# International Conference on Nanomaterials and Nanotechnology

# ICNN - 2023

September 11-13, 2023

# SOUVENIR



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Visvesvaraya National Institute of Technology (VNIT),
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ISBN : 978-81-957406-4-2

# Biodiesel Synthesis from Kusum oil (Schleichera triguga) employing KOH catalyst: Optimization Process

PID-104

**Satishchandra Ragit[1]*, Hemant Hajare[2], S K Mohapatra[3], Krishnendu Kundu[4]**

[1]Department of ASH, Guru Nanak Institute of Engineering & Technology, Nagpur, Maharashtra, India, 441502
[2]Department of Mechanical Engineering, Thapar Institute of Engineering & Technology, Patiala, Punjab, India 147 004
[3]Biofuel Department, Centre of Excellence for Farm Machinery, CSIR Lab, Ludhiana, Punjab, India, 141 006

Corresponding author email : *to.itsatishchandra@gmail.com

**BACKGROUND :**

The present experimental work illustrates the parametric effects on biodiesel production from Kusum oil methyl ester (KOME) has been investigated. To intensify the transesterification process, a water bath shaker was used. In order to optimize the transesterification reaction, potassium hydroxide was used as a catalyst. Significant parameters, such as reaction temperature, reaction time, molar ratio of methanol, and concentration catalyst were adjusted. Based on the adjusted conditions, biodiesel yield of 95.58% was achieved. The transesterification process was optimized to take into consideration of factorial experimental run. The experiments had been performed by applying 27 experimental run and optimized transesterification process. The results observed that the maximum ester yield obtained in the condition of methanol to oil molar ratio of 8:1, catalyst amount of 1.5 w/w%, 55 °C preheated temperature, 60 °C reaction temperature and reaction time of 45 min. It was noticed that highest biodiesel attained with lowest kinematic viscosity (3.53cSt).The physicochemical properties of KOME were experimentally analyzed. The quality parameters of Kusum oil methyl ester were found to be within international acceptance ASTM 6751 and EN 14214 standards. The KOME is a good feedstock for biodiesel production. Hence, KOME is an attractive and valuable source for biodiesel production.

***Keywords** : Ester recovery, Optimization, Kusum oil methyl ester (KOME), Transesterification process, Fuel properties*

**EXPERIMENTAL/THEREOTICAL REVIEW/CASE STUDY:**

The main aim of this experimental study was to evaluate optimizing parameters for maximum biodiesel production and minimum kinematic viscosity. The present study has been carried out by considering three molar ratios (4:1, 6:1, & 8:1), KOH catalyst concentrations (0.5%, 1%, &1.5%), and reaction time (45, 60, & 75 min). The preheating temperature was maintained at 55 0C and reaction temperature has been maintained constant i.e. 60°C. The single stage transesterification process has been employed to get Kusum oil methyl ester. The fuel properties have been evaluated by using BD standards. The Kusum oil was purchased from AO's Products Private Limited, Delhi. Biodiesel was prepared in Biofuel laboratory of Centre of Excellence in Farm Machinery (CMER) HQ, CSIR Lab, Ludhiana. The different equipment has been used for fuel characterization.

**MAJOR FINDINGS :**

It was observed that molar ratio (8:1) shows excellent results as compared to other molar ratios (4:1 & 6:1) for optimization of transesterification process. A total 27 samples were prepared for biodiesel production process. The reaction temperature was kept 60 °C. We tested different compositions of catalysts, it conclude that maximum yield and low viscosity were selected as best option for engine

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| Proposed Title of the Contribution: | EFFECT OF DIETHYL ETHER ADDITIVES TO IMPROVE EMISSION CHARACTERISTICS OF GSOME & ITS RESPECTIVE BLENDS OPERATED IN VCR DIESEL ENGINE | (the 'Contribution') |
| Series: The Contribution may be published in the following series | A Springer book series Lecture Notes in Mechanical Engineering | |
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APPLICATIONS OF EMERGING GREEN TECHNOLOGIES FOR EFFICIENT VALORIZATION OF AGRO-INDUSTRIAL WASTE: A ROADMAP TOWARDS SUSTAINABLE ENVIRONMENT AND CIRCULAR ECONOMY

# Performance analysis of biofuel–ethanol blends in diesel engine and its validation with computational fluid dynamics

Ajay V. Kolhe[1] · Prateek D. Malwe[2] · Yashraj Chopkar[3] · Hitesh Panchal[4] · Ümit Ağbulut[5] · Nabisab Mujawar Mubarak[6] · Subrata Chowdhury[7] · Kassian T.T. Amesho[8,9,10,11]

Received: 8 July 2022 / Accepted: 13 April 2023


## Abstract

The engine tests aimed to produce comparable data for fuel consumption, exhaust emissions, and thermal efficiency. The computational fluid dynamics (CFD) program FLUENT was used to simulate the combustion parameters of a direct injection diesel engine. In-cylinder turbulence is controlled using the RNG *k*-*ε* model. The model's conclusions are validated when the projected *p*-curve is compared to the observed *p*-curve. The thermal efficiency of the 50E50B blend (50% ethanol, 50% biofuel) is higher than the other blends as well as diesel. Diesel has lower brake thermal efficiency among the other fuel blends used. The 10E90B mix (10% ethanol, 90% biofuel) has a lower brake-specific fuel consumption (BSFC) than other blends but is slightly higher than diesel. The temperature of the exhaust gas rises for all mixtures as the brake power is increased. CO emissions from 50E50B are lower than diesel at low loads but slightly greater at heavy loads. According to the emission graphs, the 50E50B blend produces less HC than diesel. NOx emission rises with increasing load in the exhaust parameter for all mixes. A 50E50B biofuel–ethanol combination achieves the highest brake thermal efficiency, 33.59%. The BSFC for diesel is 0.254 kg/kW-hr at maximum load, while the BSFC for the 10E90B mix is 0.269 kg/kW-hr, higher than diesel. In comparison to diesel, BSFC has increased by 5.90%.

**Keywords** Biofuel–ethanol blends · Diesel engine · Performance analysis · Computational fluid dynamics

## Nomenclature

| | |
|---|---|
| $CO_2$ | carbon dioxide |
| NFT | nitrogen-fixing trees |
| PM | particulate matter |
| GGF | gasoline gallon equivalency |
| HC | hydrocarbon emission |
| SCA | spray cone angle |
| SVD | size volume distribution |

Responsible Editor: Philippe Garrigues

✉ Kassian T.T. Amesho
kassian.amesho@gmail.com; kassian.amesho@regent.ac.za

[1] Department of Mechanical Engineering, Kavikulguru Institute of Technology and Science, RTMNU Nagpur, Ramtek, Maharashtra 441106, India

[2] Department of Mechanical Engineering, Dr. D. Y. Patil Institute of Technology, Pimpri, Pune, Savitribai Phule Pune University, Pune, Maharashtra 411018, India

[3] Department of Mechanical Engineering, Guru Nanak Institute of Technology, RTMNU Nagpur, Nagpur, Maharashtra 441501, India

[4] Department of Mechanical Engineering, Government Engineering College, Kutpur, Patan, Gujarat 384265, India

[5] Department of Mechanical Engineering, Engineering Faculty, Düzce University, 81620 Düzce, Turkey

[6] Petroleum and Chemical Engineering, Faculty of Engineering, Universiti Teknologi Brunei, BE1410, Bandar Seri Begawan, Brunei Darussalam

[7] SVCET Engineering College and Technology (A), Chittoor, AP, India

[8] Institute of Environmental Engineering, National Sun Yat-Sen University, Kaohsiung 804, Taiwan

[9] The International University of Management, Centre for Environmental Studies, Main Campus, Dorado Park Ext 1, Windhoek, Namibia

[10] Desmores Biomass Energy and Farming Pty Ltd, P.O.Box 7387, Swakopmund, Namibia

[11] Regent Business School, Durban, South Africa

Published online: 28 April 2023

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# PERFORMANCE EVALUATION OF VCR DIESEL ENGINE USING DIFFERENT BLENDS OF GRAPE SEED OIL METHYL ESTER (GSOME) AS A FUEL SUPPLEMENT

**Aman Sharma[1], Satishchandra Ragit[2*], G. Singh[3], S.K.Mohapatra[4], K. Kundu[5]**
[1]Ph.D Student, DAV University, Jalandhar-
[2] Guru Nanak Institute of Engineering & Technology, Nagpur-
[3,4]Thapar Institute of Engineering & Technology, Patiala-147004, INDIA
[5]K Kundu[5], Senior Principal Scientist, CMERI-CEFM (CSIR), Ludhiana-141008, INDIA.
*Corresponding Author: [illegible]

## ABSTRACT
This research paper deals with experimental investigation carried out on VCR diesel engine operated with three different blends (GSOME 10, GSOME 20 & GSOME 30) at three different compression ratios (14:1, 16:1, & 18:1) to evaluate the performance characteristics of respective blends of GSOME. Fuel properties were determined using ASTM D 6751 & EU 14214.The non-edible oil selected for the present investigation is grape seed oil which was derived from winery waste. After single stage transesterification with KOH and methanol, grape seed oil methyl ester was produced and 100% of this methyl ester was further blended with different blends (10%,20% & 30%) with diesel. A Single cylinder, 4-stroke water cooled, variable compression ratio diesel engine was used for engine testing. Tests were conducted in 5.2 Kw at 1500 rpm. It was found that the Brake powers (BP) of all Grape seed oil methyl ester blends with diesel fuel were increased with increase in engine load. The average BP of GSOME blends was found to be 1.71 Kw which was 0.57 % lower than diesel fuel. It was found that the brake specific fuel consumption (BSFC) decreases with increase in engine load for all GSOME blends. The maximum BSFC was obtained 5.39 Kg/Kwh for GSOME 10 blends at no load condition. It showed that Brake thermal efficiency (BTE) increases with increase in engine load from no load to full load condition. The maximum BTE (30.18 %) was achieved at full load condition for GSOME 10 at Compression ratio (18:1).The maximum mechanical efficiency (41.04%) was obtained for GSOME 20 under full load condition at compression ratio (16:1). The maximum Exhaust gas temperature (EGT) i.e 346.95°c was obtained for GSOME 30 at full load condition at C R (14:1). The GSOME 10 gave the best overall engine performance in terms of brake thermal efficiency (30.18%), & mechanical efficiency (34.29%). The increment in BTE is due to increase in power and reduction in heat loss. The GSOME blends could be used as an alternative fuel with better performance compare with diesel.

**Keywords:** Grape seed oil methyl ester, Blending, Compression ratio, VCR diesel engine, Performance characteristics

## NOMENCLATURE

GSOME: Grape Seed Oil Methyl Ester
BP: Brake Power
MEff: Mechanical Efficiency
GSOME 10: 10% GSOME & 90% Diesel
GSOME 30: 30% GSOME & 90% Diesel
CR: Compression Ratio
EU: European Standard
BTE: Brake Thermal Efficiency
BSFC: Brake Specific Fuel Consumption
EGT: Exhaust Gas Temperature
GSOME 20: 20% GSOME & 90% Diesel
D100: 100% Diesel
VCR: Variable Compression Ratio
ASTM: American Society for Testing and Materials



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# Chapter 28
# Performance and Emission Characteristics of VCR Diesel Engine Fueled with Blends of Babassu Oil Methyl Esters and Diesel

Satishchandra Ragit, Krishnendu Kundu, and Aman Sharma

## Nomenclature

| | |
|---|---|
| CO | Carbon Monoxide |
| EGT | Exhaust Gas Temperature |
| HC | Hydrocarbons |
| BB | Babassu Biodiesel |
| BOME | Babassu oil methyl ester |
| BOME | BB |
| BOME 10 | BB 10 |
| BOME 20 | BB 20 |
| BOME 30 | BB 30 |
| BP | Brake Power |
| BTE | Brake thermal efficiency |
| SFC | Specific Fuel Consumption |
| NOx | Oxides of nitrogen |

## 1 Introduction

Demand for the fuel, with the rising deterioration of natural conditions has increased concern for environmental problems and energy crisis. Babassu biodiesel (methyl

*Present Address:*
S. Ragit (✉)
Mechanical Engineering Department, L K C E, Jalandhar, Punjab, India

K. Kundu · A. Sharma
Bio-fuel Department, CSIR-CMERI (Centre of Excellence in Farm Machinery), Ludhiana, Punjab, India
e-mail: k_kundu@cmeri.res.in

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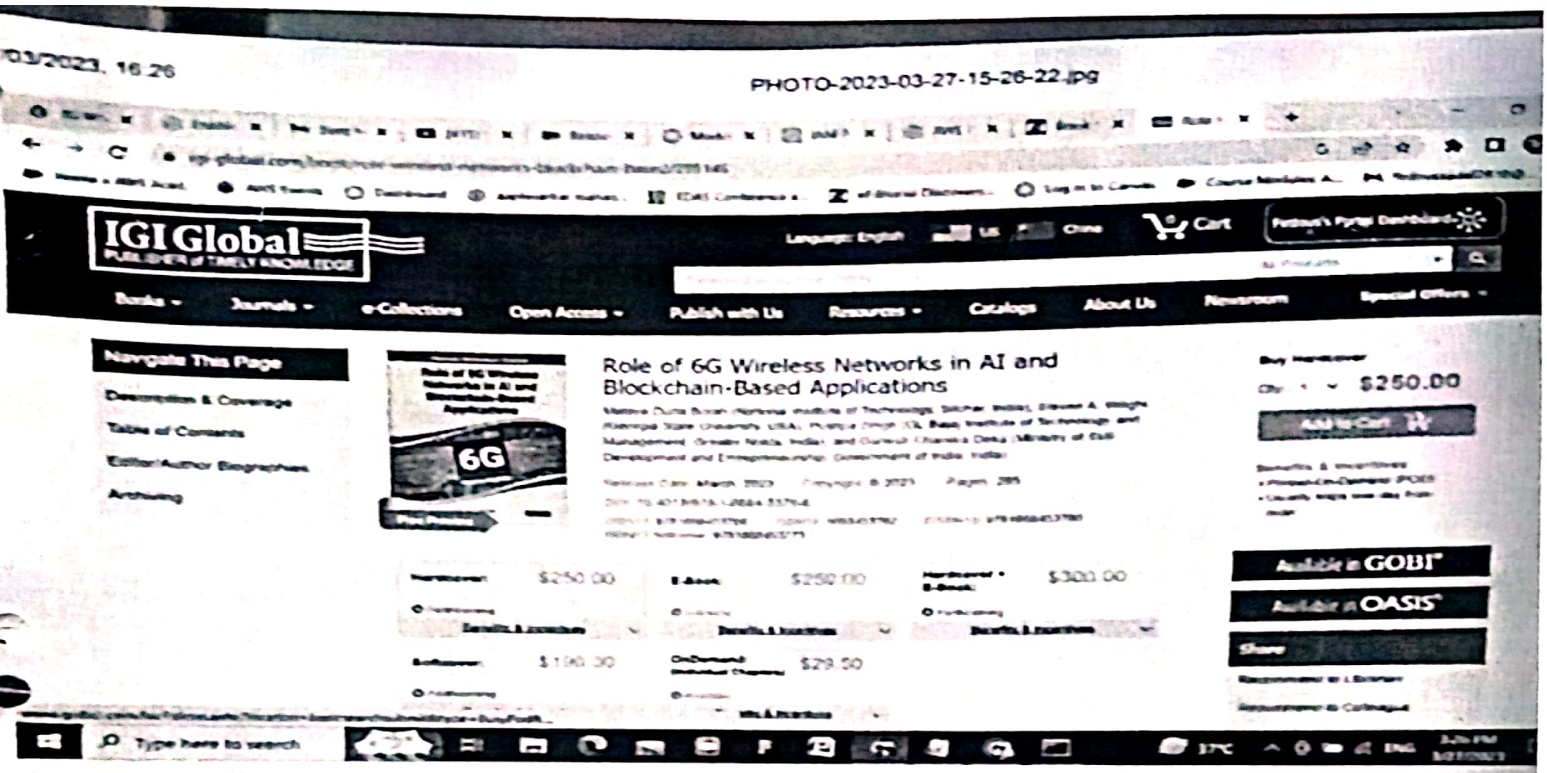


