm for load flow studies this model is incorporated. In this paper, for the selection of optimum location of UPFC and determination of UPFC's size - three Evolutionary Optimization algorithms are proposed namely, this paper comprises of Genetic Algorithm, Particle Swarm Optimization and Dragonfly algorithm. The proposed algorithms are validated for IEEE 30 bus test system for analyzing the solution methodology for the improvements in voltage profile and reducing power losses in order to present its adaptability in power systems of higher dimensionality.

## 1.INTRODUCTION

Controlling the power flow in the transmission lines is a prominent matter in planning and operating of power system since when the load increases, power utilities are also looking for ways to maximize the utilization of their existing transmission systems. It is also possible to control the phase angle, the voltage magnitude by using FACTS devices at chosen buses and/or line impedances of transmission system. Unified Power Flow Controller (UPFC) is a versatile FACT device which can independently or simultaneously control the active power, the reactive power, and the bus voltage to which it is connected. Following factors like the active power loss reduction, the stability margin improvement, the power transmission capacity can be considered important in the optimal installation and power blackout prevention.

In this paper, the placement of FACTS device in the power system networks was designated as problem and this optimal placement is formulated and resolved by the help of the proposed Evolutionary algorithm named "Dragon fly Algorithm". In the power system to determine the optimal location of Unified Power Flow Controller (UPFC), this Dragonfly Algorithm is applicable as to attain minimum transmission line losses and also to regulate the voltage profile. Using MATLAB, the proposed Algorithm results are compared for IEEE 30 bus system with the results of the Genetic Algorithm (GA) and also with the Particle Swarm Optimization (PSO) techniques.

Good number of fundamentals were got introduced by

many authors with regard to placement and sizing of UPFC. The equations in polar form in relation with real and reactive power flows are modelled by Hadi Saadat for 2 bus systems using Newton Raphson method supported by Jacobean matrix [1]. The instigation and improvement of FACTS devices from power electronics devices is enhanced by Hingorani N.G et.al. attained making use of UPFCs with the increased security, the good stability with the more responsive and capacity for transferring the power and mitigated operation and transmission investment costs can be achieved[2]. The numerous types of power electronic devices have been introduced. The main aim of these devices can be reduction of power system losses and increases the voltage profiles of the power system network which was proposed by L. Gyugyi [3]. With reference to [4]-[5] papers, the combination of either STATCOM or SSSC are regarded as the most general model of UPFCs. The UPFC is a latest power electronics device for analysis the performance of conduction line [6] - [7]. Ishit Shahi et al explains the theory of Power flow with UPFC controller for the purpose of improving the power transfer capability of the system and at the same time to maintain the system with stability and reliability [8]. C. R. Foerte-Esquivel et al well presented a set of analytical equations which are derived to present good UPFC [9]. M. Behshad et al explains about to recognize the suitable settings of the UPFC [10]. Samina Elyas Mubeen et al explains the functional performance of UPFC which is made out to power flow control over the transmission line [11]. presentation of



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## Department of Mechanical Engineering

### Publication in Journals Academic year 2020-21

S.No	Title of paper	Name of the author/s	Name of Journal	ISSN number	Is it listed in UGC Care list/Scopus/Web of Science/other, mention
1	A review on predicting the fabrication of aluminium metal matrix composites	M Venkatesulu	International Journal of Research In Aeronautical and Mechanical Engineering	2321-3051	Others
2	A review of composite materials: history, types, advantages, and applications over traditional materials	M Venkatesulu	International Journal of Research In Aeronautical and Mechanical Engineering	2321-3051	Others
3	Design and expansion of gear box for multipurpose milling machine	Pulluru Nagarajareddy , Ganta Suresh , M. Dorababu , Dr. Ganugapenta Ramesh	International Journal of Engineering Research & Technology	2278-0181.	Others
4	Design and analysis of automotive wet multi plate clutch	K. Sai Rohith , G.Suresh , Dr.G.Ramesh	International Journal of Engineering Research	2321-7758.	Others
5	Mechanism of surface generation in grinding AA6061-TiB <sub>2</sub> /ZrB <sub>2</sub> in-situ composite	A Mahamani S Jawahar	Journal of Computational and Applied Research in Mechanical Engineering	2251-6549	SCOPUS
6	High Temperature Tensile Behavior of A356-TiB <sub>2</sub> /TiC In-situ Composites	I Kakaravada A Mahamani	Iranian Journal of Materials Science and Engineering	1735-0808	SCOPUS
7	Study of Annona squamosa as alternative green power fuel in	Devaraj Rangabashiam & H. Suresh Babu Rao Ganesan Subbiah	Biomass Conversion and Biorefinery	2190-6823	Science Citation Index Expanded

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	diesel engine	Mohanavel Vinayagam			(SCIE) Impact factor 4.151
8	Production Process Optimization study on the synthesis of Manilkara zapota seed bio-oil and its characterization	P. Babu Aurtherson H. Suresh Babu Rao S. Ganesan N. Bhanu Teja Mohanavel Vinayagam Gautam Choubey	Biomass Conversion and Biorefinery	2190-6823	Science Citation Index Expanded (SCIE) Impact factor 4.151
9	Fabrication and Performance Analysis of a Vortex Tube Form by Brass	Dr G Ramesh , K Dinesh , G Pavan kalyan, K Manoj kumar , G Devendra , B Muneendra	International Journal of All Research Education and Scientific Methods	2455-6211	Others
10	Computational modeling and analysis of automobile disc brake	P.Chandana ,Dorababu , G.Ramesh	The International journal of analytical and experimental modal analysis	0886-9367	Others

  
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## A REVIEW ON PREDICTING THE FABRICATION OF ALUMINIUM METAL MATRIX COMPOSITES

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### ABSTRACT

Light and strong aluminium metal matrix composites are widely used in aerospace, automobiles, farm machinery and many other industrial applications due to their low density and mechanical properties, better corrosion resistance, wear resistance, low thermal coefficient of expansion, low density and high strength as compared between the conventional metals and alloys.

