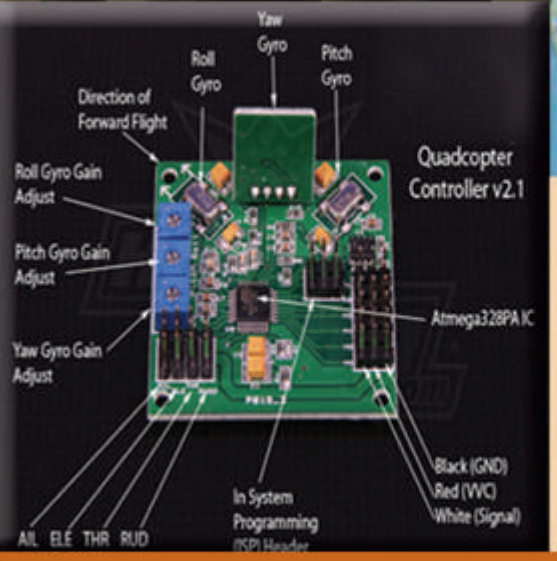
Compendium on R&D Projects under Grant-in-Aid Scheme

Volume 2

September 2013



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(Established in 1920. Incorporated by Royal Charter in 1935)
8 Gokhale Road, Kolkata 700020
Phone: +91 33 22238311/14/15/16, Fax: +91 33 22238345
Website: www.ieindia.org

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- Participation in continuing education programme at the Engineering Staff College of India (ESCI), Hyderabad and at State and Local Centres
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IEI R&D Grant-in-Aid

In order to promote Research and Development by students of undergraduate and post-graduate levels and Research Scholars of Engineering Institutes, IEI provides grant to selected projects in every year. For Guidelines and Format of Application please visit: www.ieindia.org

IEI Prizes & Awards

IEI Industry Excellence Award - to recognize industry leaders for their innovation, excellence in engineering operations and thereby, to lead their industry in competitive manner

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Apart from the above, best papers published in IEI Journals are awarded every year during the Indian Engineering Congress.

Message from the President

The Institution of Engineers (India) in accordance with Royal Charter of 1935 is committed to encourage inventions and investigate and make known their nature and merit. In pursuit of the avowed goal, the R&D Committee of IEI, since 2001, has been encouraging the faculty and students of Engineering Institutions all over the country to pursue research in different disciplines of engineering by providing financial assistance to them in the form of grant-in-aid.

It is heartening to learn that as an effective outcome of these R&D projects, lot of academic papers have been generated and published in different international and national journals of repute.

The Institution of Engineers (India) is pleased to present before you the second volume of the Compendium on R&D Projects under Grant-in-Aid Scheme, which will definitely boost the interest of the researchers. Going by the trends we are anticipating more and more fruitful researches to be carried out by our engineering fraternity at different institutes and would like to reassure them that IEI will continue to support them in their endeavour.

S S Rathore, *FIE*
President, IEI

Message from Chairman
Committee for Advancement of Technology and Engineering

I am glad to know that The Institution of Engineers (India), successfully bringing out the Second Volume of the **Compendium on R&D Projects** supported under its Grant-in-Aid Scheme of IEI. I extend my sincere thanks and gratitude to the R&D Committee and the Technical Department of the institution for such unique effort to bring together the interesting and innovative application oriented research outcome of the IEI funded projects, in the form of the Compendium.

The Institution of Engineers (India) is recognized as a Scientific and Industrial Research Organisation **(SIRO**) by the Department of Scientific and Industrial Research, Ministry of Science & Technology, Government of India to promote the cause of research and development in Engineering science and Technology. Therefore since 2001 Council of IEI taken the move to create Grant-in-Aid Scheme to provide financial support to our members attached to different Engineering Institutes/ Universities all over the country to undertake R&D work involving their students at Undergraduate, Post graduate and PhD level.

Committee for Advancement of Technology and Engineering (CATE) being the apex body of IEI to promote research and development, technical activities with special attention to advancement of Engineering Science & Technology and publication of the institution, is delighted with the fact that through R&D grant-in-aid scheme, application oriented research activities have been pursued in frontier areas of technology as are reflected in Compendium

Prof (Dr) N R Bandyopadhyay, FIE
Chairman, CATE

Message from Chairman
Research & Development Committee

I am extremely happy to present before you the second volume of the compendium on research projects that were completed under the IE Grant-in-Aid Scheme during the preceding year. This compendium captures the essentials of the innovative R&D tasks carried by the faculty and student engineering institutes from of various engineering disciplines. Remarkable feature of the IE (I) Grant-in-Aid scheme is that about 50 from 14 states participated and reaped the benefits. Numerous AICTE affiliated engineering colleges (government and self-financed), NITs, IITs and technical universities could utilize the funding and complete the projects at UG / PG / PhD levels.

Encouraging the research efforts of UG students is the salient feature of this scheme. It is worth mentioning that the impetus provided by this scheme to the UG students led to design and development several innovative systems including micro air vehicles, nano satellites, alternate energy systems and unique engineering designs. It is hoped that the compendium will be of substantial reference value to industries besides academia. Buoyed by the all-round participation of hundreds of engineering colleges, the IE(I) R&D scheme is poised grow from strength-to-strength, thus providing multifarious benefits to the national engineering eco system.

Dr U Chandrasekhar, FIE
Chairman, R&D Committee

The Institution of Engineers (India)

Volume 2, September 2013

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Compendium on R&D Projects under Grant-in-Aid Scheme

Publication Office
8 Gokhale Road, Kolkata 700 020
Ph : 2223-8311/14-16/33-34
Fax : (033) 2223-8345
email : technical@ieindia.org
web : http//www.ieindia.org

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for The Institution of Engineers (India)
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M/s Albatross Graphic Solution Pvt. Ltd.,
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For other details please contact :
The Director (Technical)
The Institution of Engineers (India)
8 Gokhale Road, Kolkata 700 020
Email: technical@ieindia.org/iei.technical@gmail.com

The Institution of Engineers (India)

8 Gokhale Road, Kolkata, West Bengal, India – 700020

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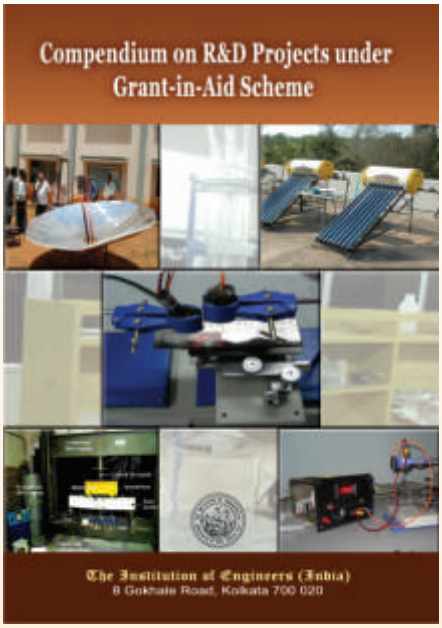
Compendium on R&D Projects under Grant-in-Aid Scheme Vol. 1, September 2012



1. Wind Cum Hydro Turbine Installation on a Single Arrangement to Generate Electricity
2. Feasibility Study on Development of Rubber Band, Powered MAV for Indoor Flight Trials
3. Human Powered Vehicle-velomobile
4. Development of Biodiesel Production Technology using Ultrasonic Cavitation
5. Study on Seismic Retrofitting of Reinforced Concrete Beams with External Reinforcement
6. Automatic Over Speed Detector with Online Traffic Crime Management System
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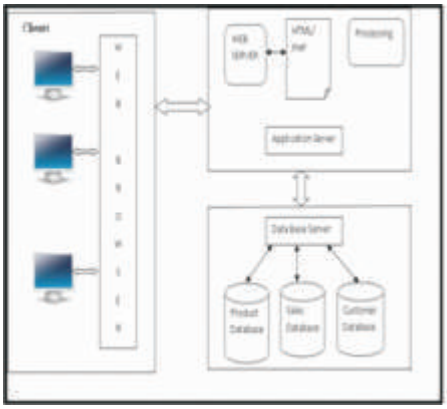
34. Low Cost Synthesis of Silicon Nanocrystals for Efficiency Enhancement of Photovoltic Solar Cell
35. Green Robot

Prediction of Product Sale on Discount Basis on Historical Statistics

Student
Komal V Kumawat
Branch of Study: Computer Science & Engineering
Email: komal.pardeshi@gmail.com

Guide
Prof L M R J Lobo
Dept. of Information Technology
Email: headitwit@gmail.com

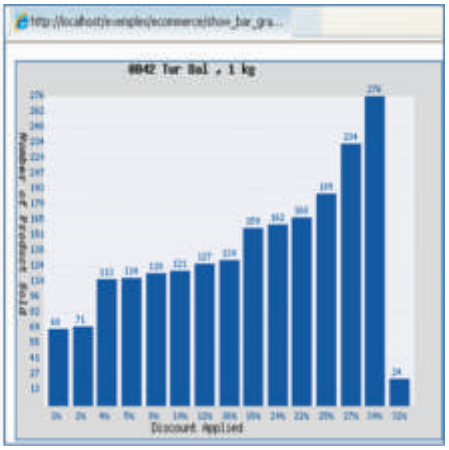
Institute
Walchand Institute of Technology
Seth Walchand Hirachand Marg,
Ashok Chowk, Solapur 413006



Web Based Architecture

Database Structure

Customer module with Browse Product Privilege



Graphical Representation of the Result Based on Discount

OBJECTIVE

1. To help executive management of shopping mall to analyze product sale
2. To use recent technologies to enhance the predicting skill and a behavioral model of data mining environment.
3. To help to take decisions on continuation of a product in the market based on incentives given and the number of customer attracted towards the product.

ACHIEVEMENTS

A system has been created that learns the response provided by a customer to the stimulus giving to him as a discount. Primary purpose was to show customer behaviour when discount is applied to the product. Based on the click stream technique collect the information and store it into database. By using this information generated results shows customer behaviour on the product purchase when discount is applied to it.

Standard deviation measures how concentrated the data are around the mean. The standard deviation can be difficult to interpret as a single number on its own. Basically, a small standard deviation means that the values in the data set are close to the mean of the data set, on average, and a large standard deviation means that the values in the data set are farther away from the mean, on average. Whether the data are close to the average or whether the data are spread out over a wide range, cannot be decided without standard deviation.

The findings of this study are, 1. For the same discount, a particular product gains more sales. The results of different bath soap like, Dove, Pears Blue, Pears Orange and Pears green were compared. It shows that people likes Dove most as compare to other soap. This also shows the customer liking of product. As discount increases it is found that product sale also increases. It can also be stated that, for branded products discount never increases to large extent. 2. Irrespective of the discount applied to some products the sale remains constant. The product sale of Ponds Dream Flower talc remains constant though discount increases. This also shows the people belief regarding particular product. 3. More comfortable product in terms of cost and weight get sold more easily and to a great extent. As we compared the product sale of Bournvita 80 gm and Bournvita jar 500 gm are compared, it can be seen that the product sale of Bournvita 80 gm is more than Bournvita jar 500 gm.

LIST OF RESEARCH PUBLICATIONS

1. Publication in International Journals and Conference

- Komal V. Kumawat and Prof. L.M.R.J.Lobo. "Prediction Of Product Sale On Discount Basis Based On Historical Statistics" International Journal on Recent Trends in Engineering and Technology, Vol. 6, No. 1, Nov 2011pages-:115-118, Published by Association of Computer Electronics and Electrical Engineers(ACEEE), USA, [ISSN : 2158-5555(print) ISSN:2158-5563] DOI: 01.IJRTET.06.01.219
- Komal V. Kumawat and Prof. L.M.R.J.Lobo "Applying Statistical Techniques To Analyze Discount Based Data Of Shopping Malls, "International Journal of Engineering Research & Technology (IJERT")Vol. 1 Issue 8, October – 2012,ISSN: 2278-0181, Available on Site http://www.ijert.org/browse/october-2012-edition, Page 2.
- Komal V. Kumawat and Prof. L.M.R.J.Lobo "Analysis of Product Sale Based on Discount and Statistical Methods" Journal of The Institution of Engineers (India): Series B , Submitted on 17th Sept 2012 and paer is under Review.
- Komal V. Kumawat and Prof. L.M.R.J. Lobo. "Discount Based Prediction for Business Systems" International Conference on Advances n Mobile Network Communication and its Applications-MNCApps 2012, Digital Object Identifier: 10.1109/MNCApps.2012.26 Publication Year: 2012 , Page(s): 99 - 102 , Print ISBN: 978-1-4673-1869-3 available on site http://ieeexplore.ieee.org/xpl/mostRecentIssue.jsp?punumber=6294628

2. M.E.(Computer Science & Engg.) Thesis of candidate Ms. Komal V. Kumawat under Prof. L.M.R.J. Lobo submitted to Solapur University, Solapur.

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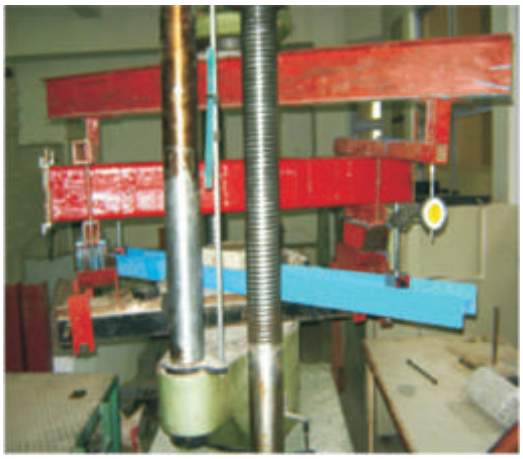
Enhancement of Torsional Resistance of R. C. Beams using Fibre Reinforced Polymer Composites

Student
Vishnu H. Jariwala
Branch of Study: Civil Engineering
Email: vjariwala71@yahoo.com

Guide
Dr. Paresh V. Patel and
Dr. S. P. Purohit
Dept. of Civil Engineering
Email: paresh.patel@nirmauni.ac.in,
sharad.purohit@nirmauni.ac.in

Institute
Institute of Technology,
Nirma University,
Dept. of Civil Engineering,
Sarkhej Gandhinagar Highway,
Ahmedabad 382481



RC Beam with GFRP Wrapping subjected to pure torsion

RC Beam subjected to combined bending and torsion in specially fabricated loading frame

OBJECTIVE

Torsional and flexural moments are dominant in the design of many structural elements such as spandrel beams, eccentrically loaded bridge girders, and beams curved in plan etc. The structural elements subjected to torsion show cracking if they are not properly designed and detailed. Further change in loading or deterioration of structural element cause the deficiency in torsion resistance. To strengthen such structural element in torsion, Fiber Reinforced Polymer (FRP) composites can be used. Research reveals that strengthening of Reinforced Concrete (RC) beams using Glass Fiber Reinforce Polymer (GFRP) composite provides a substantial increase in post-cracking stiffness and ultimate load carrying capacity of the members subjected to flexure and shear. But the strengthening of members subjected to torsion need to be explored in detail. The main objective of the present project is to study improvement in torsional resistance of RC beam with different configuration of GFRP wrapping.