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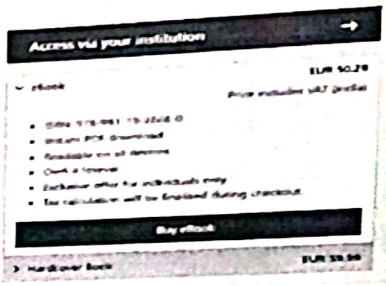


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# EFFECT OF DIETHYL ETHER ADDITIVES TO IMPROVE PERFORMANCE CHARACTERISTICS OF GSOME & ITS RESPECTIVE BLENDS OPERATED IN VCR DIESEL ENGINE

**Aman Sharma[1], S S Ragit[2], Hemant Hajare[3] G. Singh[4], S K Mohapatra[5], & K Kundu[6]**

[1] Ph.D Student, Mechanical Engineering Department, DAV University, Jalandhar, India,
[2 &3]Guru Nanak Institute of Engineering & Technology (GNIET), Nagpur, India,
[3&4] Thapar Institute of Engineering & Technology, Patiala, India
[5]CSIR-CMERI-Centre of Excellence in Farm Machinery, Ludhiana, India
**Corresponding Email Address:** ragitsatishchandra@gmail.com
**Mobile:** 7038562579

## Abstract

In the present research work, the experimental analysis has been executed to investigate the influence of diethyl ether (DEE) as an oxygenated additive to the diesel-GSOME blend on the performance characteristics of VCR Diesel Engine. Four fuels were examined in a VCR diesel engine to assess its performance characteristics. These fuels were diesel, & mixtures of diesel-GSOME-DEE with proportions of 5%, 10% and 15% by volume. The tests were conducted on a single cylinder VCR Diesel engine fuelled with Diesel, GSOME, and blends of 5%, 10% and 15 % DEE on a volume basis. Initially, the test was conducted with diesel fuel to obtain the baseline reference reading. Then, the reading was compared with results taken from the engine using diesel-GSOME-DEE blends. The experimental investigations observed that the reduction in Brake specific fuel combustion (BSFC) by 13.33%, Brake thermal efficiency (BTE) increased by 28.22%,Mechanical efficiency (MEefl) increased by 15.87 % and Exhaust gas temperature(EGT) increased by 14.58 with compared to diesel fuel when blended with different proportion of D-GSOME-DEE. A global overview of the results has shown that the D30GSOME15DEE15 blend is the most effective combination based on performance characteristics. In the present study, an attempt has been made to evaluate performance characteristics of VCR diesel engine when Diesel and GSOME blended with different proportion of diethyl ether (DEE) additives.

**Keywords:** GSOME, Diethyl Ether, Blending, VCR Engine, Performance characteristics

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# Fetal Facial Expression Recognition System by Lip Distance Method

Sushama Telrandhe
*Dept. of Electronics Engineering*
*GNIET College of Engg.*
Nagpur,india
sushama.telrandhe@gmail.com

Prema Daigavane
*Dept. of Electronics Engineering*
*G H Raisoni College of Engg.*
Nagpur, India
Prema.daigavane@raisoni.net

Manoj Daigavane
*Dept.of Electrical Engineering*
*Govt.Polytechnic,*
Nagpur,India
mdai68@gmail.com

***Abstract*— The Fetal facial expression is a continuous process related to brain development. 4D ultrasonography scan of fetal showed that expressions are developed at 24 weeks and become complex such as "pain" expressions. Fetal landmarks are not available, so we have to create the landmarks as per requirement because fatal images are not so accurate in detecting face regions like standard face images. Using matlab we create the landmark points of all images available with us. And then it is possible to compare the fetal images with landmarks.**

**In the proposed system, the lip portion is extracted from the foetal face image, and recognition of the unborn baby's facial expressions is done by designing and implementing a lip distance measurement algorithm for expression classification. This method improves accuracy by up to 20 % compared to when the total face is considered for recognition. The landmark points of foetal images are calculated considering the eyes, nose, and lips corner points. A result is compared with the Harris key-point descriptor algorithm and the Gabor feature extraction method. The lip distance method for expression classification is very simple and gives very good results as compared to other methods. This system can be used to find abnormality symptoms in a baby before birth so that the doctor and parents are aware of the baby's mental state before birth.**

**Keywords— Artificial neural network(AI), Dark channel prior algorithm, Fetal expression, Fetus mood, Feature selection unit (FSU), Gabor feature extraction, HOG features, Harris corner points,lip distance method.**

## I. INTRODUCTION

Unborn baby facial imagery is used in a multi-domain image processing application in medical science advancements. Researchers from different fields, like gynaecologists and image processing experts, are needed in order to develop a sufficiently accurate expression classification system for foetus images [1, 2]. This is used to evaluate the continuous expression of the unborn baby and thereby observe the growth of the child. The proposed system concentrates on the classification of facial expression of unborn babies in the womb, which is depicted as one of the physiological activities of an unborn baby and can be analysed from facial expression to better define normal and abnormal babies, which is depicted as one of the physiological activities of an unborn baby by adapting the coding on modern 4-D ultrasound images. The recent development of unborn baby surgery has raised the problem of baby pain and analgesia, making it important to recognise facial pain even in unborn babies. However, if the ultrasound scanning results in abnormality detection, then it is a source of worry for pregnant women, and human fatigue often fails to take into account the important consideration of existing data. Thus, automatic unborn baby facial appearance recognition becomes essential [3, 4].

Ultrasound is by far the most adopted method for safe screening and diagnosis in the prenatal phase due to its non-harmful nature with respect to radiation-based imaging techniques. [4]

The main drawback of ultrasound imaging is its sensitivity to scattering noise, which makes automatic tissue segmentation a tricky task, limiting the possible range of applications. Researchers from different fields, like gynaecologist, image processing experts, and signal processing experts, are needed in order to develop a sufficiently accurate classification system for unborn baby images. A digital input image is produced by 3D or 4D ultrasonic scans of an unborn baby. The input is generally in JPEG format. The proposed system used 3D fatal ultrasound images collected from a website. The work is designed using MATLAB 15 and developed using novel, robust, statistical digital image processing algorithms that recognise the expression of an unborn baby in the womb.

## II. Literature Survey

Georgia Sandbach et al. [15 presented], proposed a face recognition son thetem based oof a3D motion of face image. Hasen Drira et. al. 2] preset systemoas 3D faces by radial curves emanating from th noseuse annt and used elastic shape model of these curves. Mohamd Daoudi et. al. [3] presented relevant features from deformations between faces using LDA. Munaar Hayat et. al. [4] presented an efficient spectra-clustering based adesign anhm to design automatic model of facia. expression al.un Tie et al [5],presented Elastic body spline technology (EBS). Nesli Erdogmus et al. [6] used local feature detectors, which play an important role in many applications like mapping, text recognition, and image registration. Related to unborn baby facial expression, Sithichon Kanitthakunl et al. [7 ] presented an Active Shape Model (ASM) for antinatal assessment to diagnose foetal at high risk with window tracker technique.Local feature detectors play an important role in many applications like mapping, text recognition, image registration (J. Bauer et al., 2004), object recognition (A. Berg et al., 2005), object categorization (Dorko and Schmid, 2003), texture classication (S. Lazebnik et al., 2005), robot localization (S. Se et al., 2001), and video shot retrieval (J. Sivic et al., 2006). Many studies have been conducted to develop new fast and strong detectors (SIFT (D. Lowe, 2004), SURF (H. Bay et al.,2008), Fast (Guo,2011), BRISK (Leutenegger, 2011), Harris (C. Harris and M. Stephens,1988), FREAK (A. Alahi et al.,2012), MinEigen, MSER,HOG) and descriptors [1]. Table I shows the comparison of various techniques used for foetal image



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# Fetal Facial Expression Recognition System by Lip Distance Method

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**Published In:** 2023 11th International Conference on Emerging Trends in Engineering & Technology - Signal and Information Processing (ICETET - SIP)

**Date of Conference:** 28-29 April 2023 **DOI:** 10.1109/ICETET-SIP58143.2023.10151581



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Edited Book

# Progressive Techniques In Science & Technology Vol -I

Innovative Scientific Publication

Editors

Dr. Nitin K.Mandavgade | Ms. Aachal Lonhare

Nikita Nigam | Dr. Jayant D. Supe

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*On*

# Progressive Techniques in Science & Technology Vol -I

## Editors


**Dr. Nitin K. Mandavgade**
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**Ms. Aachal Lonhare**
*Assist. Prof. Biotechnology, GD Rungta College of Science & Technology ,Bhilai*

**Nikita Nigam**
*Assist. Prof. Biotechnology, GD Rungta College of Science & Technology ,Bhilai*

**Dr.Jayant D.Supe**
*Associate Professor, Civil Dept, Rungta College of Engineering ,Bhilai*



Published by

**Innovative Scientific Publication, Nagpur**

**Published By**
**Innovative Scientific Publication**
SBI Colony, Hingna Road, Nagpur (MS), India
Email: ijiesjournal@gmail.com
Ph: 7972481655
**http://ijies.net/books**

**1st Edition: December, 2023**

**ISBN: 978-81-965128-9-7**


**Price: 375 INR**

# Preface

Science and technology are important parts of our day to day life. We get up in the morning from the ringing of our alarm clocks and go to bed at night after switching our lights off. All these luxuries that we are able to afford are a resultant of science and technology. Most importantly, how we can do all this in a short time are because of the advancement of science and technology only. It is hard to imagine our life now without science and technology. Indeed our existence itself depends on it now. Every day new technologies are coming up which are making human life easier and more comfortable. Thus, we live in an era of science and technology.

Essentially, Science and Technology have introduced us to the establishment of modern civilization. This development contributes greatly to almost every aspect of our daily life. Hence, people get the chance to enjoy these results, which make our lives more relaxed and pleasurable.

We must admit that science and technology have led human civilization to achieve perfection in living. However, we must utilize everything in wise perspectives and to limited extents. Misuse of science and technology can produce harmful consequences.

As we stand on the threshold of a new era, this book aims to explore the transformative "**Progressive Techniques in Science & Technology**" in this book, we delve in to the multifaceted effects to technology on various educational domains, from traditional classroom setting to distance learning environments, we aims to provide educators, policymakers, students and stakeholders with a comprehensive understanding of how technology has reshaped and continues to shape the educational landscape.

We hope that this book serves as a guiding light, inspiring educators and learners alike to embrace innovation responsibly and cultivate an educational environment that nurtures curiosity, critical thinking and lifelong learning.

***Dr. N.K.Mandavgade***
***Ms. Aachal Lonhare***
***Nikita Nigam***
***Dr. J.D.Supe***

# Index

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# Chapter 6

# A Study on Algebra of Groups and Rings Structures in Mathematics

**Prof. Deepa M. Dashottar[1], Prof. Fouziya G. Ansari[2], Prof. Shyamali Thakare[3], Prof. Vijay Tyade[4], Prof. Shammina Siddique[5]**

[1,2,3,4] *Assistant Professor, Guru Nanak Institute of Engineering & Technology, Dahegaon, Kalmeshwar Road, Nagpur-441501*

***ddmathsclinic@gmail.com***

***Abstract:*** *Algebra extends the familiar concepts found in elementary algebra and arithmetic of numbers to more general concepts. Algebra deals with the more general concept of sets is a collection of all objects (called elements) selected by property specific for the set. All collections of the familiar types of numbers are sets. Settheory is a branch of logic and not technically a branch of algebra. Binary operation is meaningless without the set on which the operation is defined. For two elements a and b in a set S, a ∗ b is another element in the set; this condition is called closure. Addition (+), subtraction (−), multiplication (×), and division (÷) can be binary operations when defined on different sets, as are addition and multiplication of matrices, vectors, and polynomials. Zero is the identity element for addition and one is the identity element for multiplication. For a general binary operator ∗ the identity element e must satisfy a ∗ e = a and e ∗ a = a, and is necessarily unique, if it exists. This holds for addition as a + 0 = a and 0 + a = a and multiplication a × 1 = a and 1 × a = a. Not all sets and operator combinations have an identity element. The inverse of a is written −a, and for multiplication the inverse is written a−1. A general two-sided inverse element a−1 satisfies the property that a ∗ a−1 = e and a−1 ∗ a = e, where e is the identity element. Associativity is, the grouping of the numbers to be added does not affect the sum is (2 + 3) + 4 = 2 + (3 + 4). Commutative is, the order of the numbers does not affect the result is 2 + 3 = 3 + 2. Combining the concepts gives group and ring one of the most important structures in mathematics. A group is a combination of a set S and a single binary operation is an identity element e exists, such that for every member a of S, e ∗ a and a ∗ e are both identical to a. A group is also commutative—that is, for any two members a and b of S, a ∗ b is identical to b ∗ a—then the group is said to be abelian. A ring has two binary operations (+) and (×), with × distributive over +. Under the first operator (+) it forms an abelian group. Under the second operator (×) it is associative, but it does not need to have identity, or inverse, so division is not required. The additive (+) identity element is written as 0 and the additive inverse of a is written as −a.*

***Keyword: Groups, Rings and Fields are axiomatically and algebra***

## INTRODUCTION

The roots of algebra can be traced to the ancient Babylonians, who developed an advanced arithmetical system with which they were able to do calculations in an algorithmic fashion. The Babylonians developed formulas to calculate solutions for problems typically solved today by using linear equations, quadratic equations, and indeterminate linear equations. By contrast, most Egyptians of this era, as well as Greek and Chinese mathematics in the 1st millennium BC, usually solved such equations by geometric methods, such as those described in the Rhind Mathematical Papyrus, Euclid's Elements, and The Nine Chapters on the Mathematical Art. The geometric work of the Greeks, typified in the Elements, provided the framework for generalizing formulae beyond the solution of particular problems into more general systems of stating and solving equations, although this would not be realized until mathematics developed in medieval Islam.