Particular, particulate reinforced metal matrix composites (MMCs) have recently found special applications because of their specific strength, specific stiffness at room or elevated temperatures. It is proved that the elastic properties of metal matrix composites are strongly influenced by micro structural parameters of the reinforcement such as shape, size, orientation, distribution and volume fraction.

In the current study deals that provide a literature review on the overall manufacturing techniques employed in the fabrication process.

**Keywords:** metal matrix composites (MMCS), Desirable properties, Aluminium alloys, Metals.

### INTRODUCTION

Current scenario, determining the possible to develop new structural materials with higher strength to weight ratios is one of the biggest challenges in the automotive and aerospace industry. Properties like high specific strength, stiffness, better wear resistance and improved elevated temperature properties compared to the conventional metals and alloys are the key reasons for the increasing attention towards Metal Matrix Composites. A variety of processing ways have been established for the production of reinforced composites. Stir casting is one of the most universally used approaches to manufacture particle reinforced composites.

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1

**A REVIEW OF COMPOSITE MATERIALS: HISTORY, TYPES, ADVANTAGES, AND APPLICATIONS OVER TRADITIONAL MATERIALS**

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**ABSTRACT**

Today composite materials have changed all the material engineering. The evolution of composite materials have given an opportunity to various designers to use new and better materials resulting in cost reduction, increase in efficiency and better utilization of available resources. Composite materials have played an important role throughout human history, from housing early civilizations to enabling future innovations. Composites offer many benefits such as the key among them are corrosion resistance, design flexibility, durability, light weigh, and strength. Composite have their own applications in daily lives such as products that are used in constructions, medical applications, oil and gas, transportation, sports, aerospace industries, automobile sector, manufacturing industries and many more. This paper presents the general review of composite material, overview of history of composite materials in conducted, demonstrate the advantages of the composites over the conventional materials, and also future demand of composite materials towards industrial environment.

**Keywords:** Composite materials, Automobile sectors, Aerospace industries, Manufacturing Industries.

**INTRODUCTION**

A composite can define as "Two inherently different materials that when combine together produce a material with properties that exceed the constituent materials". In other words Composite material can be defined as a combination of a matrix and a reinforcement, which when combined gives properties superior to the properties of the individual components. The reinforcement fibers can be cut, aligned, placed in different ways to affect the properties of the resulting composite. The matrix, normally a form of resin, keeps the reinforcement in the desired orientation. It protects the reinforcement from chemical and environmental attack, and it bonds the reinforcement so that applied loads can be effectively transferred. A typical composite material is a system of materials composing of two or more materials (mixed and bonded)

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# Design and Expansion of Gearbox for Multi-Purpose Milling Machine

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**Abstract:-** Now days Milling and drilling operations not uniquely did on single machine. To avoid this confusion of doing manufacturing operations a small difference in gear box design may give a single option solution to the manufacturers. A lever based shifter used as a differential to change gear systems to perform these two different operations on a single machine. On the proposed above operations torque generation will play an important role. From the survey taken before thesis base papers it is observed that low torque is good for milling and high torque is good for drilling. Gear box outline will be same for casing to avoid machine space and change in gear alignment by addition of a shifter to perform good results for drilling and milling.

Angle drilling is one of the major time taking processes in large scale production industries. To overcome such deviation special purpose radial drilling with milling attachments introducing in market. Present paper is a partial fulfillment to the present market needs to understand the variations in machine design accessories.

Gear design and gear ratios are theoretically calculated and the whole gear alignment performed in design software creo 3.0. Simulations and stress analysis and torque generation graphs have been generated by using ANSYS work bench 15.0. L18 Taguchi orthogonal array on torque generated and spindle RPM on these cases has been submitted.

Total design will be analyses by using finite element analysis in terms of torque applicable at each point with different speed ratios on different materials. Simulations on each material will be submitted with torque applications and performance comparison with before designs of general purpose machines. The alignment will be in two stages with torque increasing for drilling and torque decreasing for milling operation, alignment of gear box will be changes by using lever.

**Keywords:** gear alignments, speed reduction, design of reduction gear box, FEA.

## INTRODUCTION

A radial load, or overhung load (OHL) as it is also called, is a bending force imposed on a shaft due to the torque transmitted by belt drives, chain drives, or gears. Radial forces can also be created by belt or chain tension and by a misaligned shaft coupling.

The purpose of a gear reduction system is to convert input an speed and torque into a different output speed and torque. The design at hand requires the use of two gears whose diameters are specified at 24 and 12 inches each. These gears are attached to a shaft whose diameter is specified at two inches, and the bearings, keys, gears, speeds, safety factors, etc need to be determined from statics, strengths, fatigue, and various other design considerations.

Along with torque overloading and shock loading, excessive radial loading (overhang load) is one of the top reasons for gearboxes fail. It is also one of the least considered elements when integrating speed reducers with gear, belt, and sprocket drive systems for tools, rolling mills and transmitting machinery. Toothed gears are used to change the speed and power ratio as well as direction between an input and output shaft. Gears are the most common means of transmitting motion and power in the modern mechanical engineering world. They form vital elements of mechanisms in many machines such as automobiles, metal cutting machine.

## TYPES OF GEARS

There are many different types of gears used by industry, but all these gears share the same purpose, which is to transmit motion from one shaft to another. Generally, gearing consists of a pair of gears with axes are either perpendicular or parallel. Among all the gears in the world, the four most generally discussed gears are spur gear, helical gear, bevel gear, and worm gearing.