The other objectives of present project are:

1. To understand the behavior of RC beams under pure torsion as well as combined bending and torsion.
2. To recognize effective pattern of GFRP wrapping for resisting pure torsion as well as combined torsion and bending.
3. To find out torsional resistance, angle of twist and crack pattern of RC beam under pure torsion as well as combined torsion and bending experimentally.

ACHIEVEMENTS

In present study, an attempt is made to study the improvement of torsional resistance of RC beam using externally bonded GFRP wrapping. The study is aimed to recognize effective pattern of GFRP wrapping for resisting pure torsion as well as combined torsion and bending. Total 24 RC beams are cast with M25 grade concrete. Ten beams are tested in pure torsion and rest 14 beams are tested in combined torsion and bending. The cross sectional dimensions of specimen are 150 mm × 150 mm with four bars of 10 mm diameter in longitudinal direction and 8 mm diameter stirrups at 150 mm spacing. The length of beam for testing under pure torsion is 1300 mm and length of beam for testing under combined torsion and bending is 1700 mm. In pure torsion, 2 RC beams are control beams and 8 RC beams are wrapped with four different GFRP configuration. In combined bending and torsion, 2 RC beams are control beams and 12 beams are wrapped with six different GFRP configuration.

Testing of beams under pure torsion is carried out using Universal Testing Machine and specially fabricated support and loading mechanism. The testing of beams under combined torsion and bending is carried out using specially fabricated loading frame along with fabricated attachments. During the experiment work, torque at first crack, torsion at ultimate stage, angle of twist at first crack, angle of twist at ultimate load and strain are measured. Crack pattern and types of failure are reported for each specimen. Comparison of torque vs. twist, torque at first crack, ultimate torque for different wrapping configuration is carried out. The effect of GFRP wrapping configuration on torsion as well as combined torsion and bending is presented in this study.

Based on the experimental work for improving torsional resistance of RC beam with GFRP, the following concluding remarks are drawn:

RC Beams subjected to Pure torsion:

- Reinforced concrete beams with different configuration of GFRP wrapping exhibited significant increase in their cracking and ultimate torque as well as ultimate twist deformations.
- Behaviour of all RC beams wrapped with GFRP sheet are almost similar upto first cracking load. This indicates that upto elastic limit concrete is effective in resisting torsion and after cracking reinforcement (steel and GFRP) becomes effective.
- Failure of RC beam with 300 mm central GFRP wrap (CE300S) is delayed but failure occurs in the unwrapped space between the strips. So, this configuration of GFRP wrapping is not much effective.
- The specimen with corner and 100 mm GFRP strip wrapping in between stirrups (CO&100SIS) presented maximum increase of 111.74% in cracking torque. The specimen with Corner and diagonal wrapping (CO&DS) showed maximum increase of 238.5% in ultimate torque.
- The specimen with corner and 100 mm GFRP strip above location of stirrups (CO&100SAS) exhibited less increase in ultimate torque but it presented highest angle of twist compared to other specimens tested under pure torsion. This indicates higher ductility compared to other wrapping configurations.
- Corner and diagonal strip wrapping (CO&DS) is much more efficient in enhancement of the torsional resistance of reinforced concrete beams compared to other wrapping configurations which includes 300 mm central strip wrapping, Corner and 100 mm strips at the location of stirrup, corner and strips in between stirrups. In CO&DS the inclined fibers are in tension up to failure, indicating effectiveness of GFRP in resisting cracking.

RC Beams subjected to Combined Torsion and Bending:

- Maximum central deflection of 15.28 mm is observed in corner and 100 mm strips at 100 mm centres wrapping configuration (CO&100S100) and 14.095 mm in full transverse wrapping (FT) compared to 3.995 mm central deflection of control specimen (BTCON).

- All specimens wrapped with GFRP showed better torque resistance compared to the control specimen (BTCON).
- Results showed an increase in ultimate torsional strength, angle of twist at first crack and ductility of the beam when combination of GFRP strips in the longitudinal direction followed by all around strips wrapping is done.
- Test beam with Diagonal Wrapping exhibited a tensile failure in GFRP wrapping which indicates effectiveness of FRP. Specimen with Full Longitudinal (FL) wrapping shows debonding of GFRP, which indicates less effectiveness of FRP.
- Corner and 100 mm strip at 100 mm centers (CO&100S100) wrapping configuration showed better ductility compared to other GFRP wrapping configurations.
- Test beam with corner and Diagonal strip wrapping (CO&DS) exhibited a maximum (110%) increase in cracking torque and maximum (117%) increase in ultimate torque, compared to control beam among all the test beams.

LIST OF RESEARCH PUBLICATIONS

1. Vishnu H. Jariwala, "Behaviour of FRP wrapped beams under pure torsion", 4th National Civil Engineering Student's Symposium-AAKAAR, Department of Civil Engineering, IIT Bombay, 3-4 March 2012
2. Vishnu Jariwala, Paresh Patel and S. P. Purohit, "Combined Torsion and bending Behaviour of RC Beams Strengthened with FRP Composites" 8th Biennial Conference Structural Engineering Convention (SEC), SVNIT, Surat, India, 19-21 December 2012, (Paper accepted for presentation)
3. Vishnu Jariwala, Paresh Patel and S. P. Purohit, "Experimental Investigation of GFRP Strengthened RC Beams Under Pure Torsion", 2nd UKIERI Concrete Congress, jalandhar, Punjab, India, 5-8 March 2013, (Paper accepted for presentation)
4. Vishnu Jariwala, Paresh Patel and S. P. Purohit, "Strengthening of RC Beams subjected to Combined Torsion and Bending with GFRP Composites", 3rd International Conference, NUiCONE - 2012, Departmet of Civil Engineering, Nirma University, Ahmedabad (Paper Accpted for presentation, 6 - 8 December, 2012

M. Tech Thesis Submitted

Vishnu Jariwala, "Enhancement of Torsional Resistance of RC beams using Fiber Reinforced Polymer Composites", M. Tech. Major Project, Nirma University, Ahmedabad, May 2012.

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I know this world is ruled by infinite intelligence. Everything that surrounds us- everything that exists - proves that there are infinite laws behind it. There can be no denying this fact. It is mathematical in its precision.

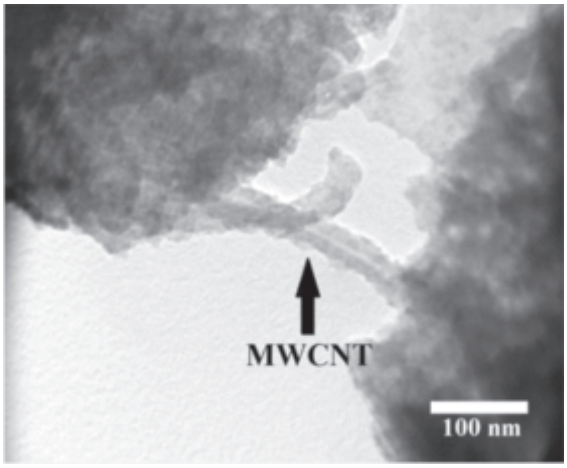
Thomas A. Edison

Characterization of Copper / Carbon Nanotube Nanocomposites Fabricated by Hot Pressing

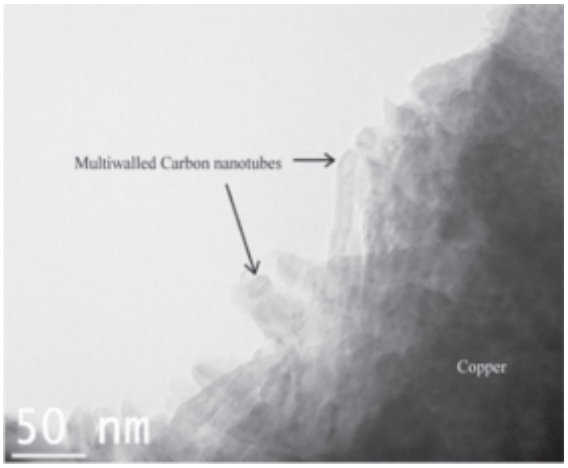
Student
Praveennath G. Koppad
Branch of Study: Mechanical Engineering
Email: praveennath2007@gmail.com

Guide
Dr. K. T. Kashyap
Dept. of Mechanical Engineering
Email: ktkashyap@yahoo.com

Institute
P E S Institute of Technology
BSK 3rd Stage, 100 Ft Ring Road,
Bangalore 560085



TEM image of 2 wt% MWCNT/Cu nanocomposite



MWCNTs in 4 wt% MWCNT/Cu nancomposite

OBJECTIVE

1. To fabricate the copper/CNT nano composite by hot pressing technique.
2. Characterization of copper/CNT nano composite by optical microscope, X-Ray diffraction, scanning electron and transmission electron microscope.
3. To evaluate the mechanical and thermal properties of developed nano composites.

ACHIEVEMENTS

For the first time, MWCNT/Cu composites were successfully fabricated by hot forging process. The MWCNTs were coated with nickel coating by electroless technique for better bonding of MWCNTs with the copper. Both uncoated and nickel-coated MWCNTs were mixed with copper powder. The microstructure of nanocomposites results in a good dispersion of MWCNTs inside the copper matrix. It was found that with the increase in MWCNTs content the microhardness of nanocomposites increased. The grain size analysis of hot forged uncoated and nickel coated MWCNT/Cu composites showed that adding the MWCNTs into the copper matrix led to the grain refinement. Thus MWCNTs acts as obstacles to the moving grain boundaries and retard grain growth.

LIST OF RESEARCH PUBLICATIONS

A paper entitled, "MICROSTRUCTURE AND MICROHARDNESS OF CARBON NANOTUBES REINFORCED COPPER NANOCOMPOSITES" has been communicated to Materials Science and Technology, Maney Publishing.

GRANT RECEIVED FROM IEI & YEAR

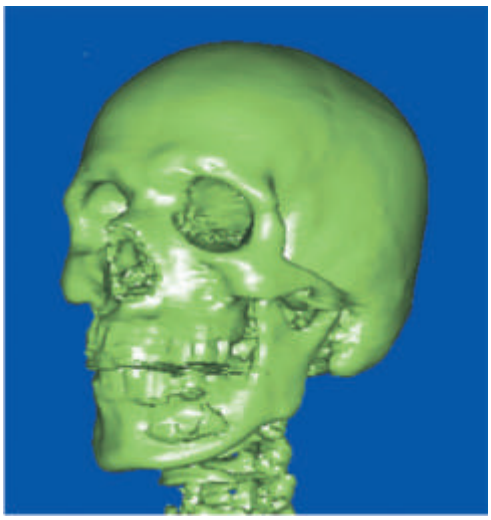
` 90, 000/- & 2011-12

Comparative Studies Involving CAD, CAE and RP Techniques for Accelerated Development of Bio-engineering and Aeronautical Systems

Student
Manmadhachary Aiamunoori
Branch of Study: Mechanical Engineering
Email: manmadhachary@yahoo.co.in

Guide
Dr. Y. Ravi Kumar
Dept. of Mechanical Engineering
Email: raviykumar@yahoo.com

Institute
National Institute of Technology, Warangal 506004



3D reconstruction of Cyst in mandible

RP Model of mandible with cyst

OBJECTIVE

The primary objective of the project is to fabricate the primary process of product development using a new approach. Traditional methods, though sufficient to serve certain functions, have their processes limitations. Therefore an improved approach would significantly lift the face of product development followed currently. In the face of the technologically advancing academic scene, students have been exposed to various opportunities to exploit Computer Aided Design (CAD) Softwares at an early stage. A method, like the one used in this project, could also contribute extensively to the development of excellent product designers.

ACHIEVEMENTS

Bio-Engineering: The project is initiated by identifying dental cases where the active participation of modern engineering techniques could prove useful by improving the success rates. The data of the patient which includes CT scans are obtained which is then processed using MIMICS software thereby creating a virtual model of the part, which in our case is a mandible. After this, a bio model is manufactured using Rapid Prototyping and validated. In comparison to preplanning surgery of the cyst in mandible and tumor in mandible with and without using RP model. This approach adapted in the project given a superior quality for preplanning surgery.

In this project two cases were taken for pre-planning the maxillofacial surgery. Comparative study for preplanning surgery of the cyst in mandible and tumor in mandible with and without using RP model, after conducting the preplanning surgery. Here it is observed that the time reduction for cyst in mandible

of maxillofacial surgery is 20 minutes. The operation time is saved by 26%. It is also observed that the time reduction for tumor in mandible of maxillofacial surgery is 20 minutes. The operation time is saved by 23%. This results in less amount of blood loss, less suffering of the patient, less inflammation and postoperative pains, and finally less manipulation and suffering of the bone graft and also improved the safety of the surgery.

Aeronautical Systems: Design and fabrication of airfoil models is very expensive and time consuming. The models can require months to design and manufacture. Using CAD, FE, RP techniques gives a good amount of cost reduction and time compression in design & fabrication of aeronautical systems as compared with conventional method of design and fabrication.

In this part of the project a component of an aero system like airfoil section is taken as a specimen of study and experimentation. The modelling, pressure analysis and production of the component is done using Pro/E, ANSYS softwares and Fused Deposition Modeling (FDM) technique, for considering geometry selection based on pressure, deformation, stress and strain analysis. Testing and analysis is carried out on the part being scrutinized. The use of modern techniques in the field of aero system, cost effective and precise as compared to traditional techniques, the components used in aero system demands the highest of quality and performance.

The adaptation of the CAD, FE, RP approaches carried out will prove to be more cost effective, less time consuming and certainly more precise, hence leading to proper utilization of the resources and realization of the goals in both the fields of bio-engineering and aeronautical.

LIST OF RESEARCH PUBLICATIONS

Papers presented in Seminars: Manmadhachary. A, and Ravi Kumar.Y "A Review of Rapid Prototyping Applications in the Biomedical", Proc. of the national Conference on Recent Advances in Mechanical Engineering, 16-17 March 2012, Osmania University, Hyderabad, India.

GRANT RECEIVED FROM IEI & YEAR

` 1,00,000/- & 2011-12

Legacy of IEI

Lord Irwin, Viceroy and Governor General of India, laying the Foundation Stone of the First Institution Building in 1930

Degradation of Rhodimine 6G at Pilot Scale Capacity using Hybrid Techniques based on Cavitation

Student

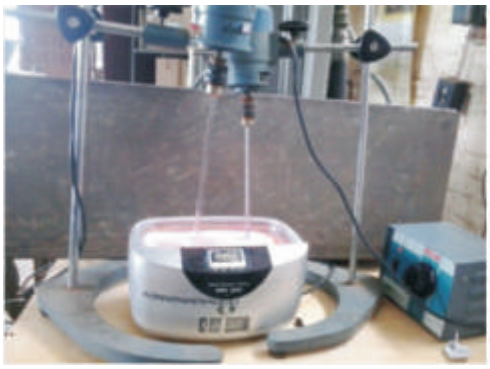
Barnali Banerjee, Archana Khode
Branch of Study: Chemical Engineering
Email:banerjeebarnali0@gmail.com, archanakhode@gmail.com

Guide

Ashish V Mohod
Dept. of Chemical Engineering
Email: ashishmohod2004@gmail.com

Institute

All India Shri Shivaji Memorial Society's College of Engineering
Kennedy Road, Near RTO,
Pune 411001



Ultrasonic Bath (50 kHz, 170 W) containing 10ppm solution of Rhodamine 6G for degradation

Ultrasonic bath (22 Hz, 120W) for degradation and scale up study of Rhodamine 6G

OBJECTIVE

The objective is to investigate degradation of Rhodamine 6G in aqueous solution using ultrasonic (US) degradation methods. Cavitation generated by use of ultrasound has been recognized as an effective approach for generating hydroxyl radical production and its subsequent use in the wastewater treatment applications. Hence, new experimental data for the ultrasonic degradation of Rhodamine 6G and optimize the operating parameters like effect of initial concentration of Rhodamine 6G with kinetic study, pH effect, hydrogen peroxide addition, CCl_4 addition, sonocatalysis of Rhodamine 6G using ultrasonic bath reactor for the maximum extent of degradation.