# Chapter 7

## Advancing Sustainability: Exploring the Principles and Practices of Green Chemistry

**Prof. Pranali P. Kharwade[1], Prof. Switi Maske[2] , Prof. Sadaf Gauhar[3], Dr. Hemant Hajare[4], Prof. Shammina Siddique[5]**

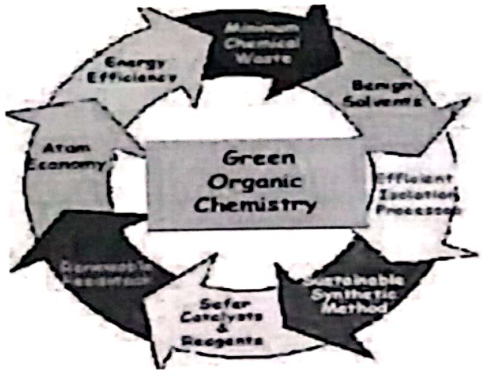
*[1, 2, 3] Assistant Professor, Guru Nanak Institute of Engineering & Technology, Dahegaon, Kalmeshwar Road, Nagpur-441501*
*[4]Principal Guru Nanak Institute of Engineering & Technology, Dahegaon, Kalmeshwar Road, Nagpur-441501*

***pranali61196@gmail.com***

***ABSTRACT:*** *In our contemporary era, the imperative for sustainable practices is more pressing than ever. Green chemistry stands as a beacon of hope, offering innovative solutions to mitigate environmental degradation while fostering economic prosperity. This abstract delves into the principles and practices of green chemistry, elucidating its significance in promoting sustainability across various industries. From renewable feedstocks to benign solvents, the principles of green chemistry guide the design of processes and products that minimize waste, toxicity, and energy consumption. Through an exploration of key concepts and case studies, this abstract aims to underscore the transformative potential of green chemistry in creating a more sustainable and harmonious future for our planet..*

**KEYWORDS:** *Green chemistry, sustainability, renewable feedstock, benign solvents, environmental protection, innovation, eco-friendly processes, waste minimization, toxicity reduction, energy efficiency, sustainable development, case studies, environmental impact, green technologies.*

**INTRODUCTION:**




In an era marked by environmental concerns and the urgent need for sustainable solutions, green chemistry emerges as a pivotal discipline at the intersection of science, industry, and environmental stewardship. Grounded in the fundamental principles of sustainability, green chemistry offers a paradigm shift in how we conceive, design, and execute chemical



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# Chapter 8

# Synthesis & Characterizations of RE ($RE^{3+}$ = Ce /Dy,) doped $K_4Ca(PO_4)_2$ phosphor

**Dr, Sadaf Gauhar M. Mushtaque[1], Dr.Hemant Hajare[2] , Shraddha Dudankar[3], Deepa Dashottar[4] , Shammina Siddique[5]**

[1,3,4,5] *Department of Applied-Sciences & Humanities, Guru Nanak Institute of Engineering & Technology, Nagpur-441501, India*

[2] *Professor & Principal, Guru Nanak Institute of Engineering & Technology, Dahegaon, Kalmeshwar Road, Nagpur-441501*

***sadafgauhar25@gmail.com***

***Abstract***

*$RE^{3+}$ ( RE = $Eu^{3+}$, $Ce^{3+}$, $Dy^{3+}$, $Sm^{3+}$) doped $K_4Ca(PO_4)_2$ phosphor were synthesized by conventional high temperature solid state reaction & their luminescent properties , energy transfer mechanism in $Ln^{3+}$ pair were investigated successfully. Here, $Ce^{3+}$ doped $K_4Ca(PO_4)_2$ phosphor shows emission under NIR range , whereas $K_4Ca(PO_4)_2$: $Dy^{3+}$ shows characteristics emission bands centred at 481 and 576 nm under NUV excitation range. Based on the spectral overlap of acceptor and donor ions , the possibility of energy transfer from $Ce^{3+} \rightarrow Dy^{3+}$ in $K_4Ca(PO_4)_2$ phosphor has been confirmed with the significant enhancement in PL intensity of $Dy^{3+}$ ion. XRD , FTIR , TGA/TDA analysis was carryout out to study phase purity, presence of functional group and amount of weight loss under different temperature regime. Hence, $RE^{3+}$ doped $K_4Ca(PO_4)_2$ phosphor could be stable phosphor host for LED application.*

***Keywords: RE; Phosphate; XRD; PL; FTIR; TGA/DTA***

## INTRODUCTION

In past few years white light emitting diodes considered as "green" full-solid state lighting sources due to their promising features like high luminous efficiency, good CRI, excellent stability, environmental friendliness, and hence it widely used in lighting, display technologies [1–5]. Basically the WLEDs has been fabricated by two different approach and one the most promising methods used for the fabrication of WLEDs, consists of the combination of NUV (near ultraviolet ) chips coupled RGB phosphors ( red, green and blue-emitting phosphors ) that provides excellent CRI index and also have better correlated color temperature (CCT) [6], but the development of pure red phosphor component is quite difficult and still challenging for researcher [7–9]. Tuneable emission in single host phosphor compound can also achieved with the co doping of different lanthanide ions. Among the different phosphor host, orthophosphates is more stable inorganic phosphors host and received lot of interest in luminescence study and find potential scope in optoelectronics devices, when doped with preferred rare earth ions. Some of the well known orthophosphates compound are $YPO_4$ [10], $LaPO_4$ [11, 12], or $LuPO_4$ [13] , $Sr_3(PO_4)_2$ [14], or $M_3Ln(PO_4)_3$ (M = $Sr^{2+}$, $Ca^{2+}$; Ln = $Y^{3+}$, $La^{3+}$, $Gd^{3+}$) [15] etc. Thus, doping of divalent / Trivalent lanthanide ions such as $Mn^{2+}$, $Eu^{2+}$, $Cr^{3+}$, $Ce^{3+}$, $Tb^{3+}$, $Dy^{3+}$ and $Eu^{3+}$ in orthophosphate compound has been widely studied to develop an energy efficient inorganic phosphors component. Among the different trivalent rare earth ions, $Dy^{3+}$ ions is considered as efficient activators owing to their $4f^9$ electronic configuration, which shows two prominent emission bands in blue and yellow spectral region which are the desirable wavelength range for the production of white light [16-18]. Doping of $Dy^{3+}$

# Chapter 9

# An Experimental Investigation of Performance And Emission Characteristics of A CI Engine Fuelled With Waste Cooking Methyl Ester And It's Respective Blends With Diesel Fuel

**Satishchandra Ragit[1] , Shyamali Thakare[2], Vijay Tayde[3], Sadaf Gauhar[4] Deepa Dashottar[5]**

[1,2,3,4] *Assistant Professor, Guru Nanak Institute of Engineering & Technology, Dahegaon, Kalmeshwar Road, Nagpur-441501*

[3] *Head of the Department, First year, Guru Nanak Institute of Engineering & Technology, Dahegaon, Kalmeshwar Road, Nagpur-441501*

***satish_ragit@yahoo.com; satishchandra@thapar.edu***

***Abstract:*** *The main aim of this paper is to study the optimization, performance and emission characteristics of WCOME. The Transesterification of WCO with methanol has been studied in the presence of various catalyst i.e. sodium hydroxide and potassium hydroxide .The optimization of experimental parameters was established to gain 95% WCOME. The final properties of WCOME like density, viscosity, pour point, cloud point, flash point, fire point and C.V. were evaluated by ASTM standards and were found to be comparable to ASTM standards for diesel. The most recommended WCME blended ratio 5 to 20% for better engine performance and emission characteristics were used. The performance and emission indicators such as brake power , BTE ,EGT ,BSFC ,$NO_x$ ,CO,$CO_2$,HC and smoke opacity have been estimated for 5%,10% and 20% blend are compared to diesel fuel. The results of experiment shows that BSFC increases with use of biodiesel however BSEC decreases with increase in blend percentage. CO and HC emissions were reduced for biodiesel. But NOX emission increases at B20 blend by50% from (B5, B10 and B20). This work discovered that waste cooking methyl esters can be used in CI engine as a replacement of diesel fuel.*

***Keywords: Trans esterification; Waste cooking oil methyl ester, Performance; Exhaust emission.***

**Nomenclature**

WCOME- Waste cooking oil methyl esters DI- Diesel engine

CN- Cetane number BP- Brake power CV- Calorific value

CO- Carbon monoxide NOx-Oxides of nitrogen HC- Hydrocarbons $CO_2$- Carbon di-oxide

BSFC- Brake specific fuel consumption BSEC- Brake specific energy consumption EGT- Exhaust gas temperature

BTE- Brake thermal efficiency PM- Particulate matter

# Chapter 10

# Impact of Communication Skills of a Teacher and Its Role in the Development of the student's Academic Success

**Prof. Shammina Siddique[1], Dr. Hemant Hajare[2], Pranali Kharwade[3], Fouziya Ansari[4], Vijay Tayde[5]**

*[1,3,4,5] Assistant Professor, Guru Nanak Institute of Engineering & Technology, Dahegaon, Kalmeshwar Road, Nagpur-441501*
*[2] Professor& Principal, Guru Nanak Institute of Engineering & Technology, Dahegaon, Kalmeshwar Road, Nagpur-441501*

***Abstract:*** *Basically the current study sought to assess the perception of students regarding the role of teacher communication skills in their academics success. Comprehensive questionnaire carrying information including social economic and demographic aspects of the study was designed by the researcher to achieve the set objectives. All those Engineering Colleges of Nagpur. where sports sciences & education programs were offering were taken as population of the study. The empirical data regarding the role of a teacher communication skills in students' academic success were obtained from (418, thirty percent 30 from each university) samples of 14 Engineering Colleges of Nagpur. The data was collected from the respondents through personally contact and by using the developed scale. After collection of data, the data was finally classified in the form of tables and regression was employed for the analysis of data. After analysis of data the researcher arrived at conclusion that teacher communication skills have significant role in the academic achievement of the students. Keywords: Communication Skills, Students Academics, Nagpur.*

## REFERENCE

**1. Study Background:** Communication skills can be defined as the transmission of a message that Communication skills can be defined as the transmission of a message that involves the shared understanding between the contexts in which the communication takes place (Saunders and Mills, 1999). In addition, teacher communication skills are important for a teacher in delivery of education to students (McCarthy and Carter,2001).

Communication skills involve listening and speaking as well as reading and writing. For effective teaching a teacher need to be highly skilled in all these areas. Teacher with good communication always make the things easier and understandable (Freddie Silver). Effective communication skills are really important for a teacher in transmitting of education, classroom management and interaction with students in the class. Teacher has to teach the students having different thinking approaches. To teach in accordance with the ability and capability of the students a teacher need to adopt such skills of communication which motivate the students toward their learning process (Sng Bee,2012).

Good communication skills of teacher are the basic need of academics success of students, and professional success of life. Teacher communicates more instructions orally in classroom to students. Teacher with poor communication skills may cause failure of students to learn and promote their academics. Student need to understand that what is right, and what is wrong while it totally depend upon the communication skills of teachers which he adopt in class-room (Sherwyn P. Morreale, Michael M. Osborn Judy c. Pearson, 2000). Good communications minimize the potential of unkind feeling during the process of teaching. For learning the learner must be attentive toward their

# Chapter 11

# Heat Transfer Study of Synthetic Air Jet for Effective Cooling

**Shyamali Thakare[1], Vijay Tayde[2], Sadaf Gauhar[3], Satishchandra Ragit[4], Shraddha Dudankar[5]**

*[1,2,5]Assistant Professor, [3] Head of the Department , [4] Associate Professor,*
*Guru Nanak Institute of Engineering & Technology, Dahegaon, Kalmeshwar Road, Nagpur-441501*

*shyamalithakare@gmail.com*

***ABSTRACT:*** *Synthetic jet is a relatively new technique which synthesizes stagnant air to form a jet resulted from periodic oscillations of a diaphragm in a cavity. Synthetic jet actuator is composed of a closed cavity with one end covered by electromagnetic actuator and a circular orifice at other end. Usually the jet is formed due to the entrainment of the vortex pairs which are rotating in opposite direction and formed at the edges of the orifice. They have promising application in various fields such as jet vectoring, electronics cooling, and boundary layer separation. In present work the synthetic jet is driven by acoustic speaker for the impingement of jet on the heated surface. The temperature distribution across the heated surface is measured with the help of infrared thermal camera. The local heat transfer study of synthetic jet for effective cooling on flat surface in terms of Nusselt number and Heat transfer coefficient by varying parameters such as excitation frequency (60 Hz to 180 Hz), axial distance between target plate and orifice plate (Z/d= 1 to 12) with maintaining constant ratio of cavity length to cavity diameter is equal to unity, i.e. L/D=1throughout work*

*The results show that at 160Hz frequency for the axial distance and diameter ratio in between of 5-6, the cooling is very effective. The Nusselt number is peak at stagnation point for all frequencies and attenuates monotonically in the radial direction. The results are expected to be helpful for the development and designing of the synthetic jet.*

## INTRODUCTION

Nowadays in the present world, there is a great demand for the electronic devices which are compact in size, occupying less space in system etc. This in turn poses a serious challenge in cooling the electronic devices due to the increase in heat generation coupled with the limited heat removal surface area. Thermal issues exist over a wide range of power dissipation levels from handheld devices that dissipate a few Watts to high-performance microprocessors dissipating over 100W. The engineers came up with some solutions like Heat sinks, forced air cooling (fans), heat pipes which are traditional cooling methods. But still they have some drawbacks, such as the heat sinks needs to have smooth and flat surface for better heat dissipation, which costs more for fabrication; forced air cooling (fan) requires more space in the system; heat pipes are hollow metal tubes which contains thermal liquid in it, which has got the chances of damaging the system. To overcome these drawbacks, synthetic jet can be potentially used for cooling applications.