Spur gears considered as the simplest form of gearing, and they consist of teeth parallel to the axis of rotation. The common pressure angles used for spur gears are 14 1/2, 20, and 25 degrees. One of the advantages of a low pressure angle is smoother and quieter tooth action. In contrast, larger pressure angles have the advantages of better load carrying capacity.

Helical gears consist of teeth that are cut at an angle and inclined with the axis of rotation. Helical gears essentially have the same applications as spur gears. However, because of their gradual engagement of the teeth during meshing, helical

RESEARCH ARTICLE



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**DESIGN AND ANALYSIS OF AUTOMOTIVE WET MULTI PLATE CLUTCH**

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**ABSTRACT**

In this present paper, we design Wet clutch by Computational Modelling and 2-D drawing's are designed for multiplate clutch from computational calculations. 3D model model is created in the CATIA modeling software for duke bike. Structural Analysis is performed for multi plate clutch by finite element analysis (FEA) software package ANSYS. Materials used for liner is Cork, Copper Powder metal, SF001 composite Material. Comparison will perform between existing design and newly designed clutch profile to validate better design under the different load conditions while changing the gears with low cost and reduction in stresses. Finally modified designed multi plate clutch prototype is to be manufacture by rapid prototyping process.

Keywords: ANSYS, CATIA, Copper, Cork, SF00, SF-BU, Wet-Clutch plate, Vonmises stress, Vonmises strain, Total Deformation.

**I. INTRODUCTION**

It is an instrument for transmitting pivot, which can be locked in and withdrew. Grasps are valuable in gadgets that have two turning shafts. In these gadgets, one pole is commonly determined by an engine or pulley, and the other shaft. drives another gadget. Give us a chance to take an occurrence where one pole is driven by an engine and alternate drives a drill toss. The grip associate the two poles so they can either be bolted together and twist at the same rate (drew in), or be decoupled and turn at diverse paces

**A. Friction Clutches:**

The contact friction clutch is an imperative part of any car machine. It is a connection in the middle of motor and transmission framework which directs power, in type of torque, from motor to the apparatus gathering At the point when vehicle is begun from halt grasp is locked in to exchange torque to the transmission; and when vehicle is in

movement grip is initially separated of the drive to consider rigging determination and afterward again connected with easily to control the vehicle.

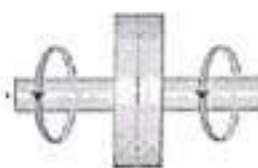


Fig.1.Engaged position of Wet-Clutch Plate

**II. MATERIAL SELECTION FOR MULTI-PLATE CLUTCH**

The materials utilized for the covering of grating surface of a grip called rubbing material f grinding coating materials, Qualities of the grating covering are as taking as follows:

1. It could have a high and uniform coefficient of grating under working conditions

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## Research Paper

## Mechanism of surface generation in grinding AA6061-TiB<sub>2</sub>/ZrB<sub>2</sub> in-situ composite

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**Abstract**

In-situ composites have gained the attention of worldwide researchers in the interest of their greater mechanical properties at the lower reinforcement ratio. Controlling the surface quality of components is a paramount task in the grinding process in order to withstand the creep and fatigue load at service conditions. The current effort is intended to examine the mechanism of surface generation in grinding AA6061-TiB<sub>2</sub>/ZrB<sub>2</sub> in-situ composite under different reinforcement ratios, grinding parameters, and wheel materials. The analysis of results indicates that the grinding of the unreinforced alloy is complicated than the composites. Diamond wheel yields superior performance by generating lesser surface roughness and subsurface hardness at all grinding conditions. Among the various grinding parameters, grinding speed and grinding depth are more sensitive than other parameters. This experimental investigation helps to control the surface roughness and subsurface at various grinding conditions.

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**1. Introduction**

Aluminum matrix composites have drawn the attention of many scientists due to their high strength-to-weight ratio, excellent elevated strength, better tribological properties, and corrosion fighting ability when compared to monolithic alloys [1-2]. The aerospace, automotive, space, and defense sectors are consistently seeking weight reduction and enforced to apply the aluminum matrix composites [3-4]. Aluminum matrix composites

manufactured by in-situ route encompass smaller size reinforcements, fine particles, homogeneously distributed reinforcements, uncontaminated matrix-reinforcement interface, improved interfacial strength, and thermodynamically stable in nature [5]. The above listed positive aspects make them attain extraordinary mechanical properties at room and elevated temperatures. TiB<sub>2</sub> and ZrB<sub>2</sub> ceramics possess numerous diverged properties, including high melting temperature, exceptional corrosion resistance, extreme thermal conductivity,

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High Temperature Tensile Behavior of A356-TiB<sub>2</sub>/TiC In-Situ CompositesI. Kakaravada<sup>1</sup>, A. Mahamani<sup>2\*</sup> and V. Pandurangadu<sup>1</sup>

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**Abstract:** In the present investigation, A356-TiB<sub>2</sub>/TiC composites with a various reinforcement ratios (0, 2.5, 5 and 7.5%) were synthesized through a K<sub>2</sub>TiF<sub>6</sub>-KBF<sub>4</sub>-Graphite (C) reaction system. Formation of TiB<sub>2</sub> and TiC particulates and their distribution are confirmed by various characterization techniques. The tensile properties such as ultimate strength, yield strength, young's modulus and percentage of elongation in addition to their failure behavior of were studied at ambient and high temperatures (100, 200 and 300°C). The increment in the volume fraction of the composite raised the hardness and the enhancement of hardness was reported up to 49% at 7.5% reinforced composite due to the strengthening effect. The density and porosity of fabricated composites were investigated. The rise in the volume fraction of reinforcement phase decreased the density and increased the porosity of composite samples. Further, the ultimate strength, yield strength, young's modulus declined with the rise in the temperature. Result analysis also illustrates that the 7.5% reinforced composite retained the ultimate strength up to 84.4% and the ductility was raised by 27% at 300°C. Yield strength and young's modulus were also retained 74.31% and 71.09% respectively at the similar material and experimental conditions. The fracture surface analysis of the composites showed that, the ductile nature of failure appearance microscopically with the formation of fine dimples and voids on fracture surface at elevated temperatures. Cleavage facets and tear crumples observation indicated the brittle kind of failure at the ambient temperature. Findings from the experimental study provide the tensile behavior of the composites at the regular working temperature of the automobile engine piston.