ACHIEVEMENTS

The present work has shown that Rh 6G, a basic dye, can be effectively removed from water by using ultrasound based treatment strategies involving the use of additives. Initial studies related to effect of pH and initial concentration indicated that the higher concentration and basic conditions favoured the extent of degradation. Use of CCl_4 as an additive resulted in enhanced degradation and the degradation rate increased with increasing the concentration of CCl_4. Presence of air also resulted in similar effects due to the increased number of cavitational events in the reactor. Ultrasonic irradiation with H_2O_2 at optimum level was the most efficient approach for the oxidation of Rh 6G dye. It has been concluded from the studies related to the effect of the addition of H_2O_2 that the rate of Rh 6G dye degradation increased to maximum of 77.81% by the addition of H_2O_2 to the ultrasound system. It has also been clearly established in the present study that the use of combination of sonophotochemical with additives such as H_2O_2 and CCl_4 would be much better option for degradation of Rh 6G as compared to the UV irradiation only.

LIST OF RESEARCH PUBLICATIONS

International Publication

Barnali Banerjee, Archana Khode, Amit Patil, Ashish V Mohod[1] and Parag R Gogate[2] "Degradation of Rhodamine 6G using ultrasonic bath at 2 liter", Desalination. Communicated.

GRANT RECEIVED FROM IEI & YEAR

` 20,000 /- & 2011-12

Legacy of IEI

Dr Shankar Dayal Sharma, Hon'ble President of India, lighting the lamp to mark the inauguration of the Platinum Jubilee of IEI on December 17, 1994, in presence of HE Governor of West Bengal Shri K V Raghunatha Reddy and Shri Jyoti Basu,Chief Minister of West Bengal

Legacy of IEI

Shri Atal Bihari Vajpayee, Hon'ble Prime Minister; HE Governor of West Bengal, Shri Viren J Shah; Shri Jyoti Basu, Chief Minister of West Bengal; Shri K C Pant, Deputy Chairman, Planning Commission of India on the occasion of World Congress on Sustainable Development organised by IEI, during January 20-23, 2000

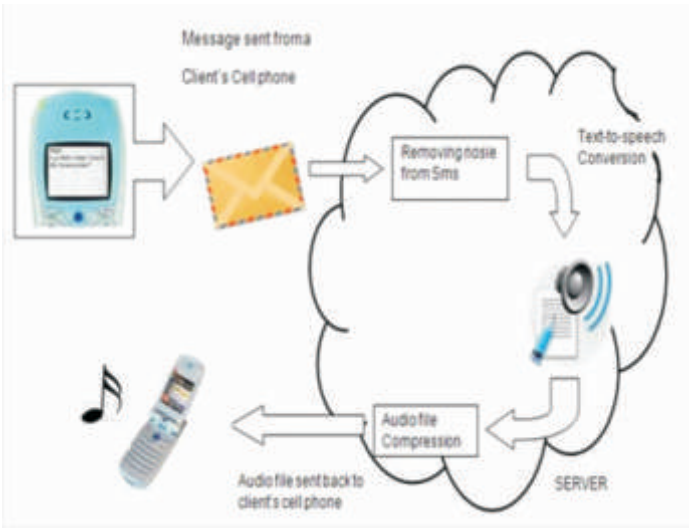
To Facilitate Cell Phone Usage for the Elderly and Disabled

Student
Gaurav Singh Bora
Branch of Study: Computer Science & Engineering
Email: gaurav_070890@rediffmail.com

Guide
Dr. Usha Banerjee
Department of Computer Science & Engineering
Email: ushaban@gmail.com

Institute
College of Engineering Roorkee
7 km on Roorkee-Hardwar highway
Vardhamanpuram, Roorkee 247667,

Text message "u dsrv great things" written on the Virtual cell phone



Flow Chart of Application

OBJECTIVE

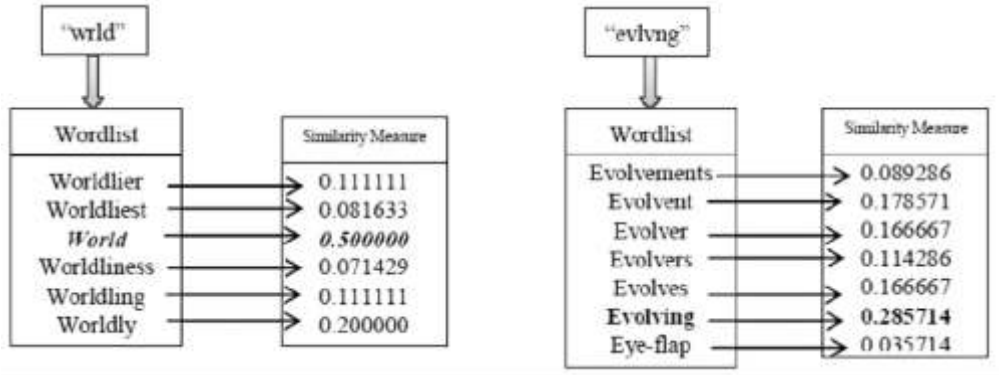
The objective of the project is to develop server side application which allows the disabled person to listen to the text message instead of reading it. The proposed mobile application does not necessarily demand the cellular device to be a modern day Smartphone. This application is independent of the mobile phone and can be activated on any simple mobile phone. Installed at the server side, this application processes the incoming text message and then forwards it to the receiver as a voice message. Before sending the converted speech file back to the receiver, it is compressed. The phone memory provided by the companies is not sufficient enough to store large number of speech files and hence by compressing the speech file, plenty of such files can be stored.

The converted voice message forwarded by the server will be saved in the receiver's mobile phone as an audio file. The receiver need not contact the server each time to hear the message. The receiver can access the audio file easily from his phone memory. The receiver has the freedom to listen to that message anytime he feels so.

The proposed application works in accordance with the present day trend of sending text messages with non-standard abbreviations and various phonetic substitutions. These misspellings are noise which the text contain and might disturb the phonetic conversion of the text. The application provides a feature where the message is processed for any noise which might be present. All the words containing noise are replaced with appropriate substitutions and the user is provided with the most optimal voice transform of the text message.

ACHIEVEMENTS

The proposed application is applied on a text message sent from a cellular device. In this paper, the cellular device functioning is demonstrated using a virtual mobile phone created using J2ME. J2Me helps in building a cellular phone in which a text message is written and sent. This text message is received by the server first, where the proposed application is applied.



Selection of best variants for tokens "wrld" & "evlvng"

Suppose the text message is "The wrld is evlvng". The text message is received by the server and saved in a text file. This text file is then processed for noise. From the text, the word "wrld" is considered and soundex algorithm is applied. Soundex code for "wrld" is W643. The soundex code of "wrld" is compared with soundex code of each word in the dictionary. The result is a reduced wordlist containing 88 words with similar soundex code. Then similarity measure thus obtained for some words of the reduced wordlist is shown in the Figure 4. The word with the highest similarity measure for "wrld" comes out to be "world". So, "wrld" is replaced in the text as "world". Similar process is carried out for "evlvng". The reduced wordlist of 22 words is processed to calculate similarity measure for each word. So, "evolving" replaces "evlvng" as it has the highest similarity measure value.

The text in the text file after reducing the noise will appear as "The world is evolving". After the noise in the text is removed, it is processed by OpenMary and a speech file is generated. The size of the speech file at this point still remains an issue and so it is processed further for reducing size. The size of the audio file is reduced by reducing its sample rate. A new speech file is created with same content as the original speech file with reduced sample rate and hence smaller size. The new speech file is then forwarded to the intended recipient. The file is received on a similar virtual cell phone as the one used for sending the message in the first place. The message is stored in the phone memory and so the user can hear it anytime with ease.

LIST OF RESEARCH PUBLICATIONS

1. Usha Banerjee, Gaurav Bora, Gaurav Batra, Ayush Agarwal, "A novel software system to facilitate better and easier communication for people with speaking disabilities", in *Proceedings of (ICACCI '12) International Conference on Advances in Computing, Communications and Informatics*, Pages: 168-173, doi>10.1145/2345396.2345425, published in ACM digital library, indexed by DBLP,

2. Usha Banerjee, Gaurav Bora, Gaurav Batra, Ayush Agarwal, "A novel software system to facilitate usage of mobile by the elderly and disabled" , Journal of the Institution of Engineers (India), Series B. Paper has been communicated and is currently under review.

3. B. Tech. Thesis titled "To facilitate cell phone usage by the elderly and disabled" submitted by Gaurav Bora, Gaurav Batra, Ayush Agarwal and Abhishek Mehrotra in partial fulfilment to the B. Tech. degree in Computer Science and Engineering to the Uttarakhand Technical University, Dehradun.

GRANT RECEIVED FROM IEI & YEAR

` 77,000/- & 2011-12

Corporate Portal Management System

Student
Guru Balakrishna A,
Bhargav Nilagiri, A Gupta
Branch of Study: Computer Science & Engineering
Email: bhargavnilagiri.live@gmail.com

Guide
Dr. Pabitra Mohan Khilar
Dept. of Computer Science & Engineering
Email: pmkhilar@nitrkl.ac.in

Institute
National Institute of Technology, Rourkela
Dept. of Comp. Sc. & Engineering
NIT, Rourkela - 769008

Workflow Chart

IBM Think Center

OBJECTIVE

Design and develop a portal for a corporate environment. Content will be published on portal by a content management tool. Before publishing the content, it will be approved by the management by way of using a workflow that will be designed. The basic purpose of the project is to ensure the streamlined data flow of the portal using workflow management as well as designing the workflow itself. The portal can be used for multiple audiences. If there is an ideal fit for corporate portals, it's at the intersection of the front and back office where negotiation, product differentiation, and competitive advantage thrive. While back-office functions focus on cost management and front-office functions focus on revenue enhancement, the middle office is where profit is maximized and risk is minimized by the efficiency achieved in coordinating the many information streams, people, and knowledge that create sound business. The middle office is where businesses ultimately succeed or fail. The audience for corporate portals is best defined by the role and function of knowledge workers in this middle-office space. Though front- and back-office functions have reached a stage of relative equilibrium and parity across most industries–thanks to extensive enterprise resource planning applications and structured transactions – middle-office workers live in a dynamic and unpredictable world. The payback for any application of technology here is measured in orders of magnitude. In the middle office, corporate portals create a single point of access. They integrate within one interface the highly unstructured nature of knowledge-work with the wide variety of ERP, document, and customer-relationship management systems in use. It is an interface that will ultimately render obsolete the contemporary, window-based metaphors we use today.

ACHIEVEMENTS

Web Portal Software Systems have become a very effective communication medium for sharing. Our Portal Management System dramatically simplifies the creation and management of portals. A corporate portal is a web-based platform to access with security a broad range of information, services, applications and expertise. The corporate portal management system Platform offers a flexible and robust content management solution that allows employees, customers and partners to safely collaborate on, contribute to and manage business content anywhere around the world. It can be utilised as an extranet that serves both internal and external users or as an intranet for internal communication in an organisation. Corporate portals can also provide single sign-on capabilities between their users and various other systems. Our Portal Management System dramatically simplifies the creation and management of portals. The focus of our software is on presenting documents and content in an effective manner to individuals, groups, customers, partners and vendors. Portal content, services and applications can be customized and personalized to the need of different users or user groups. Content will be published on portal by a content management tool. Before publishing the content, it will be approved by management by using workflow.

The basic and the most important function of the Corporate Portal Management System is the routing of data using the concept of workflow along with the various features like scheduling, commenting module and other similar features which make the software using service highly interactive and communicative. The use of this software can result in a reduction in the number of man hours spent in moderating the content on any portal. It also provides an easy to understand and intuitive interface for users which greatly helps in adapting to the use of this software. The corporate portal management system is a very effective and multifunctional tool which can be used to a great and extensive use. The extent of the software is massive and which can be tapped and used as per ones requirement. The software is also highly scalable, both in content handling and user handling capabilities, as it is built on a robust core of Drupal which is used in around 10% of all the websites around the world. The use of this software can result in a great reduction in the number of man hours spent in moderating the content on any portal. It also provides an easy to understand and intuitive interface for users which greatly helps in adapting to the use of this software. The institute newsletter Monday Morning has built their new portal with an implementation of this workflow and has seen a substantial reduction in the workload of their editors and technical co-ordinators. The portal can be further evolved and can be used for an even wider audience. The portal management system can be used for transfer of data in between multiple servers which could increase the functionality of the project substantially.

LIST OF RESEARCH PUBLICATIONS

Presented as B-Tech thesis in NIT, Rourkela.

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` 5000/- & 2011

> Engineering is the science of economy, of conserving the energy, kinetic and potential, provided and stored up by nature for the use of man. It is the business of engineering to utilize this energy to the best advantage, so that there may be the least possible waste.
>
> *William A. Smith, 1908*

Design and Modeling of Wheat Reaping Machine

Student

Punit R. Agrawal
Email: punit.agrawal 143@gmail.com
Pushparaj R. Jiwanapurkar
Email:p.jiwanpurkar@gmail.com
Swapnil D. Paunikar
Email: sonukumar22@gmail.com
Shubhranshu Shekhar
Email: shubhranshu.shekhar@gmail.com

Guide

Nilesh Parashram Awate
Dept. of Mechanical Engineering
Email:nilesh.awate@raisoni.com

Institute

G.H.Raisoni College of Engineering
CRPF, Gate No.3, Hingana Road,
Digdoh Hill, Nagpur 440016

Wheat Ripping Machine at the time of testing at GHRCE lawn

OBJECTIVE

To develop a low cost harvesting machine.

- To evaluate the performance of the developed machine on the basis of rate of harvesting, efficiency, man-hour requirement, ease of operation, cost of harvesting etc. To compare the performance of developed machine with the traditional method of harvesting.
- The introduction of harvesting machines, harvesting has become cheaper and easier than ever. Harvesting machine not only saves the time but also reduces the quantity of waste to a great extent.
- Reapers are used for cutting cereal grains, threshers for separating the seed from the plant; whereas in India wheat harvesting is performed by employing a device 'Sickle' a typical harvesting machine comprises a travelling part, a reaping part, and a baler part.
- They face a problem for need of man working forces and the labour cost are also increasing. Moreover the labour will suffer with different problem of back, neck and shoulder. The main objective is to reduce all these problems with the help of modern technology.

ACHIEVEMENTS

1 To develop a self-propelled low cost harvesting machine.

2 To evaluate the performance of the developed machine on the basis of Rate of harvesting, efficiency, man-hour requirement, ease of operation, cost of harvesting etc.