The local heat transfer characteristics of impingement of a synthetic air jet are studied in this work. Impinging synthetic air jets can be used to transfer heat in diverse applications, which may vary from the cooling of a manufacturing process to the thermal management of electronics, in particular microprocessors, graphic cards etc. While these steep cooling requirements have prompted the study and development of synthetic air jets. It is well known that a jet generates sound, conversely the opposite is also true: sound can generate jets. This phenomenon is known as acoustic streaming.

# Chapter 12

# Analysis of Hardness and Alkalinity in Water

**Switi R. Maske[1], Pranali P Kharwade[2], Sadaf Gauhar [3], Dr.Hemant Hajare[4], Prof. Deepa M. Dashottar[5]**

*[1,2,3] Department of Applied-Sciences & Humanities, [4] Professor & Principal, Guru Nanak Institute of Engineering & Technology, Nagpur-441501, India*

*maskeswiti@gmail.com*

**ABSRACT:** *This study presents a comprehensive analysis of hardness and alkalinity in water samples, aiming to evaluate their significance in water quality assessment and management. Hardness, primarily attributed to calcium and magnesium ions, and alkalinity, characterized by bicarbonate, carbonate, and hydroxide ions, are fundamental parameters influencing water chemistry and its suitability for various applications. The research employs a combination of experimental measurements and theoretical frameworks to investigate the relationships between hardness and alkalinity in diverse water sources. It explores the sources, distribution, and potential impacts of these parameters on ecosystems, infrastructure, and human health. Furthermore, the study discusses analytical methods for quantifying hardness and alkalinity, addressing their complexities and limitations. It also examines the interplay between these parameters and other water quality indicators, such as pH, conductivity, and total dissolved solids, to provide a holistic understanding of water chemistry dynamics. this research contributes to advancing knowledge in the field of water quality assessment and management by offering insights into the complexities of hardness and alkalinity dynamics. The findings provide valuable information for policymakers, water resource managers, and stakeholders involved in safeguarding water supplies and promoting environmental sustainability. Experimental Determination: The experimental determination of hardness and alkalinity in water samples involves several standardized laboratory procedures. These methods are designed to accurately quantify the concentration of calcium, magnesium, carbonate, and bicarbonate ions, which collectively contribute to hardness and alkalinity. Below, we outline the steps involved in the analysis of these parameters:*

## INTRODUCTION:

Water is an indispensable resource essential for sustaining life, supporting ecosystems, and driving economic activities worldwide. However, the quality of water can vary significantly due to natural processes, anthropogenic activities, and environmental factors. Among the multitude of parameters used to characterize water quality, hardness and alkalinity play pivotal roles in determining its suitability for various purposes. Hardness, defined as the concentration of dissolved minerals, predominantly calcium and magnesium ions, influences water's physical and chemical properties. It can affect the taste, odor, and appearance of water, as well as the performance and lifespan of infrastructure and appliances. Alkalinity, on the other hand, refers to water's capacity to neutralize acids, primarily attributed to bicarbonate, carbonate, and hydroxide ions. Alkalinity acts as a buffering system, helping to stabilize pH levels and mitigate fluctuations in acidity. Understanding the interplay between hardness and alkalinity is crucial for assessing water quality, identifying sources of contamination, and implementing effective management strategies. Elevated levels of hardness and alkalinity can pose challenges for various water-dependent sectors, including agriculture, industry, and public health. Moreover, their impacts extend beyond technical considerations to encompass ecological integrity, social equity, and sustainable development.

This study aims to provide a comprehensive analysis of hardness and alkalinity in water samples, encompassing their sources, distribution, analytical methods, and implications for water quality management. By examining the spatial and

# Chapter 13

# Comparison of Artificially Rough Surface with the Smooth Surface Solar Air Heater Using FEA

**Vijay Tayde[1], Shyamali Thakre[2], Dr. Satishchandra Ragit[3], Dr. Hemant Hajare[4], Switi R. Maske[5]**

*[1,2,3] Department of Applied-Sciences & Humanities, [4] Professor & Principal,*
*Guru Nanak Institute of Engineering & Technology, Dahegaon, Kalmeshwar Road, Nagpur-441501*

***Abstract:*** *Usually, conventional solar air heater has very low thermal performance due to the smooth absorber plate offers low convective heat transfer to moving air, leading to high heat losses to atmosphere. The working of solar air heater may be improved via mainly two methods: 1. reducing the top heat losses to atmosphere, 2 increasing the convective heat transfer coefficients at absorber plate. Second methods is the most common due to its extensive applicability*

*A Finite Element Analysis of artificial roughness geometry of V rib type in the absorber plate of solar air heater duct has been carried out and compared with smooth duct. A comparative Finite element analysis has been carried out for air at different velocity (inlet) and temperature of fluid for both absorber plate surfaces. The outcomes of the present Finite Element analysis represents the artificial roughened surface is more suitable then the flat plate surface solar air heater.*

*The objective of the present study is to make the comparative study of flat surface solar air heater with an artificially roughened surface solar air heater on the basis of*

*Varying fluid inlet temperature*

*Varying fluid inlet velocity*

***Key words; artificial roughness, solar air heater, heat transfer co-efficient, FEA etc.***

## 1. Introduction

### 1.1 General

In the present world, the prosperity of a nation is measured by the energy consumption of that nation and the GDP of a country is directly linked with energy consumption. Therefore, the demand for energy resources is increasing day by day. There are various forms of energy resources, but they are divided into two main forms, renewable energy resources (solar, air, wind)and non-renewable energy resources (coal and petroleum). The industrial growth is accelerated by non-renewable energy resources, but the stock is limited in nature. The rapid depletion of fossil fuel resources has necessitated and urgent need for alternative energy sources in order to meet the energy demand of the immediate future and the generations to come. Among them any alternatives, solar energy stands out as the brightest and long range promise towards meeting the continually increasing demand for energy.

A solar thermal collector is a heat exchanger that converts radiant solar energy into heat. In essence this consists of a receiver that absorbs the solar radiation and then transfers the thermal energy to a working fluid. Because of the nature of the radiant energy (its spectral characteristics, its diurnal and seasonal variability, changes in diffuse to global fraction,

# Chapter 14

# Exploring group theory: A comprehensive analysis

**Fouziya Gulshan Ansari[1],Deepa Dashottar[2], Sadaf Gauhar[3],Shraddha Dudankar[4] , Satishchandra Ragit[5]**

*Assistant Professor, Guru Nanak Institute of Engineering & Technology, Dahegaon, Kalmeshwar Road, Nagpur-441501*

***fouziyagulshan@gmail.com***

***ABSTRACT**: Group theory is a fundamental branch of mathematics with profound applications in a variety of fields, including physics, chemistry, mathematics, and computer science. This comprehensive analysis explores complex concepts and structures in group theory, with the goal of making them comprehensible to both novice students and experienced mathematicians.The analysis begins by introducing the basic principles of group theory and explaining the basic definitions of groups, subgroups, and group activities. We explore advanced concepts such as group homomorphism, isomorphism, and secondary classes, explaining their importance in the study of symmetry and abstract algebra.In addition, this analysis classifies finite groups as spherical groups, symmetric groups, and dihedral groups to show their characteristics and properties. The composition of change teams are explored, showing their role in change puzzles and integration problems.The analysis also explores the use of group theory in fields from quantum mechanics to text, highlighting its important role in understanding symmetries, transformations, and algebraic structures.Through a thorough examination of theoretical concepts and practical applications, this analysis aims to provide an overview of group theory and promote a deeper understanding of its elegance and utility in mathematics and beyond.*

***Keywords: Group theory, Abstract algebra, Symmetry, Group operations, Group homomorphisms, Isomorphisms, Subgroups, Cosets, Finite groups, Classification of groups, Cyclic groups, Symmetric groups, Dihedral groups, Permutation groups, Combinatorial problems, Quantum mechanics, Cryptography, Algebraic structures, Mathematical applications, Theoretical analysis.***

## INTRODUCTION

Group theory is a central branch of mathematics that investigates symmetries, transformations, and algebraic structures of mathematical objects. Beginning as the study of the symmetries of geometric figures, group theory has become a powerful tool with many applications in various scientific fields, including physics, chemistry, geometry, and computer science. This introduction aims to provide an overview of the real landscape of group theory, from basic concepts to various applications.

At its core, group theory examines the properties and relationships of mathematical structures called groups. A group is a set with binary functions that satisfy certain axioms: closure, associativity, existence of identity elements, and reversibility. These axioms cover the concepts of symmetry and transformation in a mathematical framework, allowing the rigorous study of abstract algebraic structures.

Group theory also supports new encryption techniques, providing a mathematical framework for secure communications and data encryption. Cryptographic protocols use properties of parties to ensure confidentiality, integrity, and reliability in digital communications and communications.

# Chapter 15

# Navigating New Horizons: The Impact of the National Education Policy on Higher Education in India

**Dr. Hemant Hajare**
*Professor& Principal, Guru Nanak Institute of Engineering & Technology Nagpur, Maharashtra,India -441501,*
*hemanthajare@rediffmail.com*

**Dr. Sadaf Gauhar Mohd. Mushtaque**
*Associate Professor, Department of Applied Sciences & Humanities, Guru Nanak Institute of Engineering & Technology Nagpur, Maharashtra,India -441501,*
*sadafgauhar25@gmail.com*

**Prof. Firdous Sadaf Mohd. Ismail**
*Assistant Professor, CSE-Cyber Security, Shri Ramdeobaba College of Engineering & Management, Nagpur, Maharashtra, India-440013*
*firdoussadaf2810@gmail.com*

**Dr. Satishchandra Ragit**
*Assistant Professor, Department of Applied Sciences & Humanities, Guru Nanak Institute of Engineering & Technology Nagpur, Maharashtra,India -441501,*
*firdoussadaf2810@gmail.com*

**Prof. Shammina Siddique**
*Assistant Professor, Department of Applied Sciences & Humanities, Guru Nanak Institute of Engineering & Technology Nagpur, Maharashtra,India -441501*

*successeducation66@gmail.com*

***ABSTRACT**: The National Education Policy (NEP) of India, introduced in 2020, marks a significant turning point in the landscape of higher education in the country. Aimed at overhauling and revitalizing the Indian educational framework, the NEP seeks to address longstanding challenges while introducing innovative strategies to foster a more holistic, flexible, and multidisciplinary approach to higher education. This paper explores the transformative potential of the NEP on India's higher education sector, analyzing its implications for institutional governance, curriculum, pedagogy, assessment methods, and equity in access to education. Through a comprehensive review of the NEP's key propositions, such as the move towards a more multidisciplinary undergraduate education with multiple exit options, the establishment of the Academic Bank of Credits (ABC), and the emphasis on critical thinking and creativity, the paper assesses the policy's capacity to enhance the quality, accessibility, and global relevance of higher education in India. Furthermore, it delves into the challenges of implementing such sweeping reforms, including infrastructural constraints, the need for faculty development, and ensuring inclusivity across diverse socio-economic and geographical landscapes. Employing a mixed-methods approach, combining policy analysis, stakeholder interviews, and case studies, the paper provides insights into the early impacts of the NEP on higher education institutions (HEIs) and outlines the prospects for fostering an education system that is more aligned with the needs of the 21st-century economy and society. It concludes with recommendations for policymakers, educators, and institutions on navigating the transition towards the envisioned*

# Chapter 16

# Nanoparticles: Properties, Applications and Toxicities

**Prof. Shraddha Dudhankar, Prof. Sadaf Gauhar, Dr. Hemant Hajare, Prof. Pranali Kharwade, Prof. Switi Maske**

*Assistant Professor, Gurunanak institute of Engineering & Technology*
*Dahegaon, Kalmeshwar road, Nagpur Pin- 441501*

***Shraddhadudhankar1995@gmail.com***

***Abstract*** *-This review is provided a detailed overview of the synthesis, properties and applications of nanoparticles (NPs) exist in different forms. NPs are tiny materials having size ranges from 1 to 100 nm. They can be classified into different classes based on their properties, shapes or sizes. The different groups include fullerenes, metal NPs, ceramic NPs, and polymeric NPs. NPs possess unique physical and chemical properties due to their high surface area and nanoscale size. Their optical properties are reported to be dependent on the size, which imparts different colors due to absorption in the visible region. Their reactivity, toughness and other properties are also dependent on their unique size, shape and structure. Due to these characteristics, they are suitable candidates for various commercial and domestic applications, which include catalysis, imaging, medical applications, energy-based research, and environmental applications. Heavy metal NPs of lead, mercury and tin are reported to be so rigid and stable that their degradation is not easily achievable, which can lead to many environmental toxicities.*

***Keywords - Nanoparticles, Fullerenes, Optical, Plasmonic, Toxicity***

## INTRODUCTION

Nanotechnology is a known field of research since last century. Since "nanotechnology" was presented by Nobel laureate Richard P. Feynman during his well famous 1959 lecture "*There's Plenty of Room at the Bottom*" (Feynman, 1960), there have been made various revolutionary developments in the field of nanotechnology. Nanotechnology produced materials of various types at nanoscale level. Nanoparticles (NPs) are wide class of materials that include particulate substances, which have one dimension less than 100 nm at least. Depending on the overall shape these materials can be 0D, 1D, 2D. The importance of these materials realized when researchers found that size can influence the physiochemical properties of a substance e.g. the optical properties. A 20-nm gold (Au), platinum (Pt), silver (Ag), and palladium (Pd) NPs have characteristic wine red color, yellowish gray, black and dark black colors, respectively. Fig. 1 shows an example of this illustration, in which Au NPs synthesized with different sizes. These NPs showed characteristic colors and properties with the variation of size and shape, which can be utilized in bioimaging applications. As Fig. 1 indicates, the color of the solution changes due to variation in aspect ratio, nanoshell thickness and % gold concentration. The alteration of any of the above discussed factor influences the absorption properties of the NPs and hence different absorption colors are observed.