**Keywords:** A356-TiB<sub>2</sub>/TiC In-situ composites, Stir casting, Mechanical properties, Fractographic analysis.

## 1. INTRODUCTION

Utilization of aluminum metal matrix composites (AMMCs) has been growing due to their superior properties like strength to load ratio, greater specific stiffness, extreme wear resistance, lesser density, good thermal conductivity, supreme electrical conductivity and lower thermal expansion coefficient [1]. The aforesaid reason authenticates to make use of AMMCs at countless engineering applications in space, automotive and aerospace industries. [2-3]. The particulate reinforced composite exhibits extreme mechanical property, heat bearing ability and oxidation resistance as compared with as fiber or whisker reinforced composites [4]. Aluminum matrix composites are produced by ex-situ and in-situ techniques. In ex-situ technique, the composites are produced by mixing the reinforcement into a hot molten ma-

trix. Formation of aggravation of reinforcements in a particular region and poor adhesion between the reinforcement and matrix interface is notable limitations of the ex-situ composites which causes a decline in the load-bearing ability and mechanical properties [5]. The fabrication method for in-situ composite has numerous advantages such as smaller size particle formation with oxide-free and dirt free, thermodynamic stability and homogeneous dispersion of particle in the matrix. The aluminothermic reaction during fabrication facilitates the wetting between the matrix and reinforcement. The evenly distributed reinforcement particles in the matrix, in this technique, raises the mechanical and wear properties of composites [6]. TiB<sub>2</sub> and TiC ceramics have greater hardness, tremendous stiffness and are good toughening and the strengthening agent when adding with aluminum [7-8]. A356 alloy is unavoidable ma-



# Study of *Annona squamosa* as alternative green power fuel in diesel engine

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## Abstract

In this study, the nano biochar derived from sugarcane was added with custard seed biodiesel (CBD) at different concentrations of 25 and 50 ppm to assist the emission and performance pattern of a compression ignition engine. The study monitored harmful gases, namely, hydrocarbon (HC), carbon monoxide (CO), nitrogen oxide (NO), and smoke as emission parameters and investigated brake specific fuel consumption (BSFC) and brake thermal efficiency (BTE) as performance parameters are analyzed at diverse loads by altering the concentration the biochar with CBD and compared with diesel. Experimental results revealed that the biochar addition at 50 ppm to CBD reduced smoke emission by 1.9%, CO by 0.005%, and HC by 6 ppm at all top load conditions with 71 ppm higher NO. Further, biochar addition at 50 ppm to CBD enhances the brake thermal efficiency by 0.7% and lower brake specific fuel consumption by 0.4 kg/kWh.

**Keywords** Biodiesel · Diesel · Engine · Emissions · Performance

## Abbreviations

DI	Direct injection
CI	Compression ignition
BD	Biodiesel
CBO	Custard seed oil
CBD	Custard seed biodiesel
CBD25BC	25 ppm of nano biochar dispersed in CBD
CBD5BC	50 ppm of nano biochar dispersed in CBD
CO	Carbon monoxide
NO <sub>x</sub>	Oxides of nitrogen emission
HC	Unburned hydrocarbon
BSFC	Brake specific fuel consumption
BTE	Brake thermal efficiency

## 1 Introduction

Stringent emission standard and search for high-efficiency alternate fuel for the automotive diesel engine is becoming important of engine development. Among the alternative, the most widely investigated is biodiesel. Emission benefits have increased interest for biodiesel addition in diesel engines, due to its high oxygen content [1]. Biodiesel fuels are renewable, biodegradable, and non-toxic. Biodiesel reduces the engine exhaust emissions and develops sustainable development and protect the environment [2]. Biodiesels are obtained from numerous natural non-edible and edible feedstocks, and approximately greater than 150 crops in India are recognized as prospective feedstock for production of biodiesel [3]. To address the food-fuel conflict, the usage of non-edible feedstock sources for biodiesel production is advantageous on the front of cost-effectiveness and the cultivation of waste to wealth culture, thus promoting a circular economy. Hence, non-edible and waste oils obtained from the seeds of the grape, sapota, papaya, and custard fruits have gained considerable attention in India than other non-edible tree seed oil like neem, mahua, Pongamia, jatropha, and punnai [4]. The countless study concluded that the use of biodiesel in diesel engine has a few limits, namely, cold starting problems, high NO<sub>x</sub> emission, piston ring sticking, and slight reduction in fuel efficiency owing to its properties. Samir Naje et al. [5] had

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# Production Process Optimization study on the synthesis of *Manilkara zapota* seed bio-oil and its characterization

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## Abstract

In this study, *Manilkara zapota* seed oil was used for biodiesel production. The free fatty acid content of the oil was determined as 5.91 mg KOH/g and hence a two-step acid-base transesterification reaction was followed to convert *M. zapota* seed oil into biodiesel. The performance variables such as reaction temperature, alcohol to oil ratio, experimental duration, and catalyst weight were optimized using Taguchi orthogonal array. The study revealed a 40°C reaction temperature, 6:1 alcohol-to-oil ratio, 150 min experimental duration, and 1 wt.% NaOH catalyst that were optimal performance variables to obtain maximum conversion efficiency of 97.08%. Among the four performance variables, the alcohol-to-oil ratio was found to be the most effective variable with 84.36% of the contribution. The synthesized *Manilkara zapota* methyl ester (MZME) procured from seed oil with optimized performance variables matches with the standards of ASME D 6751.