3 To compare the performance of developed machine with the traditional method of harvesting.

4 Experimenting the design with reciprocation cutter.

5 Design peripheral speed is suitable for cutting of wheat strip and the transmission system is also suitable to provide effective transmission of power available

6 Design of machine such as it is found that required cutting velocity will be in range

7 The designed machine is better alternative for the traditional machineries available in foreign markets.

8 The machine needs only two workers' one for driving the machine and second for collection .

9 This is suitable for Indian farming because in India small farms are available in plenty.

10 Large machines create more compaction in farm but the weight of this machine is only 42 kg.

11 Analysis of the physical parameters indicates that it is beneficial to measure other features such as the percentage of occupancy of the rind and vascular bundles.

12 Computer models can be developed for parametric studies on specific structural and compositional components in order to optimize their effects on these operations. These models can help to determine which bio-mechanical properties affect the energy efficiency relationships associated with harvest and post-harvest handling practices.

13 Effective use of available tool like CAD software and analysis software for checking feasibility of machine before fabrication .

14 All lab testings are found satisfactory field testing has been conducted during the month of December.

15 Proposal has been submitted for filing patent.

GRANT RECEIVED FROM IEI & YEAR

` 1,00,000/- & 2011-2012

Notification for R&D Grant-in-aid

The Institution of Engineers (India) invites applications, as per the format available on our link *http://www.ieindia.org*, for grant-in-aid in support of industry-oriented R&D projects for the session 2013-2014 for supporting students (B Tech/M Tech/Research Scholars) working under the guidance of faculty members who should be Corporate Member of IEI. After filling up the application as per the given format send the application through email to *ieirndcell@gmail.com* and one printed copy of the same to the following address:

Director (Technical)

The Institution of Engineers (India)

8 Gokhale Road, Kolkata 700 020

Applications received in format other than given in the above link will not be accepted. Application should be forwarded through the Guide, Head of the Department and Head of the Institution. Please note that preference will be given to projects received from Institutions who are members of The Institution of Engineers (India), projects dealing with industry-oriented/applied research with matching grant from industry. In case of project proposal from UG students it is desirable that he/she be a member of the Students' Chapter of the IEI, if available in his/her institution. In case of proposals from PG and PhD scholars, the applicants should be members of IEI. The grant is not intended for the faculty members who have access to other avenues for research funding. Proposals received will be scrutinized and the recipients of R&D Grant will be informed accordingly.

Secretary & Director General
The Institution of Engineers (India)

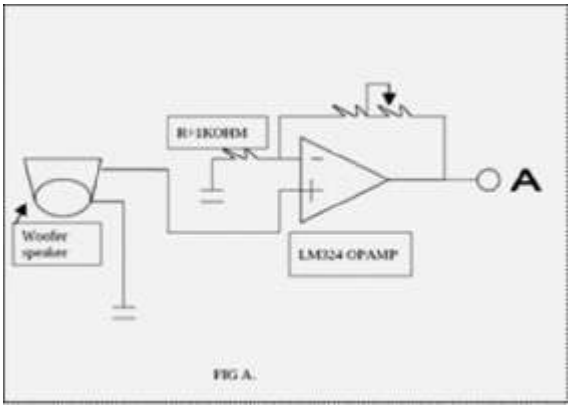
Chairman, R&D Committee
The Institution of Engineers (India)

Save Inhabitants from the Attack of Wild Animal and to Deterrent Animals away from Railway Track

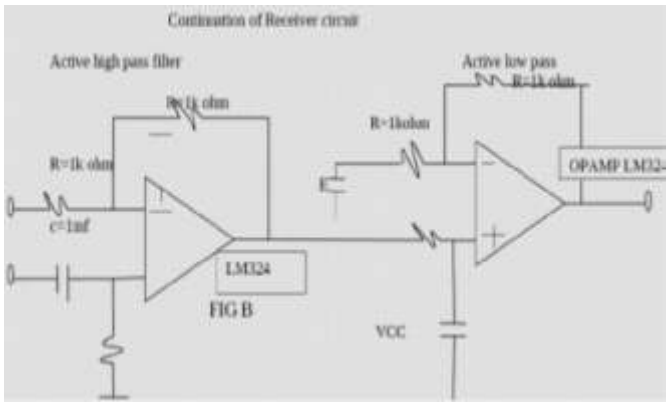
Student
Dipanjan Kar
Branch of Study: Information Technology
Email:dipanjankar007@gmail.com

Guide
Anindya Ghosh
Dept. of Electronics & Communication Engg
Email: anindya.ciem@gmail.com

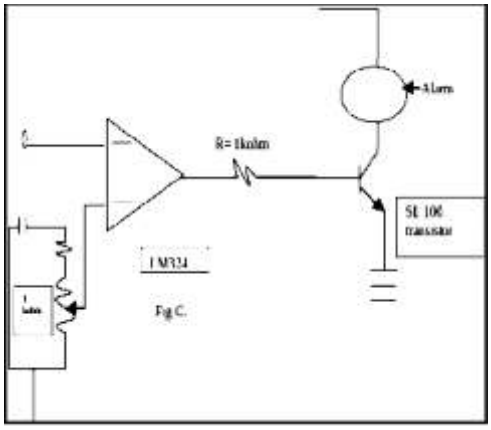
Institute
Calcutta Institute of Engineering and Management
24/1A, Chandi Ghosh Road,
Tollygunge, Besides Tollygunge ITI,
Kolkata 700040



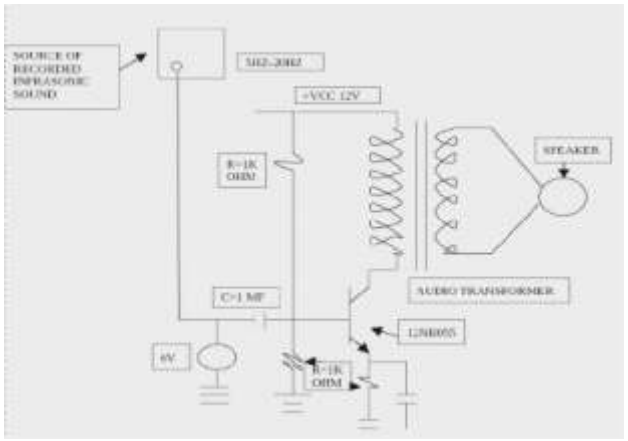
Woofer speaker receives sound from the atmosphere



Electronic signal from terminal A is connected to active high pass filter



Output from above figure 'B' enters figure 'c' though opamp



Final testing of the machine

OBJECTIVE

As the name suggests the project was initiated by an inner urge to save innocent animals and mankind from their respective unintentional negative forces. In India animals, specially elephants are repeatedly knocked down by trains running through forest regions. Ministry of Railways as well as state forest departments are planning several defensive measures but they are too costly and difficult to implement like building of elevated tracks and slowing down train speed which seemed not a proper way to face this challenge.

Another problem which forest regions of India and the world is facing is attack by elephants frequently causing destruction to life and property. No such measures practised in India and the abroad is effective to stop such attacks. This global problem is alarming. Scholars across the world are researching to understand the cause and effects of such activities.

In this project, a device has been built which will serve both the needs mentioned above. The device should be capable to automatically deter animals from regions of danger both for them and for human. The device would be working with the help of sound acoustics and will auto function when in need. It will also have the capability to drive away the animals specially elephants from around locality in forest regions as well as keep them off railway tracks so that railway trespassing is not hampered.

ACHIEVEMENTS

The device will automatically detect the presence of wild animals specially elephants within the vicinity of around 1km or more which can be operated and controlled. After detection, it will follow its course of action. The entire operation is functional based on the vocalization or acoustics of animals, specially elephants. Various researches have confirmed that elephants and wild animals are deterrent away by different unpleasant conditions of light, sound and smell generated by the people. Previously, such conditions were produced by burning ingredients and sound produced by various sources.

Wild animals are scared by such activities. The complete device will work in two ways. This will also warn nearby people of imminent danger and will be alarmed. This process will be very helpful at night when most people are busy at home or at rest. This will let the elephants or wild animals keep away from such regions where they continuously face opposition by own biological law. Thus, the process has got fully automated and almost no human intervention is required to save them. Generation of light and sound will in turn be helpful to train drivers if the device with its alarming system is planted in their engine or along the railway tracks in a measured interval. They can drive cautiously which will let them drive freely when no such alarm is seen or heard when they pass through forests. In the same time, the animals will also be deterrent away from the areas of railway tracks as the device will be fitted at specified distance from each other along the railway tracks. Importantly, it may be mentioned to tell that the area or circumference within which the device will capture the infrasonic sound can be regulated by the device. This is useful in case of railway tracks where the wild animals need not stay large distant from the tracks within the forest. If the device is planted in the engine of the train to be used just to detect vicinity or presence of animals nearby then it can also be used just to detect and get alarming signal so that the driver can control the speed of the train. The device is very cost effective unlike other methods or unit devices for performing the same. It is a great opportunity to work with the cooperation of The Institution of Engineers (India).

GRANT RECEIVED FROM IEI & YEAR

` 30,000 & 2011- 2012

> Engineering is the art of modelling materials we do not wholly understand, into shapes we cannot precisely analyse so as to withstand forces we cannot properly assess, in such a way that the public has no reason to suspect the extent of our ignorance.
>
> *Dr A R Dykes*

Design and Development of Blimp for Aerial Surveillance

Student
Sandip Nair
Branch of Study: M.Tech Mechatronics
Email: sandipnair06@yahoo.com

Guide
Dr. Subhasis Bhaumik
School of Mechatronics
and Robotics, BESU, Shibpur
Email: sbhaumik_besu@yahoo.co.in

Institute
Bengal Engineering and Science
University (BESU)
Shibpur, Howrah 711103

Blimp of 10.5 ft long

Final Blimps field test

OBJECTIVE

To develop an autonomous blimp capable of navigating on a predefined path, carrying a payload (such as rotors, controllers, camera, gyro, GPS and some other relevant sensors and actuators) and have real time wireless connectivity with the base station with minimal power consumption. In unfavourable atmospheric condition, the control must shifted to the base station. A path navigating algorithm may be incorporated for safe return of the blimp to its base if went out of range.

In this project, it is tried to synchronise theory and practice for a complete system design, there were many experiments conducted for the purpose. Even though it is known that hydrogen is highly inflammable gas, we had conducted few tests on the envelope using hydrogen gas but in much safer manner. The tests were conducted in order to understand the structural balance of the envelope and understanding the buoyancy using spring weight instrument.

But apart from the above hydrogen test, complete test was conducted using helium in two phases. In the first phase the experiment conducted was using the above 18ft blimp envelope. This was done in the open ground space inside Bengal Engineering and Science University, Shibpur campus. But the results were very disappointing as the blimp couldn't get mechanically balanced i.e. the tail region was getting tilted downwards.

To overcome the above issue, we first changed the complete envelope design by going through different technical papers and books to understand our mistakes. This helped us to develop the NI-LabVIEW program in a much better way to bring theory and practical closer to reality which led to 2nd phase testing with satisfactory results as the propulsion system needed to be more powerful to overcome the drift from the external breeze.

ACHIEVEMENTS

1. The work has been recognised by ATC, DRDO, as the project has high application potential in defence related areas.
2. An article named "Blimp for Unmanned Aerial Vehicle" was published on the college magazine of BESU called "BEgyan" which depicted the importance and best research work going on in the university.

LIST OF RESEARCH PUBLICATIONS

1. 'Design and Development of Blimp for Aerial Surveillance' by Sandip Nair, Dr. Subhasis Bhaumik, Dr. Nabhiraj P. Y., 25th National Convention of Aerospace Engineers, Organised by Jharkhand State Centre, IEI, Ranchi, 2011.
2. Sandip Nair, 'Design and Development of Blimp for Aerial Surveillance', M.Tech Mechatronics Thesis, Bengal Engineering and Science University (BESU), Shibpur Howrah, 2012.

GRANT RECEIVED FROM IEI & YEAR

` 40,000 & 2011

Legacy of IEI

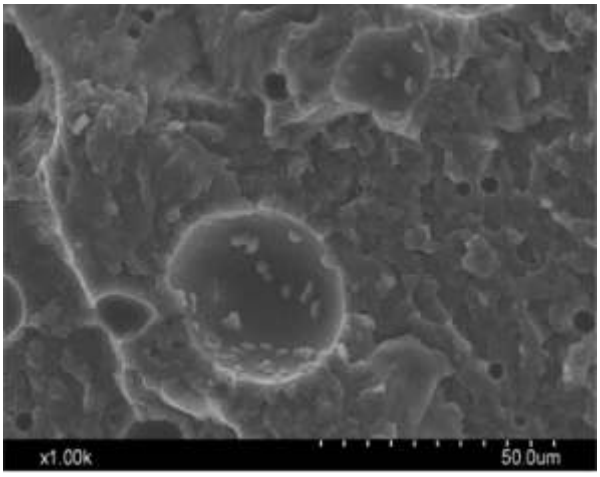
Pandit Nehru, Prime Minister of India with Dr K L Rao, D P R Cassad at Delhi Centre

Preparation of Vegetable Oil based Plasticizers

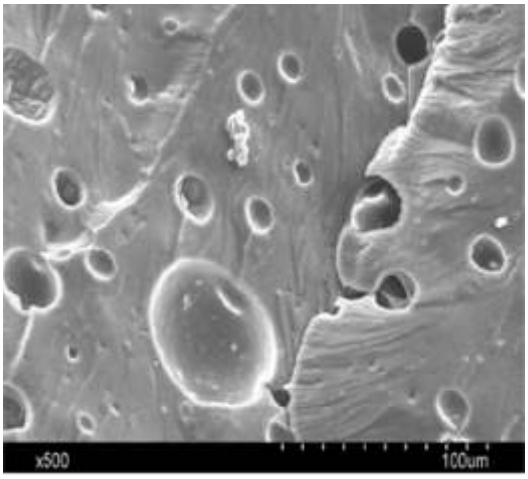
Student
Mr. Jaydip Ghosh
Branch of Study: M.Tech in Oil Technology
Email: me.jaydip@gmail.com

Guide
Dr. Mahua Ghosh
Dept. of Chemical Technology
Email: mahuag@gmail.com

Institute
Dept. of Chemical Technology,
University of Calcutta
92, A.P.C. Road, Kolkata 700 009



The SEM picture of surface of the UPE_FEPA 2% material at 1000X magnification



The SEM picture of surface of the UPE_FEOA 2% material at 500X magnification

OBJECTIVE

a. Preparation of various fatty acid esters;

b. Preparation of different polymer matrix blend materials

c. Characterization of the products

d. Performance evaluation of different product formulations.

ACHIEVEMENTS

Health and environmental issues inhibit the use of non-biodegradable plasticizers such as phthalates and dictates for use of alternative plasticizers such as bio based plasticizers. Therefore, ester produced from furfuryl alcohol with various fatty acids obtained from vegetable oils has greatest potential for use as alternative of phthalate based plasticizers.

Two types of esters were successfully prepared; Fufuryl –oleate and furfuryl-ricinoleate by the help of a biocatalyst [NS-435] and the products were isolated and characterised which confirmed the production of ester from FA with oleic acid castor oil fatty acid (COFA).