# Chapter 17

# Credit Card Fraud Detection Using Machine Learning

**Dr. Kalpana Malpe, Dr. Balram Timande, Prof.Snehal Patil, Dr. Hemant Hazare, Prof. Veena Gajbhiye**

*Assisstant Professor, Guru Nanak Institute of Engineering & Technology Dahegaon, Nagpur-441501*

***ABSTRACT***-*Credit card frauds are easy and friendly targets. E-commerce and many other online sites have increased the online payment modes, increasing the risk for online frauds. Increase in fraud rates, researchers started using different machine learning methods to detect and analyse frauds in online transactions. The main aim of the paper is to design and develop a novel fraud detection method for Streaming Transaction Data, with an objective, to analyse the past transaction details of the customers and extract the behavioral patterns. Where cardholders are clustered into different groups based on their transaction amount. Then using sliding window strategy [1], to aggregate the transaction made by the cardholders from different groups so that the behavioral pattern of the groups can be extracted respectively. Later different classifiers [3],[5],[6],[8] are trained over the groups separately. And then the classifier with better rating score can be chosen to be one of the best methods to predict frauds. Thus, followed by a feedback mechanism to solve the problem of concept drift [1]. In this paper, we worked with European credit card fraud dataset.*

***Keywords***-*Card-Not-Present frauds, Card-Present-Frauds, Concept Drift*

## INTRODUCTION

Nowadays Credit card usage has been drastically increased across the world, now people believe in going cashless and are completely dependent on online transactions. The credit card has made the digital transaction easier and more accessible. A huge number of dollars of loss are caused every year by the criminal credit card transactions. Fraud is as old as mankind itself and can take an unlimited variety of different forms. The PwC global economic crime survey of 2017 suggests that approximately 48% of organizations experienced economic crime. Therefore, there's positively a necessity to unravel the matter of credit card fraud detection. Moreover, the growth of new technologies provides supplementary ways in which criminals may commit a scam. The use of credit cards is predominant in modern day society and credit card fraud has been kept on increasing in recent years. Huge Financial losses have been fraudulent effects on not only merchants and banks but also the individual person who are using the credits. Fraud may also affect the reputation and image of a merchant causing non-financial losses that. For example, if a cardholder is a victim of fraud with a certain company, he may no longer trust their business and choose a competitor. Fraud Detection is the process of monitoring the transaction behavior of a cardholder to detect whether an incoming transaction is authentic and authorized or not otherwise it will be detected as mich in a plame system, we are applying the random forest algorithm for classifying the credit card dataset Random Forest is an associate in the nursing algorithmic program for classification and regression. Hence, it is a collection of decision tree classifiers. The random forest has an advantage over the decision ree as it corrects the habit of over fitting to their training set. A subset of the training set is sampled randomly so that to train each individual tree and then a decision tree is built, each node then splits on a feature designated from a random subset of the complete feature set. Even for large data sets with many features and data instances, training is extremely fast in the random forest and because each tree is trained independently of the others. The Random Forest algorithm has been found to provide a good estimate of the generalization error and to be resistant to overfitting.

# Chapter 18

# Development of Smart Assistant for Visually Impaired People

**Prof.Snehal Patil, Prof. Mayuri Shrungare, Dr. Balram Timande, Prof. Abhishek Bambal, Prof. Shubhangi Ghadinkar**

*Assisstant Professor, Guru Nanak Institute of Engineering & Technology, Dahegaon, Nagpur-441501*

***ABSTRACT:*** *As we all know it is pretty difficult for a visually impaired person to use a mobile phone to perform basic tasks such as calling, messaging etc. Most of them usually use inbuilt features such as Talkback to perform these hanctions. But at times this can be very time consuming and is abur not much efficient: Also these features make use of hand gestures that can be confusing for a naive user. The best solution to this can be a Virtual Assistant that completely works with voice as input as well as voice as output. The blind person then will not be dependent on the touching the screen as he will have to completely control the mobile phone with his voice.*

## INTRODUCTION

We all have heard about Smart Assistant such as Apple's Siri, Google Assistant, and Amazon's Alexa etc. that help us to interact with phone over voice and can perform tasks according to the user. They can also he called as Virtual Personal Assistant. Basically they all work on the concept of Machine Learning and Natural Language Processing. These assistants can help a blind user open an application but he/she will not be able to use the assistant to control the function of the application AN INTE TECHNOLOGY

The main purpose of our project is to create an assistant that can interact with a blind person over voice and should perform actions based on the commands given by them. Initially our project will allow the user to read and compose emails and have a chat with the assistant.

**Problem Statement & Objectives**

The visually challenged people find it very difficult to access the technology because of the fact that using them requires visual perception. Even though many new advancements have been implemented to help them use the computers efficiently no naïve user who is visually challenged can use this technology as efficiently as a normal naïve user can do that. Unlike normal users they require some practice for using the available technologies.

Main objectives of this project are as follows:

To assist them in reading mails.

To help them compose mails.

To make the interaction hands free.

To avoid the use of buttons.

To make use of voice commands.

## ACCESSIBILITY APPLICATIONS

The current development of Mobile computing technologies provides assistive technologies which increase user's quality of life. It is providing best working environment to implement a specialized software or hardware for own problems. User can develop an application for difference purposes such as general purpose computing. advanced sensor systems, crow sourcing and data integration and many more. These assistive technologies also used to develop application for visually impaired users [15]. The most popular Mobile Operating Systems, Android and iOS has been implementing various mobile applications for blind people with unique features [17]. Each mobile app has to be used by all types of users who also having impaired problems such as vision, color blindness, hearing, dexterity, cognitive disabilities and

# Chapter 19

# Smart Dustbin for Dry and Wet Waste with Integrated android Application

**Prof. Veena Gajbhiye, Prof.Snehal Patil , Dr. Balram Timande, Prof. Shubhangi Ghadinkar, Dr. Hemant Hazare**

*Assisstant Professor, Guru Nanak Institute of Engineering & Technology, Dahegaon, Nagpur-441501*

***ABSTRACT:*** *The main objective of the project is to design a smart dustbin which will help in keeping our environment clean and also Eco friendly. We are inspired from "Swach Bharat Mission". Nowadays technologies are getting smarter day-by-day so, as to clean the environment we are designing a smart dustbin by using Arduino. This smart dustbin management system is built on the microcontroller based system having ultrasonic sensors, Buzzer for alarms system, Gas sensors etc. on the dustbin. If dustbin is not maintained than these can cause an unhealthy environment and can cause pollute that affect our health. In this proposed technology we have designed a smart dustbin using ARDUINO UNO, along with ultrasonic sensor, servo motor. and battery jumper wire. After all hardware and software connection, now Smart Dustbin program will be run. Dustbin lid will when someone comes near at some range than wait for user to put garbage and close it. It's properly running or not. For social it will help toward health and hygiene, for business for we try to make it affordable to many as many possible. So that normal people to rich people can take benefit from it.*

## INTRODUCTION

Garbage and disease are pervasive problems that we face today. Everyone desires clean and tidy surroundings, but not every individual is aware of the environmental problems caused by a large amount of garbage scattered on the streets. One of the primary reasons for this problem is the lack of proper maintenance of the dustbins provided by the government facilities. These bins are often dirty and unattractive, leading people to avoid using them. The manual process of opening and closing the bin lids is also inconvenient, further discouraging proper garbage disposal.

The increasing population in our country has led to an increase in the amount of garbage generated, exacerbating the environmental issues we face. Dustbins are containers designed to collect and store garbage, whether recyclable or non-recyclable, decomposable or non- decomposable. They are commonly used in homes, offices, and other public areas. However, when these bins are full, they are often left unattended, causing garbage to spill out and pollute the surrounding area. This creates a conducive environment for the spread of harmful bacteria and viruses that can cause life-threatening diseases in humans.

In recent years, several cities around the world have started implementing smart dustbins to address these issues. A smart dustbin is a type of garbage bin that is equipped with sensors and connected to the internet, making it capable of automatically detecting and segregating waste. These dustbins use various technologies such as sensors, cameras, and machine learning algorithms to detect the type and quantity of waste being disposed of, and then sort them into appropriate compartments.

To address these issues, a smart dustbin has been designed with two compartments - one for dry waste and the other for wet waste. This smart dustbin utilizes NODEMCU and ultrasonic sensors to detect the level of waste in the bin. When the bin reaches a certain level, the sensors trigger an alert, indicating that it's time to empty the bin. This alert is sent to the designated person in charge of collecting the garbage, who can then empty the bin promptly. The smart dustbin is an innovative solution that not only improves the efficiency of waste collection but also reduces the environmental impact of waste disposal.

# Chapter 20

# Blood Vessel Molecular Segmentation and Analysis in Retinal Images using Image Processing

**Prof. Mayuri Shrungare, Dr.Balram Timande, Prof. Snehal Patil, Prof. Shubhangi Ghadinkar, Prof. Veena Gajbhiye**

**Introduction**

Retinal vessel segmentation algorithms are a fundamental issue of automated retinal sickness screening structures. This work examines the blood vessel segmentation methodologies in two dimensional retinal pix acquired from a fundus camera and a survey of techniques is offered. The aim of this paper is to review, examine and categorize the retinal vessel extraction algorithms, strategies and methodologies, giving a quick description, highlighting the important thing points and the performance measures. We intend to present the reader a framework for the existing research; to introduce the range of retinal vessel segmentation algorithms; to speak about the modern trends and destiny guidelines and summarize the open issues. The performance of algorithms is as compared and analyzed of retinal pics using some of measures which include accuracy, actual high quality fee, fake wonderful price, sensitivity, specificity and vicinity below receiver working feature (ROC) curve.

**Characteristics**

Nowadays, many segmentation methods rely on device learning concepts blended with traditional segmentation techniques for reinforcing the segmentation accuracy in their method by supplying a statistical analysis of the facts to support segmentation algorithms. These system learning standards may be broadly categorized into unsupervised and supervised techniques, based totally on the usage of labelled education facts. In a supervised approach, each pixel within the photo is labelled and assigned to a category via a human operator, i.E., vessel and non-vessel. A collection of feature vectors is generated from the information being processed (pixel-smart features in photo segmentation issues) and a classifier is skilled by way of the use of the labels assigned to the statistics. In an unmanaged technique, predefined feature vectors without any magnificence labels are used wherein comparable samples are accrued in wonderful classes. This clustering is primarily based on some assumptions approximately the structure of the enter facts, i.e., two training of input records wherein the characteristic vectors of every magnificence are similar to each other (vessel and not vessel). Based at the problem, this similarity metric may be complicated or described by means of a easy metric along with pixel intensities.

**.Objective**

- The purpose of this Project is to provide a comprehensive overview for retinal vessels segmentation techniques.
- Firstly, a brief introduction to retinal fundus photography and imaging modalities of retinal images is given.
- Then, the preprocessing operations and the state of the art methods of retinal vessels identification are introduced.
- Moreover, the evaluation and validation of the results of retinal vessels segmentation are discussed.
- Finally, an objective assessment is presented and future developments and trends are addressed for retinal vessels identification techniques.

1. Image pre-processing steps are applied to get accurate result.

# Chapter 21

# Analyzing Rice Seed Quality Using Machine Learning

**Dr.Kalpana Malpe, Dr. Hemant Hazare, Prof. Sandip Lanjewar, Prof. Snehal Patil, Prof. Mayuri Shrungare**

***ABSTRACT***

*Rice grain quality inspection is a major process in rice production. To provide quality and accurate results in rice grain analyzing it is important to analyze rice grains one by one in a testing sample. In the current situation, most of rice grain producers inspect rice grains manually without using any automated process. The major problem is the accuracy of testing results depends on human quality because manually processes include human errors. The manual inspection of rice grains is a very complicated and time-consuming process due to these reasons most of the inspector's effect by external factors such as fatigue, tension etc. In this research, we provide a time-efficient and low-cost solution for reducing above-mentioned limitations by developing software. It uses modern image processing to analyze rice grains one by one efficiently over the manual examination. The quality of rice samples can be determined with the help of colour, and geometric features such as area, maximum length, maximum width and aspect ratio. This analyzing system designed and developed for measure area, maximum length, maximum width and aspect ratio by using Java programming language, morphological and colour operations in computer vision and finally the accuracy of the system tested by comparing manually tested sample and results from the system. According to the results, it shows this system provides more than 85 percent accuracy with confirming this was a better solution.*

***Keywords—image processing, rice grain quality***

## INTRODUCTION

**1.1 Background** Agriculture industry is one of the oldest and most widespread industry which has spread all over globe Rice is the most important agriculture plant for many countries. To identify rice seeds quality, the most important factor is purity of rice seeds. The best seeds can produce best rice quality. The quality of rice is mostly depending on seeds quality. Identifying quality of rice by human eyes are very difficult and time consuming. Rice quality is a combination of chemical and physical characteristics. Physical characteristics of rice are grain size & shape, chalkiness, whiteness, milling degree, bulk density, moisture content etc. Chemical characteristics of rice are amylose content, gelatinization temperature, gel consistency. The proposed system represents the solution of grading & evaluation of rice quality on the basis of grain rice shape and size. For identifying this we are using image processing technique. Specifically edge detection algorithm is used to find out the region of boundaries of each grain. In this technique we find the endpoints of each grain and after using calliper we can measure the length and breadth of rice. These techniques can help to save time, effort and cost.

**1.2 Aims and Objectives** The main objective of project is to develop computer software which can identify rice seeds quality by using image processing technique. For that we need to collect many rice images by using image processing technique, which can help to identify rice quality. The aim of the project is to find proper solution for analyzing quality of rice in less time and cost. Many researchers have found that for the half of the world population main food is rice. So, quality of rice grain is very important for healthy life. The rice grains are classified in various physical properties like size, color, texture and quality. Image processing technique is one of the most advanced & significant technological area where farmers can identify rice seeds quality by their naked eyes. This technique also helps them to take experience about variety of rice seeds. Analysing Rice Seed Quality using Machine Learning

# Chapter 22

# Smart Mirror (Intelligent Integrate Hardware with User Interface)

**Dr. Sushma Telrandhe, Prof. Snehal Patil, Dr. Balram Timande, Prof. Shubhangi Ghadinkar, Prof. Abhishek Bambal**

**Introduction:-**

In the ever-evolving landscape of technology, the convergence of the physical and digital worlds has given rise to innovative solutions that transcend traditional boundaries. Among these, smart mirrors emerge as a compelling fusion of reflective surfaces and interactive technologies, promising transformative applications across various domains. This research proposal seeks to explore the uncharted territories of smart mirrors, investigating their design, user interactions, and potential contributions to diverse sectors.

The purpose of this independent study project was for us to learn about and experience creating deliverable software products, and being able to create and integrate hardware with a user interface. Our team will learn how to pull information from an RSS feed (for UWB calendar events) and various APIs using JSON Objects (for weather, bus schedule, traffic conditions/incidents) that is displayed on a LCD screen. GPIO motion sensors are used to "swipe" between different modules.

We used a Raspberry Pi 4 to power our product. The small, portable design of the Pi is perfect for our purpose since we are building a slim casing for the mirror frame. It is also an affordable and powerful tool. We are using two Ultrasonic Module Distance GPIO Sensors to navigate between modules in our program. These work much better because they measure at what distance the interruption (activator) happens. This way, we can say any interruptions within 1 inch of the sensor will trigger the right or left sliding module (depending on which sensor was triggered.) For the main piece of hardware, we are using an LCD TV monitor. We are the using an HDMI out on the Raspberry Pi to display it our software GUI. With all the unforeseen circumstances, we have decided to make this a display and not include the mirror-like film on the display just yet. After adding all of the other modules, the mirror film makes a lot of the information hard to read on the display and we would rather have more functionality than the originally intended aesthetic.