**Keywords** *Manilkara zapota* seed oil · Transesterification · Optimization · Taguchi orthogonal array · Biodiesel

## Abbreviations

MZSO *Manilkara zapota* seed oil  
MZME *Manilkara zapota* methyl ester  
OA orthogonal array  
RBF round bottom flask  
A.V acid value

FFA free fatty acid  
DOE design of experiment  
ANOVA analysis of variance  
S/N ratio signal to noise ratio

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## 1 Introduction

The contribution of fossil fuels such as crude oil, coal and natural gas to the total world's energy consumption is more and exhaustive over the years. On the other end, continuous usage of these fossil fuels poses serious environmental issues like global warming and climate change which endangers man's existence in the future [1]. Combinations of these factors are driving mankind to search for alternative and sustainable fuels for internal combustion engines [2]. Biodiesel has received greater attention because of non-toxicity, renewability and biodegradability. Owing to its comparable physio-chemical properties with diesel, it can be the best alternative fuel for the diesel engine [3]. Moreover, diesel engines using biodiesel as fuel produces lower emissions of carbon monoxide, particulate matter and oxides of sulfur [4]. USA, Europe, Indonesia and Malaysia are major producers of edible oils and biodiesel is being produced in these countries using edible oils

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# Fabrication and Performance Analysis of a Vortex Tube Form by Brass

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## ABSTRACT

- Refrigeration plays an important role in developing countries, primarily for the preservation of food, medicine, and for air conditioning. Conventional refrigeration systems are using Freon as refrigerant. As they are main cause for deflecting Ozone layer extensive research is going on alternate refrigeration systems. The present work mainly focuses on design and fabricating the vortex tube By using Brass material After fabricating, the performance of the Vortex tube is evaluated by varying different diameters of orifice and inlet pressures. Cooling effect and Heating effect are selected as performance measures. The main objectives of the present work are described below:
- To determine the suitable orifice diameter for getting best Cooling effect and Heating effect.
  - To find out the suitable inlet pressure for obtaining best Cooling effect and Heating effect.
  - To validate the chosen BEST performance measures of COP
  - To select the best material for chosen performance measures.

**Keywords:** hot end, cold end, orifice nozzle, tangential hole.

## INTRODUCTION

The vortex tube, also known as the Ranque-Hilsch vortex tube (RHVT) is a device which generates separated flows of cold and hot gases from a single compressed gas source. The vortex tube was invented quite by accident in 1931 by George Ranque, a French physics student, while experimenting with a vortex-type pump that he had developed, and then he noticed warm air exhausting from one end, and cold air from the other.

Ranque soon forgot about his pump and started a small firm to exploit the commercial potential for this strange device that produced hot and cold air with no moving parts. However, it soon failed and the vortex tube slipped into obscurity until 1945 when Rudolph Hilsch, a German physicist, published a widely read scientific paper on the device.

Much earlier, the great nineteenth century physicist, James Clerk Maxwell postulated that since heat involves the movement of molecules, we might someday be able to get hot and cold air from the same device with the help of a "friendly little demon" who would sort out and separate the hot and cold molecules of air.

Thus, the vortex tube has been variously known as the "Ranque Vortex Tube", the "Hilsch Tube", the "Ranque-Hilsch Tube", and "Maxwell's Demon". By any name, it has in recent years gained acceptance as a simple, reliable and low cost answer to a wide variety of industrial spot cooling problems.

When high-pressure gas is tangentially injected into the vortex chamber via the inlet nozzle, a swirling flow is created inside the vortex chamber. In the vortex chamber, part of the gas exits via the cold exhaust directly, and another part called as free vortex swirls to the hot end, where it reverses by the control valve creating a forced vortex moving from the hot end to the cold end. Heat transfer takes place between the free end and the forced vortices there by producing two streams, one hot stream and the other is cold stream at its ends.

## LITERATURE REVIEW

*gupta u. x, joshi m. k. et al [1]* Since, there is no theory perfect enough to explain the phenomenon inside the vortex tube. An experimental study was conducted to carry out the thermodynamic analysis of the vortex tube. During the study the cold

## COMPUTATIONAL MODELING AND ANALYSIS OF AUTOMOBILE DISC BRAKE

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### ABSTRACT

The Brakes are significant part of the vehicle. Stopping mechanism includes Brake set between two cushions. Pressure driven brake causes these cushions to interact with the disc to hinder the revolution of huggle to stop the vehicle. Two types a brakes are available like solid type and vented, vented disk have fins to allow air to pass through. The project aimsto investigate and analyze the parts disk and pad with changing parameters like material and area of contact of pad with disk. A vented disk brake is designed and results are studied. The disc modeling is built in CATIA and Analysis is performed in RADIOSS software. Analysis is done using ANSYS software. Comparison is done in between Vented and Non Vented Disc Brake with varying materials such as Steel, Aluminum and Aluminium Metal Matrix Composites for better life by evaluating the Stresses and Strains and Deformation.

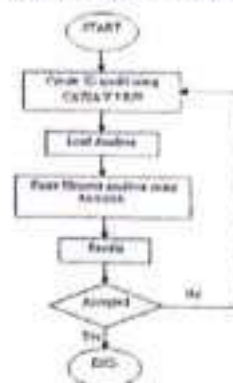
**Key words :** Non-vented Disk Brake, Hyper Mesh, RADIOSS, Structural analysis, Thermal analysis.