The enzyme kinetics for the first esterification reaction (FA with oleic acid) was deduced. Esterification of oleic acid and furfuryl alcohol by *Candida antarctica* lipase B (Novozym 435 preparation) in solvent free system was studied in this work. Ping-pong bi-bi mechanism (inhibition phenomenon taken into account) was applied as a complex kinetic model. The kinetic parameters were determined using MATLAB language programme. The two initial rate constants K_A and K_B, respectively were found out by different progress curves plotted with the help of MATLAB language programme. It was concluded from the results that furfuryl alcohol considerably inhibited the enzymatic reaction while oleic acid had negligible inhibitory effect. It was clearly seen that the initial rate was increased with the increase in the furfuryl

alcohol concentration until 2M after which there was a drop in the initial rate depicting the inhibitory effect of furfuryl alcohol. Surprisingly it has been observed that addition of 0.1mole of product activated the esterification reaction. Finally the model was statistically proved to be well fitted with the experimental data. These esters were tested with polymer blends.

The second esterification reaction (FA with COFA) was tried in two types of reactor; stirred tank batch reactor (STBR) and continuos packed bed reactor (CPBR). This CPBR is designed indigenously at this laboratory and used to conduct various esterification reactions by biocatalysis reaction. CPBR showed a better efficiency by producing higher amount of ester in lesser time due to better temperature control and lesser acyl migration. Ester was isolated from the mixture by distilling the excess alcohol under vacuum and nutralising the excess acid by alkali. Isolated ester was characterized by TLC, GC and FT-IR spectroscopy.

Application of this product as a bio-plasticizer was determined by various tests after blending with one unsaturated polyester resin which confirmed the basic characteristics or usage of this bio-based plasticizer. 'Totaliser' confirmed that the brittleness of the films was decreasing with the amount of plasticizer used from 5% to 1%. In Shore-D Scale hardness test (Fig 18), it was found that with increasing plasticizer concentration the hardness was decreasing that proves the flexibility characteristics of this bio-plasticizer.

But a more detailed study of the following properties will have to be evaluated to confirm the successful application of different furfuryl alcohol esters as plasticizer. In the next phase of study we will try to perform Tensile strength; Elongation properties; Depth of penetration; Hardness; Shear modulus; Impact strength; SEM of cured film studies with the cured polymer film using these esters as plasticizers.

LIST OF RESEARCH PUBLICATIONS

M. Tech Thesis Submitted

The work was presented as M.Tech thesis of Mr. Jaydip Ghosh at August, 2012.

One paper was submitted for the journal of The Institution of Engineers (India).

GRANT RECEIVED FROM IEI & YEAR:

` 90,000/- & 2011 – 2012.

Legacy of IEI

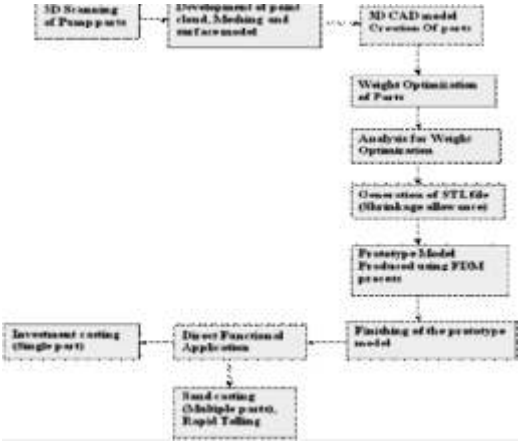
Dr Zakir Husain, President of India, opening the Main Door of the New-Headquarters Building

Integration of Fused Deposition Modeling and 3D Scanning Technology for Development of Centrifugal Pump

Student
Prashantha Kumar S T
Branch of Study: M.Tech (Mfg Science)

Guide
Jaya Christiyan K G
Dept. of Mechanical Engineering
Email:jayachristiyan@gmail.com

Institute
M S Ramaiah Institute of Technology
Department of ME,
MSRIT, Bangalore 560054



New methodology used for development of CF pump parts

ABS Material CF pump parts

OBJECTIVE

Centrifugal (CF) pump development through conventional manufacturing confronts many challenges due to small wall thickness of the casing, geometrical complexity and high competition in the pump industry leading to severe cost-cutting measures at all stages of product development. The current project suggests a methodology by which the CF pumps can be produced with greater design flexibility at low cost by integrating one of the rapid prototyping techniques called fused deposition modelling (FDM). The normal manufacturing route involves sand casting and machining. A small modification of the pump feature to improve its performance will require a complete change in the entire tooling. This leads to high costing and a small manufacturer can't afford the increased expenditure. Present centrifugal pump manufacturing techniques are very lengthy and time consuming. For example: A small 25 cm diameter of pump impeller manufacturing requires as many as three months of time to produce a model. The important objective of the proposed project is to Integrate fused deposition modelling and 3D scanning technology and also used analysis techniques to evolve and facilitate the development of quick, efficient and cost effective manufacture of CF pumps for industries like oil, sewage, water purification, power plants etc. With this project we are trying to reduce the development time by as much as 50%. 3D scanning technology helps to scanning of the existing original pump parts and developed the cloud points and surface models of the original parts this will help for developing a 3D CAD models. Fused deposition modeling would provide the design flexibility with reduced cost and analysis techniques will help to analysis for design optimized pump parts. The solutions/techniques developed through this project could be directly used and integrated into the manufacturing line.

ACHIEVEMENTS

For the past 100 years that sand casting process has been acceptable for the development of CF pump parts. Today the emphasis is on meeting customer's unique hydraulic requirements and meeting those

requirements in ever shorter period of time. This reality is new challenges for pump manufactures and caused a rethinking of the processes of design, development and implementation of the product. The project focused on how rethinking is applied in terms of the application of advanced engineering tools and methods to specify the design and development of products. Among all the pumps the centrifugal pump is a many number of applications the design and development of the CF pumps using conventional manufacturing process (Sand Casting) is very complicated, difficult and also time consuming. The main tooling for sand casting is the pattern that is used to create the mold cavity. The pattern is a full size model of the part that makes an impression in the sand mold. However, some internal surfaces may not be included in the pattern as they will be created by separate cores. The pattern is actually made to be slightly larger than the part because the casting will shrink inside the mould cavity. Preparation of small size sand moulds is difficult with conventional patterns. Perfection in producing the contoured patterns is always the problem. Pattern making takes lot of time and more costly and also any modification in the pattern design is very difficult for conventional process. In this project work we are mainly concentration on the CF pump design and development methods. For all problems overcome by using the one of the Rapid Prototyping technology called Fused Deposition Modeling are used to produce the pump parts for direct application. And also Rapid tolling technology was used to produce the master pattern for mass production In the design of the pump parts we are go through weight optimization process and reduced the weight of the parts. And also Analysis to be carried out for weight optimized component to analyze the design is safe or not. For the entire weight optimized component the design is safe and we go through FDM process for development of prototype parts and these parts are used as direct functional applications. We are replacing the conventional manufacturing process with the rapid casting process for development of CF pump parts. For this new method reduced the time and cost for the pattern and parts making comparing with the conventional process. For industrial enterprises a very important factor is the speed with which a new or improved product can flow to a market. In a competitive market, it is well known that products that are introduced before those of their competitors generally are more profitable and take a larger share of the market.

Considering the above discussion we are concluded the replace the conventional manufacturing process with the rapid casting process for development of centrifugal pump parts. The development of the pump parts using fused deposition modeling process is used as direct functional applications and also Rapid tooling for mass production.

GRANT RECEIVED FROM IEI & YEAR:

` 1,00,000/- & 2011

Legacy of IEI

Diamond Jubilee when Mother Teresa was conferred with the Honorary Life Fellowship

Optimisation of Surface Roughness in End Milling Operation using Experimental Design

Student
Jagadhish V S, Mohideen Shah F
Branch of Study: Industrial Engineering
Email: vsjagadhish@gmail.com

Guide
Prof M Subramanian
Dept. of Mechanical Engineering
Email: amsubra@gmail.com

Institute
Kumaraguru College of Technology
Saravanampatti, Coimbatore 641049

Experimental Design Specimen and End Mill Cutter

Experimental Setup and Measurement of Surface Roughness

OBJECTIVE

The objective of this study is to develop a model for better understanding of the effects of cutting speed, feed rate and depth of cut on the surface roughness and to build a multiple regression model. Such an understanding can provide insight into the problems of controlling the finish of machined surfaces when the process parameters are adjusted to obtain a certain surface finish.

ACHIEVEMENTS

The experimental run was conducted using central composite design and the second order quadratic equation had been developed to predict the values of surface roughness in terms of cutting speed, cutting feed, depth of cut and it is compared with the observed experimental values which helps to evaluate the accuracy of the surface roughness model and found the model parameters are under control.

The following conclusions were arrived from the investigation.

- An empirical relationship was developed to predict the surface roughness of AL7075-T6 alloy at 95% confidence level, incorporating shoulder milling process and process parameters.
- Response surface methodology used to develop a mathematical model to predict surface roughness in terms of cutting speed, feed rate, and depth of cut.
- The deviation between predicted and measured surface roughness values was within an error band of about 5%.
- The model indicates that the cutting speed and feed rate was the most dominant parameter on surface roughness followed by depth of cut.
- The most important interactions, that effect surface roughness of machined surfaces, were between the cutting speed and cutting feed, and between cutting speed and depth of cut.
- The mathematical model developed in this work from the experimental data can be employed to control the machining parameter and achieve the desired surface roughness in shoulder milling.

LIST OF RESEARCH PUBLICATIONS

1. M. Subramanian, M. Sakthivel, V.S. Jagadhish and A. Sethupathy (2012), "Effects of Machining Parameters on Surface Roughness in the Shoulder Milling of AL7075-T6 Aluminium Alloy by Using RSM", Int. conf. on. Systems, Methodologies, Automation and research trends (SMART-2012).
2. K. Karunamoorthy, M. Subramanian (2012),"Effect Of Process Parameters On Surface Roughness In Shoulder Milling Cutter", book of abstract on sixth national conference on Advances in mechanical sciences AIMS 2012. Kumaraguru College of technology, Coimbatore.
3. F. Mohideen Shah, R.Mohan Raj and M.Subramanian. "DE24-Optimization of Surface Roughness in End Milling On Steel (EN24) Using Response Surface Method (RSM)", Proceedings of 5th national conference on Advances in mechanical sciences AIMS 2011. Kumaraguru College of Technology, Coimbatore.

GRANT RECEIVED FROM IEI & YEAR:

` 9500/- & 2011

IEI MEMBERSHIP

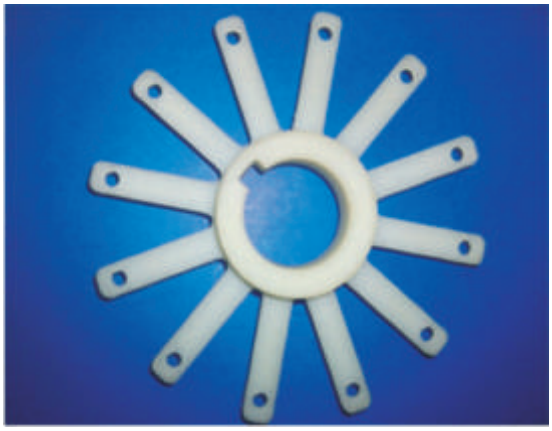
The Royal Charter defined the classification of membership and only 5 classes; namely, Honorary Life Member, Honorary Member, Members, Associate Members and Companions were known as Members of the Institution. However, through decades of modifications, changes and demands of the engineering challenges and of the engineering profession the present Bye Laws of the Institution categorized the membership under several classes; they are (a) Honorary Life Fellow (b) Honorary Fellow (c) Fellow (d) Member (e) Associate Member (f) Senior Technician (g) Technician (h) Institutional Member (i) Donor Member.

RP on Telemetry System of Gas Turbine Engine

Student
A Shanmukhi Krishna
Branch of Study: Aeronautical
Email: addepallipriya@gmail.com

Guide
Prof B Subba Ratnam
Dept. of Department of Mechanical Engineering
Email: b_subbaratnam@yahoo.com

Institute
Vardhaman College of Engineering
3-6-524, # 403,4th Floor, Zee Plaza,
Opp. Minerva Coffee Shop
Himayath Nagar, Hyderabad 500 020



Strain Simulator

Strain Simulator Prepared in RP Machine

OBJECTIVE

By using rapid prototyping technology, a telemetry system of compact size, light weight and robust body could be designed. The project aims at developing strain simulator and telemetry system for an aero gas turbine engine through rapid prototyping. Develop a 3D CAD model of entire strain simulator and telemetry system. Develop a mock up of telemetry system through fused deposition modelling. Perform assembly trials on the mock up by integrating it with the engine.

ACHIEVEMENTS

RP methods have been shown to be feasible in limited direct application to aircraft testing for predicting preliminary aerodynamic databases. Cost savings and model design/fabrication time reductions greater than a factor of 4 have been realized for RP techniques as compared to current standard model design/fabrication practices. At this time, RP methods and materials can be used only for preliminary design studies and limited configurations due to the RP material properties that allow bending of model components under high loading conditions. The uncertainty, or accuracy, of the data is lower than that of a metal model due to surface finish and dimensional tolerances, but is quite accurate enough for this level of testing. The difference in the aerodynamic data between the metal and RP models' aerodynamics is acceptable for this level of preliminary design. The use of RP models will provide a rapid capability in the determination of the aerodynamic characteristics of preliminary designs over a large Mach range. This range covers the transonic regime, a regime in which analytical and empirical capabilities sometimes fall short. However, now replacing machined-metal models with RP models for detailed parametric aerodynamic and control surface effectiveness studies is not considered practical because of the high configuration fidelity required and the loads that deflected control surfaces must withstand. Further investigations will be required to prove RP capability in Aircraft industry.