**Migration Patterns:**

The changes we made to the project from what we completed last quarter include both software and hardware changes. We changed the overall basis of the GUI and optimized it with a different API. In the beginning, we were using the JPanel API to display onto the screen but after experimentation with different APIs we later changed to JavaFX due to its simpler format and cleaner output. We also added the other modules that we had originally outlined in our wireframe. This includes the traffic information, using the Google Maps API, which displays the congested traffic areas/incidents (such as car accidents and construction routes) near campus. This page also shows a longer, written list of hazards to avoid on the roadways. Another added module is the bus schedule which shows when each bus is supposed to arrive on campus. The final module that we added this quarter is the school events page. This page displays a list of upcoming events on UWB's campus, taken from the UWB Trumba calendar RSS feed. As for hardware, we added three more sensors, for a total of four, for switching between different modules: Go left, go right, scroll up, scroll down.

# Chapter 23

# Real Time Fault Detection Protection System Using Iot

**Prof. R.M.Bhombe , Prof. Diksha Khare, Prof. Akshay Pilewan , Prof. Saurabh Bagde, Prof. Milind Rode**

*Assistant professor, Department of Electrical Engineering, GNIET, Nagpur, India – 440051*
*Guru Nanak Institute of Engineering and Technology, Nagpur*

***Abstract-*** *An embedded system is a combination of software and hardware to perform a dedicated task. Some of the main devices used in embedded products are ADC and Microcontrollers. Microprocessors are commonly referred to as general purpose processors as they simply accept the inputs, process it and give the output. In contrast, a microcontroller not only accepts the data as inputs but also manipulates it, interfaces the data with various devices, controls the data and thus finally gives the result. The project GSM Based Embedded System for Transmission Line Monitoring and Control System using according to the instructions given by the above said microcontroller*

## INTRODUCTION

The time complicated interlocking and operation controlling requirements usually noticed in the transmission Line working which lead to necessity of automation of the undergoing process. In this respect, transmission line automation which is the creation of a highly reliable, self healing power system that rapidly responds to real time events with appropriate actions ensures to maintain uninterrupted power services to the substations. In overall electrical power system, more than 80% faults occur in transmission line. In this project, the design and implementation of fault detection, classification and protection technique of transmission line are present. When an electrical network, machines and equipments are in operating condition then they suffered by a different types of faults. Whenever the faults occur, the characteristic values of the transmission line may get change from real existing values to another values until the networks such as lightning, wind, storm, tree falling on line, apparatus failure etc. In our proposed system, the phase voltages and phase current sense by CT & PT and these sensing values are continuously send to the microcontroller. When fault occurred, the insulating path and conducting path get affected which causes the short circuit and open circuit of conductor. During ideal operating condition, the power system equipment operated at normal voltage and current rating. But in faulty condition, the voltage and current values are swing from their reference value. Normally our power system is protected by switch-gear and protection equipments like relays, circuit breaker, fuses to reduce the losses of service due to the electrical failure after the occurrence of faults. Fault: In an electrical power system, a fault or fault current is any abnormal electric current that flows through the line. In three phase system, fault may occur between one or more phases and ground or it may involve only phases. There are two main types of faults: A. Symmetric fault: This fault is also called as balanced fault. It affects all the three phases of transmission line equally. Approximately 5% faults are symmetric, in total transmission line faults. B. Asymmetric fault: This type of faults are unbalanced faults. All the three phases of transmission line does not get affected by asymmetric fault.

## LITEARTURE SURVEY

It is very important to know the effect of series compensation on transmission voltages. If the effect of series compensation on voltages is not known it will cause various operational problems such as high voltages and low voltages. Series compensation can cause low and high voltages due to different line loading conditions and the method by which the voltage control is adjusted. The voltage on the one side of the capacitor should be adequately controlled otherwise the other end of the capacitor cause voltage problems. When the line is lightly loaded, over-voltages can cause

# Chapter 24

# Condition Monitoring of Power Transformer using Fuzzy Logic

**Prof. R.M.Bhombe, Prof. Diksha Khare, Prof. Akshay Pilewan , Prof. Saurabh Bagde,Prof. Milind Rode**

*Assistant professor, Department of Electrical Engineering, GNIET, Nagpur, India – 440051*
*Guru Nanak Institute of Engineering and Technology, Nagpur*

***ABSTRACT:*** *In this project the work done focuses on problem identification due to faults in power transformers during operation by using dissolved gas analysis such as key gas, IEC ratio, Duval triangle techniques, and fuzzy logic approaches. Then, the condition of the power transformer is evaluated in terms of the percentage of failure index and internal fault determination. Fuzzy logic with the key gas approach is used to calculate the failure index and identify problems inside the power transformer.*

*The IEC three-gas ratio is subsequently applied to confirm the problems in different failure types covering all possibilities inside the power transformer. After that, the fuzzy logic system was applied and validated with DGA results of transformers collected from case study with satisfactory accuracy. This fuzzy logic is a smart, accurate tool for automatically identifying faults occurring within transformers.*

***Keywords: Regional Diversity, Mural art, Contemporary Indian mural art***

## INTRODUCTION

The power transformer is a key component in power transmission and distribution systems. During operation, it might be deteriorated by both normal and abnormal conditions, including overloading, aging, and degradation of paper-oil insulation, internal arcing and partial discharge (PD), short circuit, etc. Survey results show damages within power transformers including on-load tap changer (OLTC), winding and iron core, bushing, tank, and other related damages [1]. Therefore, to prevent failure and to maintain the power transformer in the satisfactorily working condition, several traditional and nontraditional diagnostic methods have been performed to assess the condition. The traditional diagnostic methods are dissolved gas analysis, oil quality, power factor testing, winding resistance measurement, turn ratio, and thermography, while the nontraditional diagnostic methods are partial discharge measurement, dielectric spectroscopy, frequency response analysis, tap changer monitoring, and internal temperature measurement[2]. After obtaining the test results from various diagnostic methods mentioned above, the data has been further evaluated to assess the condition of the power transformer.

Most of the methods performed DGA with a simple tool to find out the incipient fault. However, it is inconvenient and time-consuming for industrial applications due to the complex analytical process [3]. Hence, artificial intelligence techniques have been proposed to develop more accurate diagnostic tools based on DGA data. The fuzzy logic method is also an effective method developed to determine the answer, where the boundary is not explicit. It operates by designing the membership function and fuzzy sets appropriated to a specific problem [4]. The most important step is tuning on ranges of the proposed fuzzy sets to obtain the correct answer with logical reason leading to a precise output. Therefore, the fuzzy logic has been adopted for DGA and fault severity analysis in this work [5].

### Objectives

- In this project, the work done is representing the minor and major types of faults that canrise inside power transformer.

# Chapter 25

# Regenerating the Energy from Building Lift

**Prof. R.M.Bhombe, Prof. Diksha KhareProf. Akshay Pilewan , Prof. Saurabh Bagde, Prof. Milind Rode**

*Assistant professor, Department of Electrical Engineering, GNIET, Nagpur, India – 440051*
*Guru Nanak Institute of Engineering and Technology, Nagpur*

**Abstract:** In the new design is used for converting unutilized mechanical energy into electrical energy and it is compactly system. This new design is specific to the regenerate the electrical energy from mechanical energy of the lift which is stored in battery and it will use whenever the light is off, this design is easily compile with the existing system. This design content two rolling part and a reciprocating part which is used to convert circular motion into reciprocating motion and vice versa. When lift is in motion, the mechanical energy converts that's specific system into electrical energy.

***Keywords: Regional Diversity, Mural art, Contemporary Indian mural art***

## INTRODUCTION

An elevator system, elevator providing a self generating power source. The system converts kinetic energy of an elevator cab movement into electrical energy used to regulate the speed of descent. The elevator system can be structured in numerous ways and includes either a generator or a motor in generator mode, driven by a system to the elevator cab. The present invention relates to a self-powered for elevator systems. More particularly, the present invention pertains to the use of the kinetic energy of an elevator cab movement to generate electrical energy to regulate the speed level.

## LITERATURE REVIEW

The literature survey has been pioneered effort in this regard. Various machine design concepts, mechanics, material behavioral properties and CAD/CAE concepts form literatures help to establish comparative study between existing and new experimentation. The terminologies referred from literatures for designing are discussed as follows.

The machine room less lift is to utilize permanent magnet, synchronous gearless drive technology powered by a variable frequency inverter unit matched to the machine to deliver and control the necessary torque throughout the full speed range of the machine provided. All drive equipment is to be mounted in the lift shaft without the need for separate plant Rooms. Where the control panel is required to be mounted outside of the lift shaft.

Lift or elevator is transport devices that are used to move goods or peoples vertically. In this project, the Motorola MC68CH11 A1 microcontroller based lift control system is constructed to simulate as an actual lift in the real life. This project dissertation documents the findings and results of a research on a microcontroller based lift control system. It provides useful information to those who wish to carry out a lift control system research or project.

This paper presents Power Generation for Permanent Magnet Motor Elevator by Energy Regenerative Unit (ERU). The study reveals that permanent magnet motors with rated 5.5 kW in elevators which is working by transferring mechanical

# Chapter 26

# Electricity Generation from Waste Heat Radiated From Machine Using the Thermo Electric Generator

**Prof. R.M.Bhombe , Prof. Diksha Khare, Prof. Akshay Pilewan , Prof. Saurabh Bagde, Prof. Milind Rode**

*Assistant professor, Department of Electrical Engineering, GNIET, Nagpur, India – 440051*
*Guru Nanak Institute of Engineering and Technology, Nagpur*

***ABSTRACT:*** *This project deals with power generation from waste heat radiated from machines .the application of thermoelectric technology is used in this project. The need of energy isincreasing rapidly, but only few sources are available to produce energy. To produce the energy efficiently from waste heat the peltier module is used. Here the power generation is simple, as there is a need of temperature difference to produce power The waste heat energy is being generated from ocean thermals, steam and various forms of waste heat. The trapping of these waste heat energy is converted into electrical energy with the help of peltier module, which works on the principle of seebeck effect. The seebeck effect is a phenomenon in which temperature difference between two dissimilar metal junctions produces a voltage difference. Also DC-DC boost converter circuit is used to boost up the magnitude of voltage being generated by the module to charge the battery .*

***Keywords-TEG(Thermoelectric Generator),DC-DC Boost converter, temperature sensor***

## INTRODUCTION

Generation of electric power via thermoelectric devices has been a subject of interest for decades. In today's world we cannot imagine life without electricity, but as we all know that the electricity which we get is mostly produced from the non-renewable energy sources 13 which are getting depleted. In India the per capita electrical consumption is 917.2kWh. In India renewable energy power plants constitute 28.43% and 71.57% of non-renewable power plants. As we can see from the statistics that energy production of renewable energy is less. So in modern technologies, production of power is focusing on renewable power production, for that we need to focus on renewable energy resources. There are technologies which implement the recycling of waste energy; by these technologies we can transform the waste energy into useful form of energy. In everyday life we see many places were heat energy produced from its source gets wasted. Those are combustion gases; hot products obtained in various industrial processes and also transfer of heat from hot equipment surfaces. This heat energy which gets wasted can be utilized by converting it to electrical energy by using thermoelectric devices. The voltage produced from the peltier module is not sufficient to switch on any device or system. Therefore this voltage needs to be increased or boosted up by the use of booster and converts. These converts will increase input voltage produced by the module, so that we can charge the battery. By using this battery appliances can be operated.

The thermoelectric power is the power obtained by the conversion of the generated heat energy into electrical energy. It works on the principle of Seebeck effect, which can be stated as, "When two ends of the conductor are held at different temperatures, the electrons at the hot junction at higher thermal velocities diffuse into the cold junction." This defines that the thermal electrons move from the junction in the hot region to the junction in the cold region.

**Thermoelectric power generation**

# Chapter 27

# Compensation of voltage sag and voltage swell by using the power electronics device by Dynamic Voltage

**Prof. R.M.Bhombe , Prof. Diksha Khare, Prof. Akshay Pilewan , Prof. Saurabh Bagde, Prof. Milind Rode**

*Assistant professor, Department of Electrical Engineering, GNIET, Nagpur, India – 440051*
*Guru Nanak Institute of Engineering and Technology, Nagpur*

***ABSTRACT:*** *The electrical energy is one of the easily used and available forms of energy. For electrical engineering, power quality is a noteworthy topic. At present day, the problem of power quality has become one of the major problems which have to be taken into account for the maintenance Dept. Of Electrical Engg. GNIET. 6 of power supply quality. For the power generation companies and customer, the most important issue is the power quality. Today's generation mainly depends on electrical energy for maintaining their life style. Today's equipment like electric motors, computers, machines, etc. cannot be used without electricity. In order to improve the technical performance, quality of supply is demanded by the equipment. The problem of power quality is an occurrence which is actually demonstrated as a nonstandard frequency, voltage or current. Service disruption and failure of electricity can be easily found in sensitive industrial loads, utility distribution networks and detracting commercial which causes great financial losses. The power quality disturbing points are voltage swell, sag, spike, notch and transients etc. In this paper, we will be dealing with voltage sag which is a major problem.*

*The voltage sag and swell is one of the severe problems for an industrial customer which has to be dealt with urgent attention for its compensation. There are many methods which can compensate the problems of voltage sag and swell. Today the most popular methods of sag and swell mollification is Dynamic Voltage Restorer (DVR), which can used in low voltage as well as medium voltage applications. Dynamic Voltage Restorer is a cascaded connected device; which is based on the principles of power electronics which can immediately mitigate the voltage sag in the system and will be restoring the load voltage to the pre-fault system value. The problem of power quality compensation is made possible with the increase in the development in power electronics. This paper work gives a brief focus on the major problems of voltage sag. The compensation of voltage sag problem is done with the help of devices such as DVR, UPFC, STATCOM and tap changing transformer. Our of all these power electronic devices dynamic voltage restorer provides the most convenient, economical and commercial answer to compensate voltage sag by the injection of power as well as voltage into the system. This paper gives an introduction to power quality problems for DVR as well as power electronics controllers for voltage sag compensation. Then operation of hardware and elements in DVR is study.*

## INTRODUCTION

Voltage sag are cause abrupt increases in loads such as short circuit or fault motor starting or electric heaters turning on or they are cause by abrupt increases in source impedance, typically cause by loose connection. Voltage swells are