### INTRODUCTION

One of the most important control systems of an automobile is Brake system. They are required to stop the vehicle within the smallest possible distance and it is done by converting kinetic energy of the vehicle into heat energy by friction which is dissipated into atmosphere. The main requirements of brakes are: The brakes must be strong enough to stop the vehicle within the minimum possible distance in an emergency. But, this should also be consistent with safety. The driver must have a proper control over the vehicle during emergency braking and the vehicle must not skid. The brakes must have good antifade characteristics and their effectiveness should not decrease with constant prolonged application. A disc brake assembly consists of Disk rotor that rotates with the wheel, Calliper assembly attached to the steering knuckle, Friction materials (disk pads) that are mounted to the calliper assembly.

This work shows the heat generation and dissipation in a disk brake of an ordinary car during panic braking and the following release period. As the brakes slow the car, they transform its kinetic energy into thermal energy, resulting in intense heating of the brake disk. If the disks overheat, the brake pads stop working and, in a worst-case scenario, can melt.

### DESIGN METHODOLOGY



A disk brake consists of so many materials disk bolted to the wheel hub and a stationary housing called caliper. The caliper is connected to some stationary part of the vehicle like the axle casting or the stub axle as is cast in two parts each part containing a piston. In between each piston and the disc there is a friction pad held in position by retaining pins, spring plates etc. The passages are also connected to another one for bleeding. Each cylinder contains rubber-sealing ring between the cylinder and piston.

The main components of the disk brake are:

- > The Brake Pads
- > The Calliper which contains the piston
- > The Rotor which is mounted to the hub

When the brakes are applied, hydraulically actuated pistons move the friction pads in to contact with the rotating disk, applying equal and opposite forces on the disk. Due to the friction in between disk and pad surfaces, the kinetic energy of the rotating wheel is converted into heat, by which vehicle is to stop after a certain distance. On releasing the brakes the rubbers-sealing rings acts as return spring and retract the pistons and the friction pads away from the disk.

The caliper is hinged about a fulcrum pin and one of the friction pads is fixed to the caliper. The fluid under pressure presses the other pad against the disk to apply the brake. The reaction on the caliper causes in to move fixed pad inward slightly applying equal pressure to the other side of the pads. The caliper automatically adjusts its position by swinging about the pin.

These are two pistons between which the fluid under pressure is sent which presses one friction pad directly on to the disk where as the other pad is passed indirectly via the caliper.

# MATHEMATICAL MODELING TO DEVELOP A SIMPLE NANO TO MACRO STRUCTURE CONCRETE - BASED MODEL

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*A simple concrete - based structure model is proposed by developing it from nano to macro structure. In this model, the structure is divided into four levels and each level is represented by a parametric model. The parameters of the four based structures are identified, in terms of elastic modulus (EM) and poisson's ratio at any time period (t) at Calcium silicate hydrates (CSH), cement paste, mortar and concrete levels. Then, by integrating the proposed model with Bazant – Baweja (B3) model, the compressive strength (CS) and EM of concrete at different curing periods is estimated. Further, it is analyzed and validated by other international models such as B3 model alone, Comite Euro – International Du Beton (CEB) model and Indian standards (IS) method. Few tests were done to investigate the CS of concrete with the inclusion of 25% fly ash (fa) and varying ratios of waste foundry sand (WFS) – 0, 25, 50, 75 and 100%. The results are compared with the obtained values by other models and validated with the experimental results. It is found that the proposed model (PM) i.e., Multiscale modeling (MS) can be used reliably integrated with the other models and builds the interaction between the various matrix to estimate and study the strength parameters of the concrete. MS is a new technique which is based on the mathematical formulation, it doesn't require any earlier data about the mechanical properties of the concrete except the intrinsic values of the cement-based materials and mix details to evaluate the strength of the concrete.*

**Keywords:** Concrete, international models, strength parameters, elastic modulus, poisson's ratio, parametric model

## Highlights:

- Mathematical modeling is used for describing the compressive strength of concrete
- The model is used to predict the elastic modulus of concrete from microstructure
- Compressive strength of concrete was estimated using prediction models
- Proposed model requires only the mix design details and intrinsic properties

## 1. Introduction

As it is well known that concrete is a heterogenous material varying with length scales in the multiscale modeling [1]. In multiscale modeling there are four levels which consist of CSH phase, large portlandite (CH) phase, mortar and concrete phase also termed as microscale to macroscale. CSH (calcium silicate hydrates) is one of the major parts in the microscale, which mainly deals with two categories in the nanoscale namely, low density (LD) and high density (HD) based on the size of the particles [2]. The origin of creep and can also be studied by understanding the growth of the nanostructure of concrete. To evaluate the creep of concrete the strength parameters are the important factor. They have investigated that the establishment of creep is due to the reorganization of CSH particles, firmly packed densities present in the cement paste matrix [3]. The porosity of gel is occurred due to the hydration of particles in which there is an increment in water – cement ratio (w/c). Nanoindentation tests were carried out by sub stoichiometries w/c varying between 0.15 to 0.40. It showed a good correlation between the microstructure and mechanical properties of concrete [4]. In this paper, it mainly focuses the determination of elastic modulus and poisson's ratio at each level where the chemical constituents can

be identified. The cement – based homogenized models are adopted to develop the micro level to macro level [5]. The creep of shotcrete by using multiscale was studied and investigated to determine the basic creep of concrete [6]. Macroscopic creep tests were carried out to know the viscous properties of creep at finer scales. Further, the proposed model was validated to the B3 models. Due the hardening effect of inclusion, the CSH phases are improvised to the macroscale level. It can be improved by taking the curing temperature into account as one of the important factors in the compliance of creep other than  $T_c=20^\circ\text{C}$ . From the observation, it was stated that the relative humidity and the degree of hydration plays a vital role in the magnitude and direction of creep. Using waste products with varying w/c ratios in the production of concrete, there was a development in the durability and strength properties of concrete [7-16]. Researchers have studied on the strength factors and effects due to the abrasive action by utilizing waste foundry sand with varying ratios. From the observation, it was noted that the compressive strength of concrete gave the best results at the age of 28 days with 15% of WFS [17]. They had investigated the behavior of concrete by replacing WFS with cement during the production of concrete. Several tests were conducted and also by adopting the B3