GRANT RECEIVED FROM IEI & YEAR:

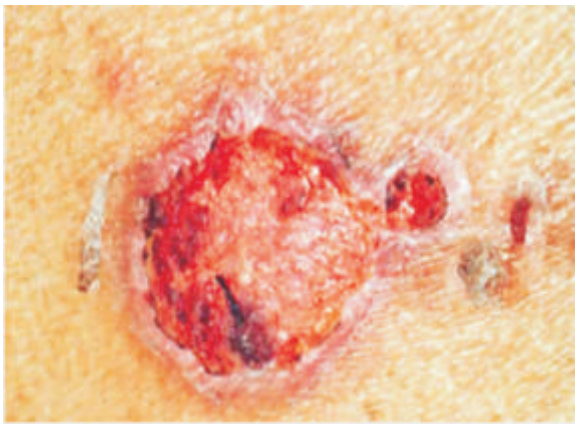
` 65, 000/- & 2011

Novel Indicative Methods for Melanoma Detection using Mobile Imaging Techniques

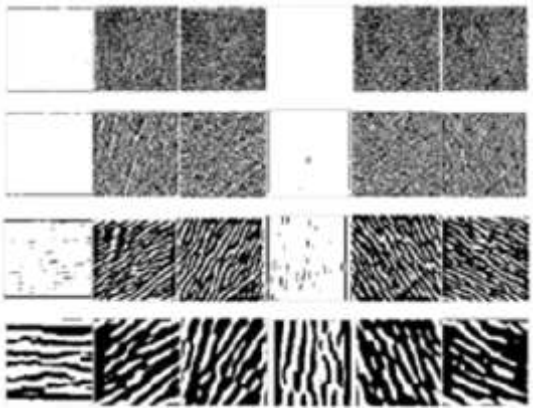
Student
V. Sasikumar
Branch of Study: Computer Science and Engineering
Email: sasikumar.venkat@gmail.com

Guide
Dr. S. Chitra
Dept. of Computer Science and Engineering
Email:schitra3@gmail.com

Institute
Er. Perumal Manimekalai College of Engineering
17th KM, Hosur-Krishnagiri Highway,
Koneripalli, Hosur 635117



An Melanoma Image to be Analysed



Six Orientation with Four Scales on Melanoma Image using Gabor Filter

OBJECTIVE

The incidence of malignant melanoma (skin cancer) has steadily increased throughout the world and is becoming one of the deadliest forms of cancers. It is the seventh most common malignancy in women, the sixth most common in men and its incidence rates are increasing faster than any other cancer. Melanoma is caused by changes in cells called melanocytes, which produce a skin pigment called melanin. Melanin is responsible for skin and hair color. It can appear on normal skin, or it may begin as a mole or other area that has changed in appearance. Some moles that are present at birth may develop into melanomas. There is on-going research on better prevention and early detection strategies for melanoma. Both primary prevention (keeping melanoma from developing) and secondary prevention (early detection of melanoma) are important. One promising area is the screening of people with a high risk of developing melanoma.

In this work it is proposed to acquire various skin lesions from reputed hospitals along with the type of melanoma and the location of occurrence. Once the database is built, for a given captured skin lesion using high resolution camera it is proposed to remove artifacts, extract features and propose a novel algorithm for automatic classification of malignant and benign skin condition.

ACHIEVEMENTS

Features were extracted using gabor filter and Discrete Cosine Transform (DCT) . The extracted features were fused and ranked using information gain. A novel Multi Layer Perceptron (MLP) Neural network with hidden bell fuzzy function was proposed.

The proposed neural network Bell Fuzzy Multi-Layer Perceptron (BF-MLP) Neural network was constructed by introducing a fuzzy logic in hidden layer with the sugeno model and bell function. The

proposed neural network consists of two layers with the first layer being a tanh activation function and the second layer containing the bell fuzzy activation function.

The Bell Fuzzy Multi-Layer Perceptron (BF-MLP) Neural network proposed in this paper uses the criteria specified in Table 1.

Table 1: Design metrics of the proposed neural network model

Input Neuron	20
Output Neuron	1
Number of Hidden Layer	2
Number of processing elements – first layer	6
Transfer function of first hidden layer	tanh
Learning rule	momentum
Number of processing elements-second layer	2
Transfer function of second hidden layer	bellfuzzy
Learning Rule of hidden layer	momentum

The Sugeno fuzzy model is introduced in the proposed algorithm. A typical fuzzy rule in Sugeno fuzzy model has the form

If x is A and y is B then z=f(x,y)

where A and B are fuzzy sets in the antecedent part, while z=f(x,y) is crisp function in the consequent part.

The fuzzy bell membership function is given by

$$\frac{1}{1+\left|\frac{x-w_2}{w_0}\right|^{2w_1}}$$

Where x is the input and wi is the weight.

Results of the classification accuracy obtained are shown in Table 2

Technique used	Classification accuracy %
MLP	90.9
Proposed Fuzzy MLP	93.2

GRANT RECEIVED FROM IEI & YEAR:

` 50,000/- & 2011-12

Engineering is the practice of safe and economic application of the scientific laws governing the forces and materials of nature by means of organization, design and construction, for the general benefit of mankind.

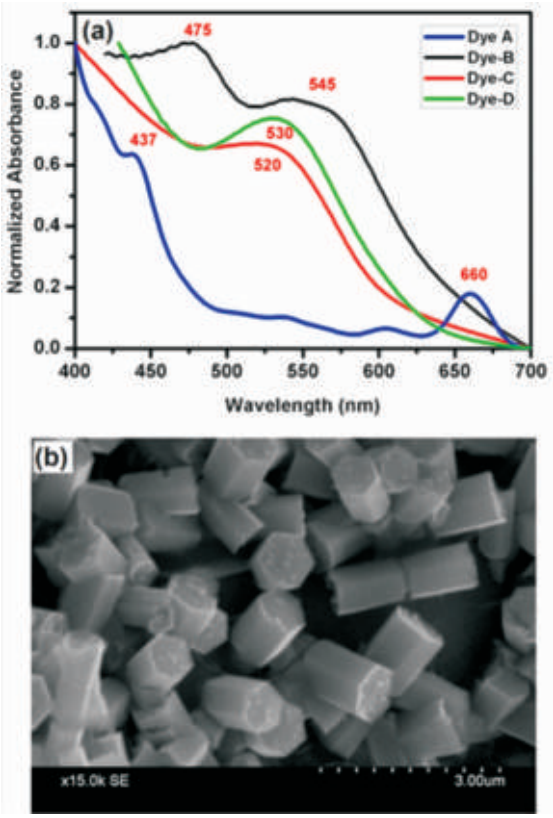
S. E. Lindsay

Fabrication of Low Cost Dye-Sensitized Solar Cell Based on Natural Dyes

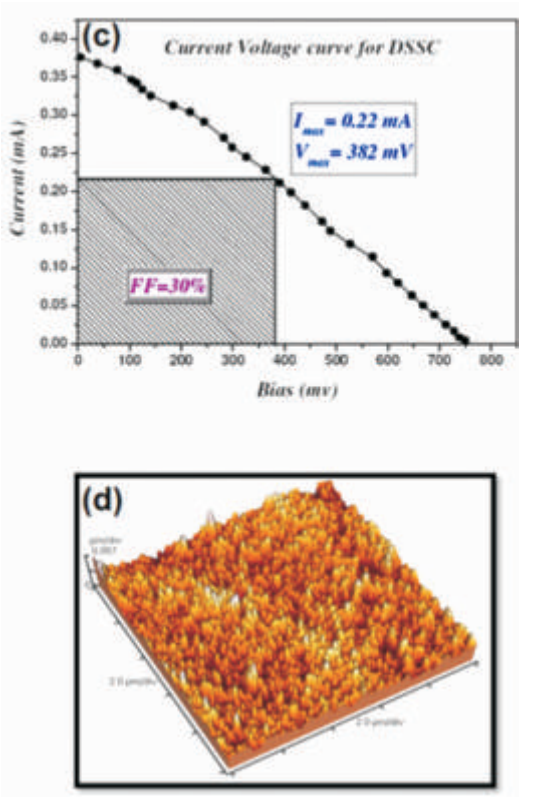
Student
Ujjwal Ghanta
Branch of Study: Ph D (Materials Engg.)
Email: Ujjwal.besu@gmail.com

Guide
Prof (Dr) N R Bandyopadhyay
School of Materials Science & Engineering
Email: nrb@matsc.becs.ac.in

Institute
Bengal Engineering & Science University (BESU)
Shibpur, Howrah,
Botanic Garden 711103



(a) UV-*vis* absorption spectra of capsicum extract in ethanol (Dye-A), beet extract in ethanol (Dye-B), raw beet extract (Dye-C) and water extract of rose (Dye-D). (b) SEM micrograph of ZnO thin film deposited on Al substrate.



(c) I-V characteristics of dye sensitized solar cell using rosella and Si photoelectrode
(d) 3D AFM micrograph of the nano structured Si photoelectrode

OBJECTIVE

There are three basic types of solar cell-monocrystalline, polycrystalline and amorphous or thin-film semiconductors primarily based on silicon. Dye-sensitized solar cell belongs to the group of thin-film solar cell. As we are looking for low cost, DSSC satisfy the required criterion in spite of its low conversion efficiency (?) (11%) which is comparable to the traditional low-cost commercial Si panels (12-15%). The most efficient (10-11%) dye sensitizers used in DSSC are polypyridyl ruthenium complexes. But the main issue with these dyes are their high cost and the low availability of noble metals such as ruthenium. Our aim in this project is to construct a low cost dye-sensitized solar cell using natural dyes extracted from natural materials like green leaves, vegetables, flowers & fruits etc. and optimization of the cell efficiency using nanostructured TiO_2, ZnO and nanostructured silicon as photoelectrode.

ACHIEVEMENTS

We have successfully synthesized nanostructured ZnO and Si photoelectrodes. The structural and spectroscopic characterizations of the electrodes were performed using SEM (Hitachi, S3400N), EDX, AFM (Veeco, di-cpII) and photoluminescence spectrofluorometer. The average crystallite sizes of hexagonal ZnO nanocrystals are 950 nm in diameter and they are more or less aligned on the surface. On the other hand, the dimensions of the silicon crystallites are very small ~3 nm and form a quantum sponge like structure. From the optical experiment it is found that the optical band gap of ZnO and Si photoelectrodes are 3.1 and 2.05 eV respectively. All the characterization techniques implies towards the formation of nano-structures. We have also synthesized four different natural photosensitive dyes from capsicum, beet root and rose flower using ethanol and water as the extraction medium. These extracted dyes were characterised by UV-*vis* spectrophotometer (Perkin Elmer, Lambda-45) and Spectroflurometer (Jobin Yvon, Flurolog-3). All the dyes are photosensitive in the visible region of the spectrum. The absorption peak of capsicum extract in ethanol is about 660 nm and 437 nm while those of beet extract in ethanol are about 475nm and 545 nm. The absorption peak of raw beet extract and rose in water is about 520 nm and 530 nm respectively. The differences in the absorption characteristics are due to the different types of pigment and colours of the extracts which can be used as photosensitizer in the active cell to absorb the photon energy of the solar spectrum.The construction of the cell is very simple and the materials are bio-computable. The photoelectric conversion efficiency (%) of the DSSC is very low (0.5%) but the maximum current density J_{sc} (mA/cm^2) and Fill Factor (FF) is quite high ($0.26mA/cm^2$) and 0.3 respectively. Most interestingly the open-circuit voltage of the cell does not becomes zero just after the switching off the illuminating lamp. It takes few hours to decrease. This is due to the capacitive effect of the nanostructured photoelectrode. The nano-structure provides a large surface area compared to volume where the charges can accumulate. The defect present on the surface of the nanocrystals temporarily tap the charges. As a result the cell behaves capacitively.

This capacitive nature of the cell can be used for the purpose of charge storage. Normally in solar cell power systems' we have to have a charge storage unit (Battery). But we can use the capacitive property of our cell for dual purpose (charge generation & storage). After sunset we can use the stored charge at least for few hours. The capacitance of the cell can be increased by adding multiple cells in parallel grids.

LIST OF RESEARCH PUBLICATIONS

High Capacitive Dye Sensitized Solar Cell using Nano Structured Silicon Electrode(Ready for communication in IEI- Springer Sr. D Journal)

GRANT RECEIVED FROM IEI & YEAR:

` 1,50,000/- & 2011-2012

Legacy of IEI

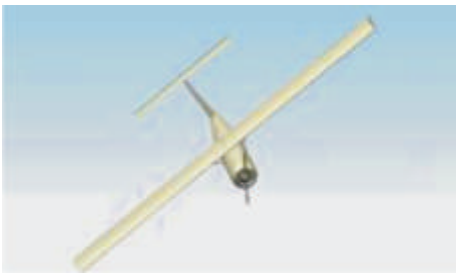
Honourable V V Giri, President of India with IEI delegation

Development of RC Mini Air Vehicle for Video Surveillance and Atmospheric Modelling

Student
Bharath Rao R
Branch of Study: Mechanical Engineering
Email: bharath.gec@gmail.com

Guide
Dr. T. Rangaswamy
Dept. of Mechanical Engineering
Email: ranga.hassan@gmail.com

Institute
Government Engineering College, Hassan 573201



3-D Solid model of the UAV

Mini UAV

OBJECTIVE

The project aims at design, development and prototyping of a stable mini air vehicle with high strength-to-weight feature through ingenious application of RP and CAE techniques. The UAV developed through this project would find use in atmospheric modelling, measuring pollution levels, video surveillance etc. The most important aspect of the proposed development case study is the use of FDM technique and CAE tools, leading to a proof-of-concept case study on the digital manufacturing of a mini air vehicle with substantially reduced part count and highly compressed assembly times. The aircraft developed will be a high winged aircraft to meet the stability criterion and efforts will be put in to extract the maximum efficiency. The aircraft developed will be flown manually with the help of a radio controller. Major concentration in this study will be on minimizing the number of parts when compared to a conventional radio controlled aircraft.

ACHIEVEMENTS

By the end of this work, it was concluded that the designed Mini UAVs achieved the designed mission specifications and the design & manufacturing process that was developed for this project, proved to be efficient for small UAV system from the point of view of labour and cost.

The multidisciplinary optimization technique that was used to supplement the design process resulted in significant decrease in weight and increase in performance. A 75% reduction in the number of parts was achieved through the design optimisation.

GRANT RECEIVED FROM IEI & YEAR:

` 50,000/- & 2011-12

Green Synthesis of Silver Nano-Particles for Solar Cells Efficiency Improvement

Student
Balamurugan M
Branch of Study: PhD in Chemistry
Email: chem.muruga@gmail.com

Guide
Dr S Saravanan
Dept. of Department of Sciences
Email: rasisaran@gmail.com

Institute
Sona College of Technology
(An Autonomous)
TPT Road, Sonanagar, Salem 636005

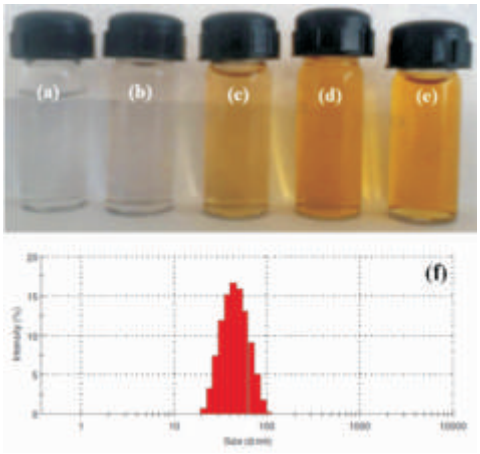


Fig. 1 a). Aqueous solution of $AgNO_3$ before adding the leaf extract b-e). with 1ml, 5ml, 10ml and 20ml of Eucalyptus globulus leaf with 100ml of $AgNO_3$ and f). Size distribution of particles by intensity

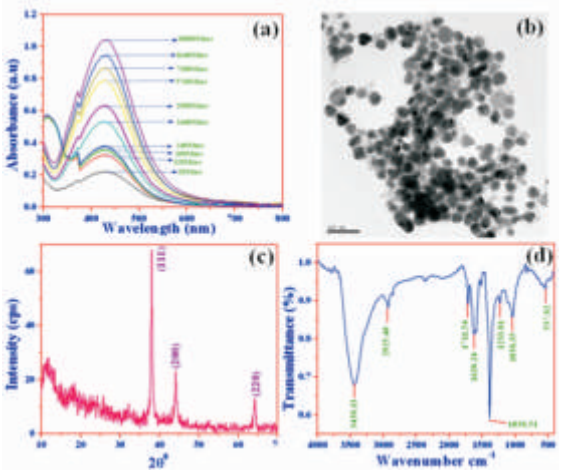


Fig. 2 a). The UV-Vis spectrum of 100ml of aq.$AgNO_3$ and 20ml of *Eucalyptus globulus* leaf extract mixture at various time intervals, b). HR-TEM images, c). X-Ray diffraction and d) FT-IR spectrum of silver nano-particles prepared from 100ml of 0.005M aq.$AgNO_3$ and 20ml of *Eucalyptus globulus* leaf extract.