# Chapter 28

# IOT Based Vehicle Accident Prevention and Detection System

**Dr.S.Telrandhe[1], Prof.S.Milmile[2], Prof.S.Buradkar[3], Dr.H.Hazare[4], Prof.D.Deshpande[5]**

*Guru Nanak Institute of Engineering & Technology, Nagpur*

***ABSTRACT***

*The Growth of the population is increasing day by day along with technology. According to a recent survey, accidents are the main cause of death in developing countries. The most dangerous accident-prone areas are on mountain roads have many narrow curve roads, Hairpin bend curves, and T-roads. Mountains have mini narrow curves due to this curve drivers can't able to see the vehicles /obstacles that are coming from the other side of the curve. The main prospective of this project is to save trees from severe accidents that occur on mountain roads. The unavailability of assistive technology, and guidance system and the lethargic activities of the drivers have caused several accidents over the past few years. The accidents can be controlled by the implementation of technology from the fields of pneumatics and mechatronics. To avoid accidents and to prevent collisions we propose an "Accident avoidance system by using IR sensors". The system works by using the inputs from the IR sensors. It detects if the driver has fallen asleep by observing the eye blinks and sends pulses via the microcontroller. This activates the alarm and hazard lamps as the first level of safety. If the driver is still asleep the seat starts to vibrate. Eventually, the pneumatic bumper and braking unit get activated and halt the vehicle. At this point, the driver must have regained his senses, and the automatic steering control is provided that turns the vehicle in the direction away from the hindrance and avoids collisions. This system is aimed to provide safety to the passengers and avoid accidents by detecting lethargic driving activity In this project the system contains sensors that are powered by ESP8266, it includes IR sensors, LED lights, and a buzzer. The vibration sensor detects any impact and if its greater than the threshold value then the controller sends a signal to the IFTTT through webhook and IFTTT service and then requests the mobile SMS system to send the GPS coordinates of the person in URL format.*

***Keywords:*** *ESP8266, Vibration sensor, Buzzer, LED, accidents, IR sensor*

## INTRODUCTION

Drowsy driving is a major problem. The risk, danger, and often tragic results of drowsy driving are alarming. Drowsy driving is the dangerous combination of driving and sleepiness or fatigue. This usually happens when a driver has not slept enough, but it can also happen because of untreated sleep disorders, medications, drinking alcohol, or shift work. No one knows the exact moment when sleep comes over their body. Falling asleep at the wheel is dangerous, but being sleepy affects your ability to drive safely even if you don't fall asleep. Drowsiness makes us less able to pay attention to the road, slows reaction time if we have to brake or steer suddenly, and affects our ability to make good decisions. These ultimately lead to accidents on the roads. Road safety is of paramount importance but even then, accidents are bound to occur due to a variety of reasons like driver error, bad roads, stray animals, etc. The time just after the accident is very critical for the people involved as if they can get prompt medical help, the chances of survival will be much higher than if the medical help gets delayed. So a system is necessary that can detect and send an emergency message to the required authorities so that the people involved get the necessary help. In this project, we are going to build an IoT based accident detection system with the help of Node MCU ESP8266 Module and a Vibration Sensor Module SW-420 which will

# Chapter 29

# Memory Technology

**Dr.S.Telrandhe[1], Dr. H. Hazare[2], Prof.D.Deshpande[3], Prof.S.Bhuradkar[4], Prof.S.Milmile[5]**

*Guru Nanak Institute of Engineering & Technology, Nagpur*

## INTRODUCTION:

Memory technology encompasses the various methods and mechanisms used for storing, accessing, and managing data in electronic devices. It is a fundamental component of modern computing systems, enabling the storage and retrieval of vast amounts of information. Memory technology is the backbone of modern computing, enabling devices to store, access, and manage digital information efficiently. It encompasses a wide range of methods and mechanisms for storing data, from volatile RAM used for temporary storage during program execution to non-volatile flash memory found in USB drives and SSDs. Historical advancements have seen a transition from early mechanical devices to semiconductor-based solutions, which dominate contemporary computing systems. Emerging technologies such as RRAM and PCM hold promise for further innovation, driving towards higher capacities, faster speeds, and lower power consumption. Efficient memory management techniques and performance optimization strategies play a crucial role in maximizing the capabilities of computing systems. Overall, memory technology continues to evolve rapidly, shaping the landscape of computing and enabling new applications and capabilities across various domains. Memory technology is a critical component in the realm of computing and electronics, serving as the foundation for storing, accessing, and manipulating data in various devices and systems.

## FUNDAMENTALS OF MEMORY:

Memory operates based on fundamental principles such as:
Storage: Information is encoded and retained in a physical or digital form.
Retrieval: Stored information can be accessed and retrieved when needed.
Addressing: Each piece of data is assigned a unique address for efficient retrieval

## HISTORICAL PERSPECTIVE:

The evolution of memory technology has been characterized by significant advancements, including:
Early Mechanical Devices: Examples include punch cards and mechanical calculators.
Electromechanical Systems: This era saw the development of magnetic drum memory and magnetic core memory.
Semiconductor Revolution: The invention of transistors and integrated circuits led to the rise of semiconductor-based memory technologies, revolutionizing computing. Early Mechanical Devices Punch Cards: In the18thcentury, punch cards were used to store data in the form of punched holes, primarily for controlling textile looms. They represented one of the earliest forms of data storage and processing. Mechanical Calculators: In the 19th century, mechanical calculators emerged as devices capable of performing arithmetic calculations through mechanical means, often using gears, levers, and other mechanical components to store an manipulate numbers

## ELECTROMECHANICAL SYSTEMS:

Magnetic Drum Memory: Developed during World War II, magnetic drum memory used rotating magnetic drums to store and retrieve data. It was a significant advancement in data storage technology and was widely used in early

# Chapter 30

# An Efficient Routing Algorithm for Wireless Sensor Networks based on Centrality Measure

**Prof.D.Deshpande[1], Dr.S.Telrandhe[2], Prof.S.Milmile[3], Dr.H.Hazare[4] Prof.S.Bhuradka[5],**

*Guru Nanak Institute of Engineering & Technology, Nagpur*

**ABSTRACT:** *A routing algorithm for wireless sensor networks with a random distribution in a target observation area is proposed. In practice, selecting a path to route data from a source node to a destination node in a sensor network is very useful. An investigation is carried out on the combination of centrality measures and a routing algorithm to determine whether this can improve the route selected by the network's decision. Various measures of centrality are used and the network's response is evaluated with regards to the route selected by the network's decision when some nodes fail. It is demonstrated through simulations that controlling sensor nodes efficiently with a high measure of centrality gives a network the ability to resist node failures or attacks. Furthermore, this provides the network with high failure tolerance. In this paper, a routing algorithm that uses centrality measures to select the shortest path (a low-energy path between the source and destination node) is implemented.*

***KEYWORDS:*** *Graph Theory; Routing algorithm; Shortest path; low cost; Wireless Sensor Network.*

## INTRODUCTION:

The routing problem in wireless sensor networks involves selecting paths with minimal distance for data forwarding, including connections to the base station. It's crucial for efficient packet delivery via intermediate nodes while minimizing energy consumption and maintaining fault tolerance. Existing algorithms face challenges in fault tolerance and message overhead, motivating a proposed dynamic routing approach based on centrality measures. This novel algorithm aims to optimize reliability and energy consumption, outperforming traditional approaches like Dijkstra's algorithm, as evidenced by its superior performance in network connectivity and energy efficiency.

## NETWORK MODELLING:

- **Overview of Centrality Metrics**

This subsection introduces essential concepts for understanding centrality measures in network analysis. Centrality metrics depend on shortest paths between nodes, as illustrated in Figure 1, highlighting distinctions between closeness and betweenness centrality. Walks, trails, and gossip methods are fundamental notions, elucidating how data propagates through networks. Figure 2 exemplifies different types of routes, showcasing the significance of paths, trails, and walks in network communication. Nodes with high closeness and betweenness play pivotal roles in information flow, shaping network dynamics and efficiency.

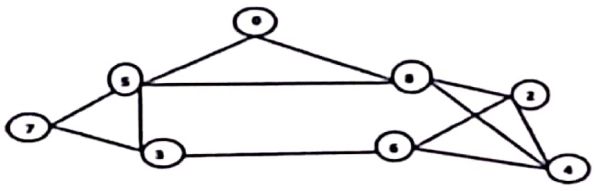

*Figure: A simple network*

# Chapter 31

# Development of Hydroponic Root Zone Cooling System for Selected Vegetables (*Lactuca Sativa*) Cultivation Under Crop Protection Structures.

**Prof.D.Deshpande[1], Prof.S.Bhuradkar[2], Dr.S.Telrandhe[3], Dr.H.Hazare[4], Prof.S.Milmile[5]**

*Guru Nanak Institute of Engineering & Technology, Nagpur*

***ABSTRACT:*** *Hydroponics cultivation method commonly applies for growing leafy vegetables and sometimes fruit vegetables. Problems commonly associated withhydroponic system are wastes of growing media and liquid, and water temperature can easily increase under direct sunlight in the tropics region. Thus, this study is conducted to develop cooling system for hydroponic water tank which can control the water-dissolved nutrient temperatures that suits the crop growth needs. This paper highlights the development of hydroponics root zone cooling (HRZC) system and the performance of Lactuca Sativa growing under crop protection structure via HRZC system. It was found that the HRZC system was able to distribute and control the hydroponic water-dissolved nutrient temperatures flow to the hydroponic growing container which has a length of4m long at different height levels of the structure wall. The ranges of temperatures that can be controlled using the HRZC system were between 15 °Cto 25 °C which meets the crop-root zone temperature needs. The process of chilling and controlling the root zone temperatures to the crop-root requirement seems to have impact on Lactuca Sativa growing performance and yield weight where the crop that cultivated via HRZC shows a better growing performance and yields compared to the crop that cultivated via conservative hydroponic method.*

***KEYWORDS:*** *Hydroponics, Root zone cooling, Crop protection structure.*

## INTRODUCTION:

Vegetables in Malaysia are commonly cultivated in open field production system, which involves heavy use of inputs and labour (Farahzety et al., 2017). In tropical lowland of Malaysia, heavy rainfall, wind and various plant pests and diseases often damage the open field grown vegetables. Most vegetables are able to grow at temperatures between 20 and 35 $^{0}$C, rain range about 600 to 1250 mm/year, humidity at 60- 80% and light intensity at 2000-8000 Wm$^{2}$ (Rezuwan and Mohammed, 2007). The average temperatures between May and August in tropical country is above 35 $^{0}$C and between August and February is below 35 $^{0}$C (Julia, 2004). This inconsistent climate condition is not suitable for vegetables growth. Those climate factors can increase the water temperatures inside the hydroponic tank and effects the dissolved nutrient. Malaysia Agriculture Research and Development Institute (MARDI) had developed several cooling techniques in greenhouse to increase the production of temperate crop in lowland. Research have been done to explore the alternative technology of cooling such as root zone cooling system, misting fan, evaporative pad and ventilation fan which can reduce the production cost (Ahmad Syafik et al, 2010). This root zone cooling system can be adapted to the hydroponics cultivation method which enables the water-dissolved nutrient temperature to be controlled. By manipulating the root zone temperatures with adequate lighting system, it would increase the crop productivity (Gosselin & Trudel, 1984). It was reported that the effect of root zone temperature is greater on root growth especially in early stage of crop development (Mohammud et al., 2012). Studies have shown that crop roots are more sensitive to fluctuation in temperature than crop shoots

However, extreme root zone temperature manipulation can cause excessive vegetative growth, flower abscission and poor fruit set. Thus, it is important to consider the crop requirements before planning for cooling technique (Mat Sharif, 2006). In this study, hydroponic root zone cooling (HRZC) system was developed to cultivate high value

# Chapter 32

# Embedded System

**Prof.D.Deshpande[1], Prof.S.Bhuradkar[2], Prof.S.Milmile[3] Dr.S.Telrandhe[4], Dr.H.Hazare[5]**

*Guru Nanak Institute of Engineering & Technology, Nagpur*

## INTRODUCTION:

**Definition and Characteristics:** Embedded systems are specialized computing systems designed to perform specific asks within a larger system. They are characterized by their real-time operation, low power consumption, and often constrained hardware resources.

**Importance and Applications:** Embedded systems are ubiquitous in modern technology, found in consumer electronics, automotive systems, medical devices, industrial automation, and more. They play a critical role in enhancing functionality and efficiency in various domains.

**Evolution of Embedded Systems:** Tracing the historical development of embedded systems, from early standalone systems with limited functionality to today's highly integrated and interconnected devices.

## EMBEDDED HARDWARE COMPONENTS:

Microcontrollers vs. Microprocessors: Understanding the differences between microcontrollers (integrated with CPU, memory, and I/O peripherals on a single chip) and microprocessors (CPU-only chips requiring external components).Sensors and Actuators: Exploring the diverse range of sensors (e.g., temperature, pressure, motion) and actuators (e.g., motors, relays) used in embedded systems for data acquisition and control. Memory Systems: Overview of different types of memory used in embedded systems, including ROM, RAM, EEPROM, and flash memory, and their roles in storing program code and data. Communication Interfaces: Explanation of common communication interfaces such as UART, SPI, I2C, USB, Ethernet, and CAN bus, and their importance in enabling connectivity and data exchange between embedded device.

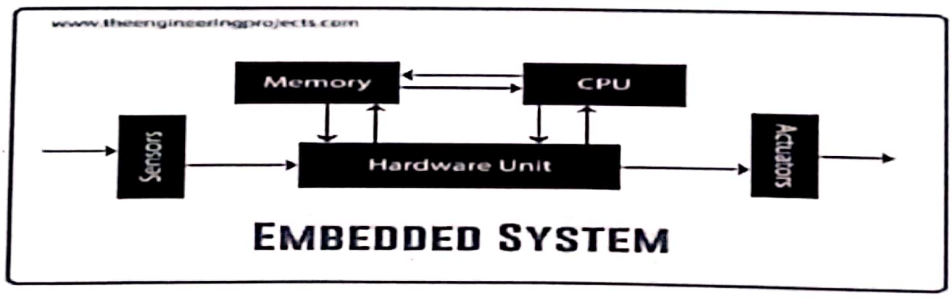


*Fig: Embedded Hardware Components*

# Chapter 33

# IOT-Based Crop Protection System against Birds and Wild Animal Attacks

**Prof.S.Milmile[1], Dr.S.Telrandh[2], Dr.H.Hazare[3] Prof.D.Deshpande[4], Prof.S.Bhuradkar[5]**

*Guru Nanak Institute of Engineering & Technology, Nagpur*

**ABSTRACT:**

The main aim of our project is to protect the crops from damage caused by animals as well as divert the animals without any harm. Crops in farms are many times ravaged by local animals like buffaloes, cows, goats, birds etc. This leads to huge losses for the farmers. Farmers can't barricade entire fields or stay on field 24 hours and guard it. So here we propose an automatic crop protection system from animals. Animal detection system is designed to detect the presence of animals and offer a warning. In this project we used PIR and ultrasonic sensors to detect the movement of the animal and send signal to the controller. It diverts the animal by producing sound and signal further, this signal is transmitted to GSM and which gives an alert to farmers and forest department immediately.