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## DURABILITY CHARACTERISTICS OF FLY ASH /SILICA SAND WITH FULL FACTORIAL DESIGN

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*When the sand can no longer be reused in the foundry, it is removed from the foundry and this high quality silica sand in large volumes is used in making concrete as partial replacement of fine aggregate. In this paper investigations were carried out on the mechanical properties and durability studies of concrete by adopting silica sand and fly ash during the formation of concrete where, flyash is used as a partial replacement material of cement. Silica sand (SS) or foundry sand (FS) is incorporated (0%, 25% and 50%) along with fly ash (FA) in different proportions (0% and 25%) with water – cement ratio (w/c) as 0.5. The outcomes indicated that the inclusion of FA and SS improved the compressive as well as tensile strength of material. The study reveals the feasibility of using spent foundry sand as a partial replacement of M-sand and also that full factorial design method is a reliable tool to arrive the conclusion that the FA and SS can be replaced with 25% effectively. The statistical software was used with full factorial design to predict the values and to validate the results with true values.*

**Keywords:** Silica sand (SS), Fly ash (FA), Foundry sand (FS), Mechanical properties, durability, factorial design

### Highlights:

- Full factorial design was adopted to evaluate the strength of concrete
- Mechanical and durability of concrete was studied to know the behavior of concrete
- Compressive and tensile strength of concrete was estimated using Minitab17 statistical software
- The regression equation was derived for the various strength of concrete using by products

### 1. Introduction

Concrete is one of the most essential material utilized in the development of structures, which mainly consists of cement, fine aggregate, coarse aggregate and water. Utilization of waste byproducts has become a common part in the production of concrete to develop the sustainability and durability of the structures [1, 2]. The river sand is used as the fine aggregate which is in high demand in the present scenario. To overcome this scarcity, waste byproducts are introduced during the manufacturing of concrete. The high – volume fly ash concrete was found to be more durable and effective in the construction industry when compared with the concrete made up of ordinary Portland cement. The usage of fly ash in the cementitious material was considered between 50% to 60% of its mass [3]. Many researchers have studied on the waste byproducts which are likely to be utilized as the fractional swap material for the normal sand such as offshore sand, shore sand, quarry dust, washed soil, waste foundry sand, fly ash [4, 5]. Fly ash is used as one of the byproducts in the construction industry, which is obtained from coal from the thermal power plants. Many researchers have done the study on developing the strength of concrete and showed that the material act as a valuable product which can be used as a replacement material [6]. An experiment was carried out using the stone dust

under various curing methods such as hot water, autoclaving and in normal condition. It was observed that under autoclave up to 40% replacement of stone dust gave the similar compressive strength results when related with conventional mix [7]. Strength and durability of concrete were evaluated by using the crushed fine aggregate, bottom ash and fine recycled aggregate as a sandy material during the production of concrete. From the investigation, it was found that usage of stone dust and bottom ash gave the higher strength in concrete, better resistant to chloride ion penetration and performing in low drying shrinkage [8]. Sewage sludge ash was used in the making of concrete. Based on the strength, several tests were conducted in mortars with the usage of sewage sludge ash and it was observed that 25% and 50% gave lower results with the other references which showed a constructive result related to the pozzolanic activity [9]. Many researches have also studied on the bottom ash to estimate the performance of concrete [10, 11]. Bottom coal ash was used in the concrete as a replacement with varying proportions. It was noted that 50% of bottom ash gave the satisfactory compressive results and it can be used for the structural application [12]. The effect of waste foundry sand was studied to know the micro – structural properties and durability parameters. It was observed that there was a good resistance to carbonation and chloride penetration by adopting

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## Effect of vacuum annealing on structural, optical and magnetic properties of Sn doped ZnS thin films

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### ABSTRACT

Tin doped Zinc Sulphide ( $Zn_{1-x}Sn_xS$ ) thin films at  $x = 0.00, 0.02, 0.05, 0.08$  were prepared onto Corning 7059 glass substrates using electron beam evaporation technique and then subjected to vacuum annealing at 300 °C for 2 h. The effect of vacuum annealing on structural, optical and magnetic properties of the thin films were studied in detail. From XRD studies, it was found that the vacuum annealed thin films were in cubic structure and have finer crystalline size compared to the unannealed thin films. All the films exhibited high transmittance (95%) in the visible region. The vacuum annealing led to narrowing of band gap compared to the unannealed thin films. The presence of surface defects in vacuum annealed thin films were confirmed by the observation of two broad emission photoluminescence peaks at 420 nm and 440 nm, but the reduction in the intensity of photoluminescence emission peaks associate to the decrease in the concentration of sulphur vacancies. Also, the vacuum annealed Sn doped ZnS thin films were found to exhibit paramagnetic behaviour with lower maximum magnetization value compared to that of the unannealed Sn doped ZnS thin films.

### 1. Introduction

Dilute magnetic semiconductors are prepared by doping a non-magnetic semiconductor with any kind of small quantity of impurities (DMS). The influence of the dopants makes them exhibit different magnetic behaviour which will be useful in spintronic devices [1,2]. Also, a detailed first study about DMS materials were already reported by Dietl et al. [3]. Among the DMS families, II-VI DMS thin films are rising in recent trends. Earlier reports showed the exhibition of different magnetic behaviours such as ferromagnetism, paramagnetism and spin glass behaviour in different II-VI DMS compounds [4–6]. The metal sulphides show the most efficient behaviour among the other groups in II-VI semiconductors. And if the metal is considered as Zinc, then zinc sulphide (ZnS) is known as one of the most important wide band gap semiconductors. The uniqueness of ZnS is that it can be influenced by very small number of dopants to show enhancement in magnetic, electric and optical properties.