OBJECTIVE

The increasing demand for energy poses one of the biggest challenges. A reason for this is the unexpected growth of the global population and the industrialized countries consuming increasingly higher amounts of energy. Generating power in the future must hence unavoidably be based on more environmentally friendly sources of energy. The sun is such an alternative. By the use of photovoltaics, or more specifically; solar cells, energy from the sun can be directly converted to electricity without polluting emissions and with potentially low levels of maintenance. The nanotechnology is used to improve the efficiency of solar cells. Colloidal particles are still small enough to be dispersed uniformly and maintain a homogenous appearance but also large enough to scatter light and not dissolve. Metal nano-particles are very attractive because of their size- and shape-dependent properties. The small silver particles help to capture a wider range of wavelengths of sunlight than would normally be possible, which in turn increases the current output. Nowadays the researchers focus on increase in efficiency of solar cells using low-cost, non-hazardous, and plentiful materials. In the recent years, the use of silver (metallic) nano-particles to enable high efficiency solar cell concepts has frequently been described in scientific literature. There are different physical and chemical preparation methods available for synthesis of silver nano-particles. All those methods use copious reactants and starting materials that are toxic and potentially hazardous are used in these reactions. In the present work, a green approach to synthesize the silver nano-particles by using plant extract as reducing and capping agent have been used. The plant extract mediated synthesis shows a great advantage over the other synthesis methods named, because it involves environmentally benign solvents and renewable materials.

ACHIEVEMENTS

In the typical synthesis of silver nano-particles, the aqueous $AgNO_3$ solution was used as silver precursor and the *Eucalyptus globulus* leaf extract as reducing and capping agent. The *Eucalyptus globulus* leaf extract was dripped into the aqueous solution of $AgNO_3$ with constant stirring at room temperature. Visible colour changes were observed, as the colour less aqueous solution of $AgNO_3$ changes to yellowish brown and then to dark brown which depends on the concentration of aqueous $AgNO_3$, dosage of plant extract and time. Metal nano-particle formations show the colour changes from aqueous solution of metal precursor. The colour changes indicate the formation of silver nano-particles. The reduction of silver ions in solution and formation of silver nano-particles were monitored periodically by measuring the Ultr Violet Visible (UV-Vis) spectrum (Fig. 2a) of the solutions. The intensity of the color increases with increase in *Eucalyptus globulus* leaf extracts dosage (Fig. 1a-e) and the reducing time. As shown in Figure 3 the UV-Vis spectrum absorbance values increased nearly five folds for the 100ml of aq.$AgNO_3$ and 20ml of *Eucalyptus globulus* leaf extract, which indicates the higher production of silver nano-particles against the increase in the reaction time. The absorbence intensity of UV-Vis spectra increased with the increase in molars of silver nitrate solution and gradually increased up to 40ml of *Eucalyptus globulus* leaf extract. When the dosage of plant extract increased further then the UV-Vis absorbance decreased slightly. The morphological characterizations were performed using High Resolution Transmission Electron Microscope (HR-TEM) for the analysis of size and shape of synthesized nano-particles. HR-TEM (Fig. 2b) images showed that particles are mostly spherical in shape, whereas some particles showed triangular and hexagonal shapes as well. The images also clearly show the coating around the nano-particles which can be assigned plant organic compounds present in the flower broth to stabilize the nano-particles. Sizes of the silver nano-particles are varied from 20-70nm for different concentrations of aqueous solution of $AgNO_3$. The sizes of silver nano-particles were measured by using the size distribution of particles by intensity. The average sizes of silver nano-particles were 37nm, 30nm and 33nm prepared from 100ml of 0.001M, 0.005M and 0.01M aq.AgNO3 with 20ml of *Eucalyptus globulus* leaf extract respectively. The powder X-Ray diffraction (XRD) pattern (Fig. 2d) shows the crystanality and structure of the prepared silver nano-particles. The diffraction peaks exhibits at 2° angles of 38.1°, 44.3° and 64.1° that correspond to the (1 1 1), (2 0 0), (2 2 0) respectively and can be assigned to face-centered cubic (FCC) silver nano-particles. Whereas any peaks originating from potential silver oxides cannot be observed. The FT-IR spectrum shows the organic molecule which was response to cape the silver nano-particles. It displays three strong bands around 3438cm^{-1}, 1620cm^{-1} and 1038cm^{-1}. The vibration bands are 1620cm^{-1} (H_2O bending vibration), 1620cm^{-1} and 1711cm^{-1} (C=C str), 1038cm^{-1} and 1233.81cm^{-1} (C-O str) and a broad peak at 3438cm^{-1} (H_2O str).

The synthesis of silver nano-particles using *Eucalyptus globulus* leaf extract as reducing and capping agent have been demonstrated. The presence of water soluble organic compounds in the *Eucalyptus globulus* leaf extract was mainly responsible for the reduction as well as stabilization of Ag ions to nano sized silver nano-particles. It is confirmed that the *Eucalyptus globulus* leaf extract is one of the best reducing and capping agent for the synthesis of silver nano-particles. The HR-TEM images confirmed the nano sizes of silver. The X-Ray diffraction indicates the crystanality of silver nano-particles with face-centered cubic (FCC). FT-IR suggests that the biological molecules present in *Eucalyptus globulus* leaf extract can possibly perform dual functions of formation and stabilization of silver nano-particles in the aqueous medium. The silver nano-particles produced with in the above mentioned range can be applied in areas of solar cell.

LIST OF RESEARCH PUBLICATIONS

Green Synthesis of Silver Nano-particles by using *Eucalyptus globulus* leaf extract to be communicated to Journal of The Institution of Engineers (India): Series A.

GRANT RECEIVED FROM IEI & YEAR:

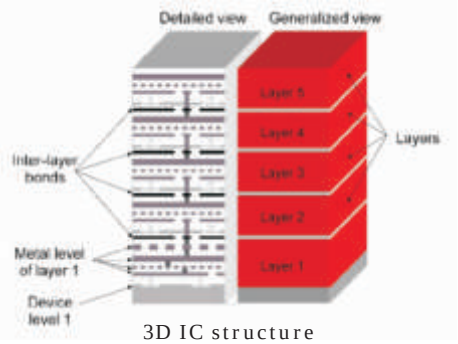
` 30000/- & 2011-2012

Development of Obstacle Aware Routing Tool for 3D Integrated Circuits

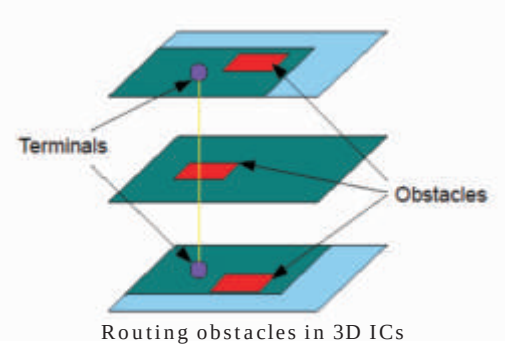
Student
Satrajit Das, Arindam Das
Branch of Study: M. Tech. (IT)
Email: satrajit_das@sifymail.com, rajonline05@gmail.com

Guide
Dr. Prasun Ghosal
Dept. of Information Technology
Email:p_ghosal@it.becs.ac.in, prasung@gmail.com

Institute
Bengal Engineering and Science University (BESU)
Shibpur, Howrah 711103



3D IC structure



Routing obstacles in 3D ICs

OBJECTIVE

Primary objective of the proposed project was to develop obstacle aware routing algorithms during the physical design of 3D integrated circuits and thereby the development of an obstacle aware routing tool to be used during the layout design of 3D ICs by the layout design engineers. Physical design phase of three dimensional integrated circuits is suffering from several challenges in present days. Obstacle aware routing problem is one of the most important problems in this domain.

ACHIEVEMENTS

Progressive scaling of technology node has serious impacts on the performance of VLSI circuits. A major influencing factor is the dominance of interconnect delay, and its associated effects such as excessive power consumption, signal integrity issues, and so on. 3D architecture was proposed as an alternative to the classical 2D architectures with certain specific advantages. One advantage is the increasing proximity of the layout components resulting in reduced interconnect lengths, and hence the delay. However, this has certain negative consequences as well, such as the issues of having through-silicon vias (TSVs) for interconnection of modules in different layers, excessive heating effects, and so on. Routing problem in 3D ICs becomes even more complicated in presence of obstacles across the routing layers.

In first phase of the project, in an attempt to gain a better insight of the use of interconnects in 3D architectures, we propose a method for routing of nets in the 3D architecture with the presence of obstacles across the routing layers, and perform empirical study in terms of total interconnection lengths across the layers as well as the inter-layer cost involved in TSV.

3D ICs also provide increased system integration by either increasing functionality or combining different technologies. Using 3D ICs allows for integrating the best technology for a particular portion of an application into the chip cube. For 3D designs to achieve their full potential, it is necessary to devise appropriate physical design strategies that can handle the complexities and new objectives specific to 3D design. Routing phase plays a critical role during the layout design of 3D ICs. Standard 2D routing tools can not be easily extended to route in 3D ICs. Due to much more higher design compaction routing problem

in 3D chips is very complex. The problem again becomes worse in presence of obstacles across the routing layers. This obstacle aware routing tree construction has become a challenging problem among the researchers recently. So in the next phase of our work, an efficient algorithm has been proposed for the rectilinear minimum Steiner tree (RMST) construction in presence of obstacles across the routing layers using a shortest pair approach. Due to ever increasing design complexity issues, careful measures have been taken to reduce the time complexity of the proposed algorithm. The novelties of this work may be stated as follows (i) proposed algorithm helps to construct RMST in presence of obstacles, (ii) time complexity of the proposed algorithm is very much competitive with available tools, (iii) proposed algorithm efficiently reduces the number of Steiner points during the construction of RMST in presence of obstacles in comparison to the standard solution available in absence of obstacles. Experimental results are quite encouraging.

In another approach, an efficient algorithm has been proposed for the rectilinear minimum Steiner tree (RMST) construction in presence of obstacles across the routing layers using a farthest pair approach. Due to ever increasing design complexity issues, careful measures have been taken to reduce the time complexity of the proposed algorithm. The novelties of this work may be stated as follows (i) proposed algorithm helps to construct an RMST in presence of obstacles, (ii) time complexity of the proposed algorithm is very much competitive with available tools, (iii) proposed algorithm efficiently reduces the number of Steiner points during the construction of RMST in presence of obstacles in comparison to the standard solution available in absence of obstacles. Experimental results are quite encouraging.

Recently, successful design and fabrication of three dimensional integrated circuits i.e. 3D ICs have shown a new pathway to the researchers to handle with enormous design complexity of modern day electronic circuits. Moreover, due to the close proximity of logic modules, the interconnect cost has also been reduced in this interconnect centric VLSI design era. In recent years, a group of researchers has also come up with non-Manhattan interconnect routing strategies to beat the ever increasing routing cost due to traditional Manhattan routing in 2D planar ICs. Again, in VLSI routing, obstacles are a common and inherent consequence. A routing obstacle is an obstacle that causes a dead end with a large void, or a routing trap. Therefore, to ensure the reliability of routing as well as to ensure complete routability, obstacle avoiding routing tree construction has also become a challenging issue to the modern day researchers.

To address the above problem, in the last phase of our work, our approach is in two folds viz. (i) to get the benefit of non-Manhattan routing in case of 3D ICs, we have explored the possibilities of using non-manhattan X-routing technique in case of routing in 3D ICs, and (ii) a novel algorithm has been proposed for the construction of Obstacle Aware non-Manhattan routing tree construction in 3D VLSI layout design. The experimental results are quite encouraging.

LIST OF RESEARCH PUBLICATIONS:

Edited Volumes/Journals/Book Chapters

1. Prasun Ghosal, Satrajit Das, and Arindam Das, "*A Novel Algorithm For Obstacle Aware RMST Construction During Routing in 3D ICs*", In Natarajan Meghanathan et al. (Eds.): Advances in Computing and Information Technology, Vol. 2, Advances in Intelligent Systems and Computing Series 177, Springer, pp. 649-658.

2. Prasun Ghosal, Satrajit Das, and Arindam Das, "*A New Class of Obstacle Aware Steiner Routing in 3D Integrated Circuits*", In Natarajan Meghanathan et al. (Eds.): Advances in Computing and Information Technology, Vol. 3, Advances in Intelligent Systems and Computing Series 178, Springer, pp. 697-706.

3. Prasun Ghosal, Arindam Das, and Satrajit Das, "*Obstacle Aware RMST Generation Using Non-Manhattan Routing For 3D ICs*", In Natarajan Meghanathan et al. (Eds.): Advances in Computing and Information Technology, Vol. 3, Advances in Intelligent Systems and Computing Series 178, Springer, pp. 657-666.

4. Prasun Ghosal, Hafizur Rahaman, Satrajit Das, Arindam Das, and Parthasarathi Dasgupta, "*Obstacle Aware Routing in 3D Integrated Circuits*", In P.S. Thilagam et al. (Eds.): ADCONS 2011, LNCS 7135, pp. 450–459, 2012. Springer-Verlag Berlin Heidelberg 2012.

International Conferences

1. Prasun Ghosal, Arindam Das, and Satrajit Das, "Obstacle Aware RMST Generation Using Non-Manhattan Routing for 3D ICs", In proceedings of The Third International Workshop on VLSI (VLSI 2012), July 13-15, 2012, Chennai, India.
2. Prasun Ghosal, Satrajit Das, and Arindam Das, "A Novel Algorithm for Obstacle Aware RMST Construction During Routing in 3D Ics", In proceedings of The Second International Conference on Advances in Computing and Information Technology (ACITY 2012), July 13-15, 2012, Chennai, India.
3. Prasun Ghosal, Satrajit Das, and Arindam Das, "A New Class of Obstacle Aware Steiner Routing in 3D Integrated Circuits: A Farthest Pair Approach", In proceedings of The Third International Workshop on VLSI (VLSI 2012), July 13-15, 2012, Chennai, India.
4. Prasun Ghosal, Hafizur Rahaman, Satrajit Das, Arindam Das, and Parthasarathi Dasgupta, "*Obstacle Aware Routing in 3D Integrated Circuits*", In proceedings of International Conference on Advanced Computing, Networking and Security (Adcons-2011), December 16-18, 2011, NITK-Surathkal, Mangalore, India, pp. 573-578.

Best Paper Awardee in ADCONS 2011.