***KEYWORDS-*** *PIR Sensor, Microcontroller, MATLAB, GPS Module, GSM Module*

**INTRODUCTION:**

Wildlife tracking provides vital insights into animal behavior for scientific and conservation purposes, often involving location acquisition termed tracking or radio-tracking. Remote methods, including visual and acoustic signals, aid in animal identification. Designing a strategy to localize mobile phones without GPS, using Bluetooth devices and GPS-equipped phones as beacons, proves feasible. The problem is formulated as an inequality defined on the Bluetooth network, solved using a neural network with proven convergence and feasibility. Hardware implementation details are provided, with simulations demonstrating effectiveness in scenarios like tunnel driver localization and supermarket customer tracking.

**EXISTING SYSTEM:**

Boundary walls and solar fences around the sensitive areas are built to prevent the wild animal attacks. But this system does not allow the animals to have a large living range and in-dependence of movement. Overhead or underground structures as in are built to divert the wild animals into a different path not interfering with vehicle traffic. But this system takes longer duration, labor and moreover not economical and satisfactory some devices of information technology, viz., radio collars with very high frequency, global positioning system and satellite uplink facilities, are being used by the research institutions to monitor the movement of lions, tigers, elephants, olive riley turtles, and other wild animals to understand their movements and their use pattern of the habitat. But installation of the system becomes difficult and is not always possible.

# Chapter 34

# Condition Monitoring of Drive Trains by Data Fusion of Acoustic Emission and Vibration Sensors

**Prof.S.Bhuradkar[1], Dr.H.Hazare[2] Prof.D.Deshpande[3], Prof.S.Milmile[4], Dr.S.Telrandhe[5]**

*Guru Nanak Institute of Engineering & Technology, Nagpur*

***ABSTRACTS:***
*Early damage detection and classification by condition monitoring systems is crucial to enable predictive maintenance of manufacturing systems and industrial facilities. The data analysis can be improved by applying machine learning algorithms and fusion of data from heterogeneous sensors. This paper presents an approach for a step-wise integration of classifications gained from vibration and acoustic emission sensors, to combine the information from signals acquired in the low and high frequency range. A test rig comprising a drive train and bearings with small artificial damages is used for the acquisition of experimental data. The results indicate that an improvement in damage classification can be obtained using the proposed algorithm of combining classifiers for vibrations and acoustic emission.*

***KEYWORDS:*** *Condition monitoring, Vibration, Acoustic emission, Drive train, Data fusion, Machine learning.*

## INTRODUCTION:

Increasing demand for efficient, reliable, and available industrial production systems has led to the development of systems for continuous condition monitoring (CM). By the analysis of sensor signals, failures, and wear can be detected in an early stage, enabling cost-effective predictive maintenance and prohibiting severe damages.

## APPLICATIONS AND METHODS FOR CONDITION MONITORING:

A widely implemented application is condition monitoring of bearings. These are critical parts of many industrial drives. Since bearings exist in a wide range of geometries and are driven at different speeds and loads, CM systems have to be adapted individually for a sufficient damage detection capability.

A common monitoring approach includes vibration measurements, usually conducted with accelerometers. It has been successfully applied for the detection of mechanical faults like imbalances [2]. Still, the performance of vibration-based CM systems suffers when dynamic acceleration levels become low due to slow rotation speeds, when disturbance levels are high due to coupling with noisy gearboxes or other drivetrain components, and in case of varying speeds.CM based on ultrasonic structure-borne noise or acoustic emission has been proven to be an alternative in some cases [5]. The method is based on the detection of impulsive events (bursts) sent out from the rolling contact of damaged bearing elements. While being very sensitive, disadvantages of the method include the limited range of the impulsive waves in the mechanical structure and being insensitive to global mechanical faults like misalignment of drive shafts, imbalances or loose parts. For both methods, vibration approach and ultrasonic approach, a number of signal analysis algorithms have been developed, either in time or frequency domain. More recent approaches use the corresponding sensor data as input to powerful machine learning algorithms.

# Chapter 35

# Home Appliances Automation System Using Bluetooth and Voice Operated Technology

**Prof.D.Deshpande[1], Prof.S.Bhuradkar[2], Prof.S.Milmile[3], Dr.H.Hazare[4] Dr.S.Telrandhe[5]**

*Guru Nanak Institute of Engineering & Technology, Nagpur*

**ABSTRACT:**

*Now-a-days we are expected to achieve a lot more in a limited amount of time. Thus, our project aims to help by using Home Automation System which can be controlled via human voice. We will be using android software for the voice recognition. The software will recognize the voice command given at the microphone and will generate according data. Today's homes require sophistication control in its different gadgets which are basically electronic appliances. This has revolutionized the area of home automation with respect to an increased level of affordability and simplicity through the integration of home appliances with smart phone and tablet connectivity. Smart phones are already feature-perfect and can be made to communicate to any other devices in an ad hoc network with a connectivity option like Bluetooth. With the advent of mobile phones, Mobile applications development has seen a major outbreak. Utilizing the opportunity of automating tasks for a smart home, mobile phone commonly found in normal household can be joined in a temporary network inside a home with the electronic equipment's. Android, by Google Inc. provides the platform for the development of the mobile applications for the Android devices. Home automation system is a mobile application developed using Android targeting its vast market which will be beneficial for the masses. According to the International Data Corporation (IDC) Worldwide Quarterly Mobile Phone Tracker, Android maintained its leadership position in global market share. Bluetooth is a short-range wireless communication technology that comes in handy as the solution while communicating over an ad hoc network environment like the home environment for connecting the home appliances with the mobile phones. Bluetooth works over 2.4 GHz frequency range up to the range of 100 m with 1 Mbps speed, providing a safe and efficient solution for controlling home automation.*

***KEYWORDS***— *Liquid Crystal Display (LCD), Operating System (OS), Single Pole Double Throw (SPDT), Personal Computer (PC), American Standard Code for Information Interchange.*

**INTRODUCTION:**

In today's fast-paced society, electronic automation has become indispensable for achieving accuracy and efficiency in various tasks. Whether it's simple arithmetic or complex calculations, electronic controllers dominate every aspect of modern life. This project, "Android-based Rolling Display using Matrix LEDs," bridges analog and digital electronics to meet user needs partially. With the ability to display predefined messages, this project finds applications in conference halls, shops, hospitals, and more. Utilizing 8 x 8 Matrix LEDs, the display unit offers versatility and adaptability to different settings, controlled via Android for message customization.

**BASIC IDEA:**

Home automation integrates everyday devices via the Internet, employing sensors and Bluetooth connectivity for remote management via smartphones or tablets. The concept of task automation dates to ancient times, evolving during the Industrial Revolution into modern automation systems. Home automation describes the coordination of household appliances, exemplified by a centrally controlled LCD touchscreen panel, which regulates various devices such as air conditioners, security systems, and lighting.

# Chapter 36

# Microcontroller-Based Compact Webserver for ADAS to enhance V2V Communication with a Scalable Web Browsing

***Abstract- This*** *research explores the development of an innovative, compact web browsing solution that leverages microprocessors or smart chips for vehicle-to-vehicle (V2V) communication within Advanced Driver-Assistance Systems (ADAS). The study extends the application of microcontrollers to facilitate not only internal website hosting and remote server analysis but also to support the critical functionality of V2V interactions. These solutions are designed to be affordable, scalable, and easily transportable, aligning with the demands of modern vehicular systems.*

*A unique IP address is assigned to each machine, with the capability to store and retrieve websites directly from the microprocessor's memory. This paper initially focuses on hosting static webpages on a portable web server, with the intent to further investigate the incorporation of dynamic webpages in future work.*

*In addition to the web server functionality, this research integrates V2V communication protocols to enhance the ADAS by providing real-time data exchange between vehicles, thereby improving safety and traffic efficiency. Users can access the web server through Internet Explorer by entering the device's IP address, where the home page also functions as the server interface.*

*By combining microcontroller-based web server technology with V2V communication, this research aims to pave the way for more connected and intelligent transportation systems, ultimately contributing to the advancement of ADAS and the broader Internet of Things (IoT) ecosystem.*

**Keywords-** Microcontroller, Web browser, portable.

## INTRODUCTION

The advent of Advanced Driver-Assistance Systems (ADAS) has revolutionized automotive safety and comfort. Central to ADAS is Vehicle-to-Vehicle (V2V) communication, vital for accident prevention and traffic management. This paper proposes integrating a microcontroller-based compact web server with V2V capabilities, offering scalability and portability for web browsing and data exchange, especially in ADAS.

Traditional web servers are bulky and maintenance-heavy, unfit for vehicular networks. In contrast, the proposed microcontroller-based solution is lightweight, cost-effective, and easily deployable. It stores webpages internally, making it highly portable, crucial for real-time data access in ADAS.

The system assigns unique IP addresses to each vehicle, enabling direct webpage access. V2V integration enhances real-time data transfer, crucial for ADAS sensor data processing. Users can browse stored webpages by entering the vehicle's IP address into Internet Explorer, using the device's homepage as the interface.

This research explores the feasibility of a microcontroller-based compact web server for web browsing and remote data monitoring. It offers affordable, scalable, and transportable solutions, with potential for dynamic webpage hosting in the future.

Overall, the proposed solution addresses the limitations of traditional web servers in automotive contexts. It promises to advance intelligent transportation systems and IoT applications, marking a significant milestone in vehicular communication and safety.

# Chapter 37

# Venture Capitalists Involvement In Employment Generation

**Ashima Varghese** [1]

*Assistant Professor, Guru Nanak Institute of Engineering and Technology, Dahegaon, Nagpur, Maharashtra, India, Corresponding Author: ashimavarghese8gmail.com*

**Dr. Hemant Hajare** [2]

*Principal, Guru Nanak Institute of Engineering and Technology, Dahegaon, Nagpur, Maharashtra*

**Dr. Jonathan Joseph** [3], **Shweta Wasnik** [4]

[3 4] *Assistant Professor, Guru Nanak Institute of Engineering and Technology, Dahegaon, Nagpur, Maharashtra, India*

***Abstract:*** *A group of wealthy investors who are willing to invest in any business initiative with a good chance of success is known as venture capitalists. Regarding the venture capitalist, their involvement is typically expressed in monetary terms. Investments in venture capital typically include a sizeable sum being given to a business venture without the support of any physical assets. The focus of this study was mostly on firms and how venture capital investments affect economic growth. The findings showed that, in contrast to the entrepreneur, venture capitalists were primarily concerned in the financial aspects of the business. Four different areas of involvement were found by the research of venture activity involvement patterns: development and operations, management selection. Four key areas of involvement were found by the research of patterns of involvement in venture activities: financial participation, personnel management, management selection, and development and operations. According to the study, their varying methods of assessing risk cause individuals to have logically disparate opinions on the risks associated with both agency and market risk. The most obvious kind of support would be in providing the funds needed to establish businesses that may thereafter sustain themselves by generating employment.*

***Keywords : Venture Capitalists, Venture capital investments, Start-up business, Financial Management, Employment Generation***

## INTRODUCTION

### *Basics of Venture Capitalist*

There exist firms that are specifically structured to find and finance new ventures as well as established small-scale enterprises that have potential for growth but lack the necessary funding. When it comes to providing financial support to people who need it but lack the necessary credentials to contact organizations like banks, government lending agencies, or finance firms, venture capitalists are crucial. In addition to their reputation for having strong financial backing, venture capitalists can offer additional competencies including technological and management know-how. These also have the potential to be of great help to people who are deficient in this area but nonetheless have a proven strategy for producing amazing money. Venture capital (VC) is a form of private equity financing that is provided by firms or funds to startup, early-stage, and emerging companies that have been deemed to have high growth potential or which have demonstrated high growth (in terms of number of employees, annual revenue, scale of operations, etc.).

A venture capitalist (VC) is an investor who provides young companies with capital in exchange for equity. Startups often turn to VCs for funding to scale and commercialize their products. Due to the uncertainties of investing in unproven

# Chapter 38

# Time Management Techniques for Students Attending College

**Ashima Varghese** [1]

[1]*Assistant Professor, Guru Nanak Institute of Engineering and Technology, Dahegaon, Nagpur, Maharashtra, India, Corresponding Author : ashimavarghese8gmail.com*

**Dr. Hemant Hajare** [2]

[2]*Principal, Guru Nanak Institute of Engineering and Technology, Dahegaon, Nagpur, Maharashtra*

**Prof. Rajendra Bhombe** [3]

[3]*Vice-Principal, Guru Nanak Institute of Engineering and Technology, Dahegaon, Nagpur, Maharashtra*

**Dr. Jonathan Joseph** [4], **Dr. Satishchandra Ragit** [5]

[4 5] *Assistant Professor, Guru Nanak Institute of Engineering and Technology, Dahegaon, Nagpur, Maharashtra, India*

## INTRODUCTION

Time management techniques for students attending college.

There are a lot of new experiences and worries in college life. Both the finest and worst of times may be experienced. The finest things are to learn, meet new people, and spend time alone yourself. Final examinations can be the worst, as can falling behind in class and doing "all-nighters." The greatest of times might occasionally give way to the worst of times. Excessive time spent "socializing" and meeting new people leads to students missing class, getting behind on tasks, and "bombing" tests. Stress is a normal and inevitable part of being mortal. It emerges from our everyday struggles to meet objectives, interact with people, and adapt to the demands of a constantly changing environment.

For the majority of us, college is a very stressful time due to the demands of tests, extensive reading, research papers, grade competition, financial costs, and decisions about social and professional life. Instead of being defeated and paralyzed by stress, students can learn how to manage it.

According (Carolyn MacCann a, Gerard J. Fogarty b , Richard D. Roberts , 2012) Main objectives were to ascertain whether time management mediates the relationship between conscientiousness and achievement, whether conscientiousness and time management predict academic achievement, and whether time management benefits part-time students more than full-time ones.

According to reports, there are many benefits connected to efficient time management in education, and these benefits are the main focus of many counseling and advisory services provided to both current and at-risk students (e.g., Rowh, 2004). Furthermore, it is commonly acknowledged that ineffective time management techniques—such as cramming for tests, failing to meet deadlines set by academic staff, and improperly allocating time for work assignments—are a major cause of stress and subpar academic performance (e.g., Gall, 1988; Longman & Atkinson, 2004; Macan, Shahani,

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ISBN 978-81-965128-9-7