The origin of the magnetic property in a non-magnetic semiconductor by doping a transition metal is still not clearly stated. The magnetic property in DMS compounds can be intrinsic and extrinsic in nature. The efficient DMS will be those which inherit intrinsic magnetic

properties [7]. Earlier reports published some dopants originating intrinsic and some dopants originating extrinsic magnetic properties in the host semiconductors [8]. The research is going on to develop more intrinsic magnetic property exhibiting DMS compounds for applications such as magnetic sensors, photoconductors, light emitting diodes, buffer layer in heterojunction solar cells, flat panel display, injection lasers, etc [9–13]. As these applications are used in room temperature, the compound to be used in them should attain magnetic and electrical properties at room temperature only. So, research is focused on developing room temperature magnetic property exhibiting DMS compounds in nanoscale. For an example InAs exhibited ferromagnetism at above room temperature [14]. The other features of ZnS is that it is a direct band gap semiconductor with a band gap (>3.5 eV) and it expected room temperature ferromagnetism. It exhibited half metallicity when doped with Cr, Fe and Ni [15]. Recent studies indicated that Fe doped ZnS nanoparticles exhibited room temperature ferromagnetism whereas the Cr doped ZnS exhibited both ferromagnetism and anti-ferromagnetism [16,17]. From the DFT studies it was found that the transition metal ions doped ZnS will exhibit ferromagnetism and half metallicity. It was also reported that the magnetic moments developed in them were due to delocalization of 3d orbitals of the transition metal

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# Structural, optical and magnetic properties of vacuum annealed Fe, Mn doped NiO nanoparticles

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## Abstract

Iron (Fe) substituted nickel oxide ( $\text{Ni}_{1-x}\text{Fe}_x\text{O}$ ) and manganese (Mn) substituted ( $\text{Ni}_{1-x}\text{Mn}_x\text{O}$ ) nanoparticles at  $x=0.05$  were prepared using solid-state reaction. The synthesized  $\text{Ni}_{1-x}\text{Fe}_x\text{O}$  and  $\text{Ni}_{1-x}\text{Mn}_x\text{O}$  nanoparticles were annealed in vacuum at a pressure of  $1 \times 10^{-3}$  mbar at two different temperatures of 473 K and 673 K for 1 h. The influence of vacuum annealing on the physical properties of  $\text{Ni}_{1-x}\text{Fe}_x\text{O}$  and  $\text{Ni}_{1-x}\text{Mn}_x\text{O}$  nanoparticles were studied. The vacuum annealed nanoparticles were characterized by XRD, SEM, EDS, UV-Vis-NIR and VSM instruments to study their structural, surface, chemical, optical and magnetic properties, respectively. From the XRD results it was found that  $\text{Ni}_{1-x}\text{Fe}_x\text{O}$  nanoparticles were in cubic structure with Fe impurity phases whereas the  $\text{Ni}_{1-x}\text{Mn}_x\text{O}$  nanoparticles exhibited cubic structure without any impurity phases. The crystallite sizes of the nanoparticles were in the range of 2.5–30 nm. From the EDS spectra, it was found that the elements such as Fe, Ni, Mn and O were in almost stoichiometric ratio. An increase in optical band gap for  $\text{Ni}_{1-x}\text{Fe}_x\text{O}$  and  $\text{Ni}_{1-x}\text{Mn}_x\text{O}$  nanoparticles was observed with an increase of annealing temperature. The pure NiO and doped NiO nanoparticles exhibited ferromagnetism at room temperature. The strength of magnetization decreased in NiO with a rise in annealing temperature. The  $\text{Ni}_{1-x}\text{Fe}_x\text{O}$  and  $\text{Ni}_{1-x}\text{Mn}_x\text{O}$  nanoparticles were ferromagnetic at room temperature and the magnetization increased with increase in vacuum annealing temperature. The highest magnetization of 1.4 emu/g, 0.85 emu/g and 0.76 emu/g were observed for NiO,  $\text{Ni}_{1-x}\text{Fe}_x\text{O}$  and  $\text{Ni}_{1-x}\text{Mn}_x\text{O}$  nanoparticles, respectively at 673 K. The nanoparticles will be suitable for storage device applications.

**Keywords** X-ray diffraction · Semiconductor · Transparent conducting oxides · Solid-state reaction

## 1 Introduction

Currently, high importance is given on nanostructured metal oxide such as indium oxide ( $\text{In}_2\text{O}_3$ ), tin oxide ( $\text{SnO}_2$ ), zinc oxide ( $\text{ZnO}$ ), titanium dioxide ( $\text{TiO}_2$ ), etc. These metal oxides exhibit high electrical conductivity, optical

transmittance with wide band gap ( $> 3.0$  eV). In addition to these existing properties, if these oxide nanostructures exhibit magnetism, they will find more applications in future. Generally, magnetic nanoparticles are widely studied because of their fundamental and technological interest as they exhibit novel structural, chemical, optical, electrical and magnetic properties [1–4]. A considerable research work has been carried out on ferrites as they possess above all properties. Ferrites such as cobalt, nickel, manganese, zinc will exhibit good thermal stability, poor conductivity, low cost, high dielectric and magnetic properties. The ferrites find in many applications such as lithium-ion battery, high-density data storage, magnetic recording, magnetic fluids, etc. A detailed investigation has been made on nanoferrites by Dippong et al. [5–7]. They have extensively studied the physical properties of pure and doped cobalt ferrites. The magnetic nanoparticle plays an important role in disease diagnosis, magnetic refrigeration, microwave absorber, drug delivery for cancer treatment, antibiotic, etc. [8–10]. Due to

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