GRANT RECEIVED FROM IEI & YEAR

` 50,000/- & 2011

Legacy of IEI

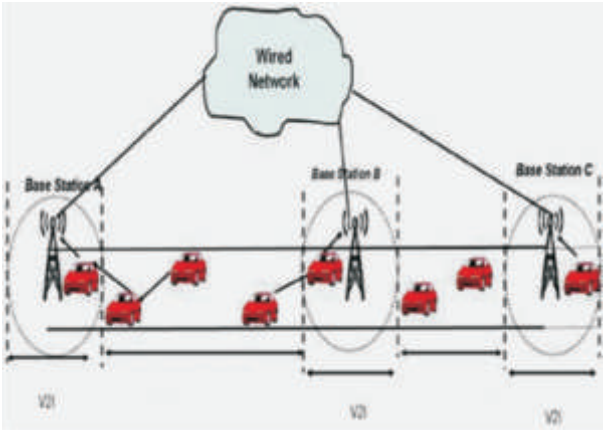
Prime Minister Mrs Indira Gandhi cutting the Golden Jubilee Cake

Bidirectionally Coupled Network and Road Traffic Simulation for Improved IVC Analysis

Student
P. Arun Prakash
Branch of Study: Computer Science and Engineering
Email: getinprakasham@gmail.com

Guide
Mrs.D.Jemi Florinabel ,ME ,PhD
Dept. of Information Technology
Email: jemidelta@yahoo.co.in

Institute
Dr. Sivanthi Aditanar College of Engineering,
Tiruchendur 628 215, Tuticorin



Car to car communication through central server

Secure communication between the vehicles

OBJECTIVE

A Vehicular Ad-Hoc Network, or VANET, is a technology that uses moving cars as nodes in a network to create a mobile network. VANET turns every participating car into a wireless router or node, allowing cars approximately 100 to 300 metres of each other to connect and, in turn, create a network with a wide range. In this project a method to reduces the road traffic problem and avoiding accidents on roads. Usage of Inter Vehicle Communication (IVC) protocol may be used to observe the traffic congestion and incidents for incorporating safety applications. The advantages and the need for bidirectionally coupled simulation based on the evaluation of protocol for incident warning over VANETs are demonstrated. Bidirectional coupling which allows the network simulation to directly control the road traffic simulation and to stimulate the influence of VANET communication on road traffic.

ACHIEVEMENTS

VANET services are used for evaluating the applicability of developed network protocols. This project addresses the need for bidirectional coupling of realistic mobility modes with network tools in evaluation of VANET protocols. The main theme of this project is to reduce the road traffic problems and avoiding the road accidents.

Security and privacy are two of the fundamental problems that have to be solved before inter-vehicle communication can be deployed. Otherwise, the dependability and user acceptance of the entire system are likely to be low, because attackers may manipulate messages or track the itineraries of vehicles. The

work comprises three parts. First, it is important to recall what we want to achieve with IVC, which is mostly safety and driver comfort functions. In particular, those applications require that drivers can trust the system. The second part of summarizes the current state of the art and the required building blocks for security & privacy in IVC. Based on this overview and the estimation as to how mature solutions are in each ? eld, the talk continues by highlighting open challenges of security ad privacy in IVC. Among those are ? exible, large-scale security management, security evolution, and internationalization. The work finally concludes with an exclamation to start research in these ? elds that is also practically in? uenced and deployable.

Road traffic injuries and fatalities are major social, economic, health and development problem. Therefore, there is a continuous need to place road safety high on global, regional and national agenda and enhance coordination at global, regional and national level while planning and implementing measures for improving road safety.

India has more truly congested cities than any other nation, which is not surprising, since it is also the world's second-most populous country, after China. Vehicles in India are distributed somewhat unevenly. Delhi, Mumbai, Kolkata and Bangalore have 5% of India's population but 14% of its registered vehicles.

India's population and its traffic are concentrated within its cities. The contrast between urban and rural India is far more pronounced than in most Western nations. The migration of rural population to urban areas in search of better job prospects has made cities densely populated. About 27 percent the population lives in urban areas.

Traffic is well known for moving at the pace of its slowest component. Most countries have automobiles, buses, trucks, trains, motorcycles, motor scooters and bicycles. But in India, in addition to this routine urban transportation, and contributing substantially to the congestion.

Road accidents are another major problem in India. Another problem is after accident occurred the message is not immediately send to the emergency helpers.

The problems like heavy traffic can be regulated and the shortest route can be identified for the user to reach their destination and the most important emergency message can be delivered immediately to the emergency helpers like ambulance, fire station, police station etc.

LIST OF RESEARCH PUBLICATIONS

- *Presented a paper in International Conference on "INTERNATIONAL CONFERENCE ON INNOVATIVE COMPUTING AND INFORMATION PROCESSING" held in Mahendra Engineering College*
- *Presented a paper in National Conference on "COMPUTER VISION" held in Dr. Sivanthi Aditanar College of Engineering*
- *Presented* a paper in National Conference on "COMPUTING AND COMMUNICATION" held in Ganadipathy Tulsi's Jain Engineering College

GRANT RECEIVED FROM IEI & YEAR:

` 10,000/- & 2011

> The story of civilization is, in a sense, the story of engineering - that long and arduous struggle to make the forces of nature work for man's good.
>
> *L. Sprague de Camp*

Design and Development of Hydroforming Setup

Student
Dwaipayan De
Branch of Study: Mechanical Engg
Email:dwaipayan88@gmail.com

Guide
Prof Asish Bandyopadhyay
Mechanical Engg Dept
asishbanerjee@yahoo.com

Institute
Jadavpur University
188 Raja S C Mullik Road
Kolkata 700 032

Sheet Hydroforming Setup

OBJECTIVE

From the literature review, it is clear that a lot of research works have been done on hydroforming technology in relation to tube hydroforming, but a little information is available related to sheet hydroforming technology. The work done on sheet hydroforming is mainly using punch and water as a liquid medium. But enough research work on sheet hydroforming using only water without the use of any punch is not available in the literature.

Hence, the present investigation has been initiated by fabricating a hydroforming setup using the hydroforming technology of single blank. Water is used as a liquid medium and only female die has been used without a punch. The fluid pressure is varied in order to analyse the effect of sheet hydroforming on aluminium sheet of thickness 0.3 mm, 0.5 mm and 0.7 mm respectively.

ACHIEVEMENTS

1. The deformation by using hydroforming process has been achieved.
2. The different shape and size of the blank material has been achieved only by changing the die keeping the total setup intact. Thus any shape and size can be prepared in this type of forming using the same hydroforming machine.
3. Uniform forming shape has been achieved based on the principle of Pascal's law.
4. As the newly developed sheet hydroforming setup deals with cold forming therefore several advantages were established in this context.
   - I. It has increased the strength and hardness of the aluminium sheet due to strain hardening which would be beneficial in several situations.
   - ii. Better dimensional accuracy has been achieved.
   - iii. It is also beneficial as it does not produce any oxide and thus no oxide will form on the surface of aluminium sheet.

Papers Published in Journals / Papers Presented in Seminars / M.tech Thesis / Ph.d Thesis / Patent Generated from this Project

1. Dwaipayan De and Asish Bandyopadhyay, "Hydroforming Setup and its Experimental Results", National Conference on Recent Trends in Manufacturing Science and Technology (RTMST - 2013), 18th and 19th April, 2013, NITTTR, Kolkata - 700106, India, pp.218-226.

GRANT RECEIVED FROM IEI & YEAR:

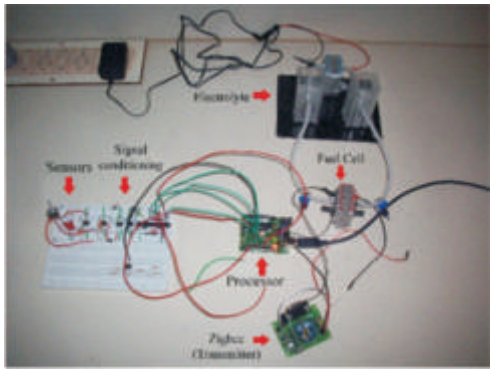
` 50,000/- & 2012-2013

Design, Modelling and Implementation of a Field Deployable Single Pem Fuel Cell based Power Cells based Power Cells for Low Power Telecom Applications

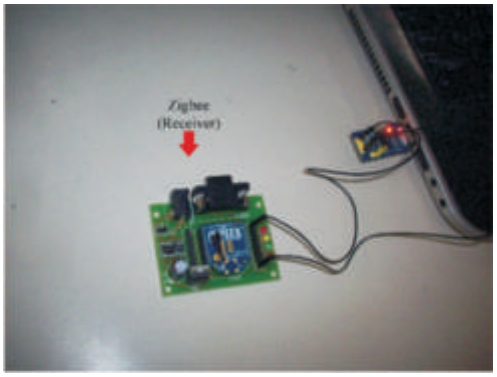
Student
Arundas R
Branch of Study: Electronics & Communication Engineering
Email:arundas1903@gmail.com

Guide
Ramesh P
Dept. of Electronics & Communication Engineering
Email: rap@ieee.org

Institute
College of Engineering Munnar
County hills, Munnar, Idukki Dist.
685612



Transmitter section experimental setup



Receiver section experimental setup

OBJECTIVE

The project aims at developing a single PEM fuel cell based power supply for low power telecom applications such as wireless sensor nodes.

ACHIEVEMENTS

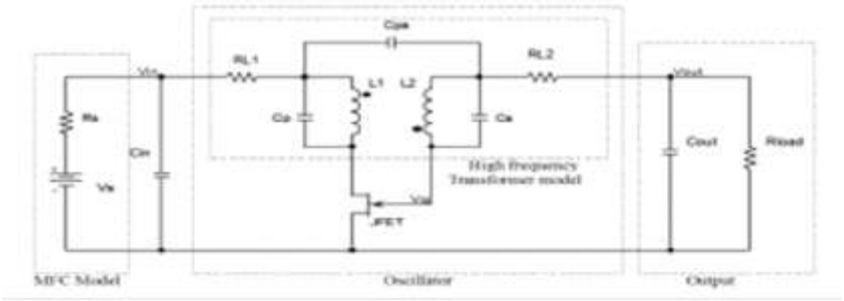
A fuel cell of dimensions 1cm x 1cm x 1cm delivering 100mW power was designed and simulated using Comsol Multiphysics and was implemented using conventional technologies. The sensor node is equipped with multimode sensors for sensing different parameters; the node can sense three different parameters, heartbeat rate, temperature and Pressure. The measured parameters were sent by using a Zigbee Module to distant. Heart rate (Pulse) measurement is based on the principle of PPG (photoplethysmography) which uses a light source and a detector. Change in blood volume is synchronous to heartbeat; this method can be used to calculate the heart rate. Temperature is measured by a thermistor; it uses the Wheatstone's bridge principle. Using the available datasheet of thermistor we can derive a relationship between the temperature and voltage. ECG measures the electrical activity of heart. The activation of the heart starts at Sino-atrial node that produces heart frequency, at about 70 cycles per minute. The electrical signal so produced is measured using the electrodes. Pressure measurement was based on the ECG and PPG signals. After obtaining the PPG waveform, systolic blood pressure can be estimated. This can be done by determining the PWTT. PWTT is the time interval between two pulses measured on the same artery. More specifically, PWTT is the time interval between the peak of the ECG and the minimum peak of the PPG waveforms. Since both PPG and ECG are measured from the same arm, these two modalities are combined to calculate the PWTT. The time between the two peaks in the pulses is measured, giving PWTT.

$$SBP = - 0.6881 \times PWTT + 228.59 \quad (1)$$

where the PWTT is in milliseconds (ms) and SBP is in millimetres of mercury (mmHg). Due to time and resource limitations, the scope of this project did not involve determining this equation. Therefore, for the purposes of this project, this equation is accepted to be a reasonable estimation of blood pressure.

The ultra-low voltage and power DC/DC conversion is done based on the circuit given below.

When the converter is connected to the fuel cell, the current increases in the primary winding. The secondary winding applies a positive voltage on the gate of the JFET which is ON. The JFET gate-source PN junction is conducting, and the output capacitor is charged with a negative voltage. The output voltage is



DC to DC Converter

therefore negative. When the primary current reaches saturation, the voltage across the primary winding cancels and the negative voltage of the output capacitor is applied on the gate of the JFET pinching it off. The current in the primary winding decreases and a negative voltage is applied by the secondary winding on the gate of the JFET, which leads to its switching off. This peak of voltage that switched off the JFET falls back to zero and the oscillation process starts again.

GRANT RECEIVED FROM IEI & YEAR

` 50000/- & 2012

Legacy of IEI

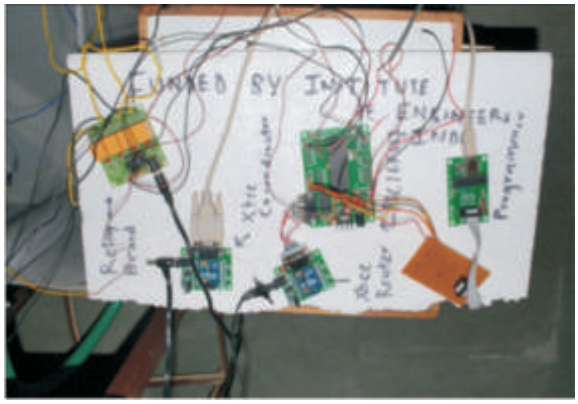
His Excellency The President of India Dr Sarvepalli Radhakrishnan visited Hyderabad on 12th November, 1966 and unveiled the Statue of Bharat Ratna Sir Mokshagundam Visvesvaraya erected in AP State Centre on the Raj Bhavan Road, Hyderabad

Automatic Drip Irrigation System

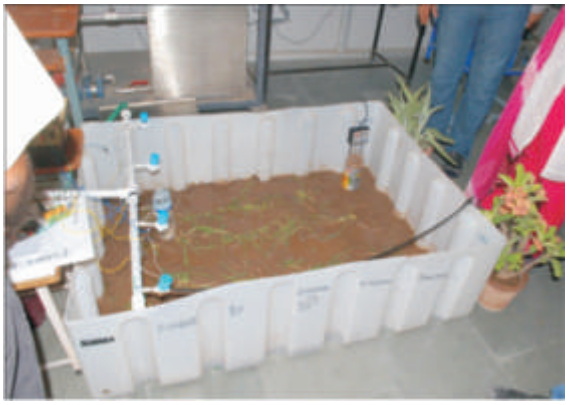
Student
Siddharth Puanik & Ankur Gajjar
Branch of Study: Instrumentation & Control Engineering
Email: sidsagitarian@gmail.com

Guide
Prof. Prakash Velamkar
Dept. of Instrumentation & Control Engineering
Email:prakashvelamkar@gmail.com

Institute
Sardar Vallabhbhai Patel Institute of Technology
B/h Bus Stand, Rajupura Gam, Vasad, Dist. Anand 388 306



Hardware setup of the project



Working Model of the farm

OBJECTIVE

Automation of farm irrigation allows farmers to apply the right amount of water at right time, regardless of availability of labour to turn valves on and off and to sprinkle fertilizer. Farmers using automation equipment are able to reduce runoff from over watering saturated soils, avoid irrigating at the wrong time of day and save the power, water & fertilizer. Thus it will improve crop performance by ensuring adequate water and nutrients when needed. Automatic drip irrigation is a valuable tool for accurate soil moisture control for the crops particularly where there is scarcity of water & power.

Aim of this project is to build the Wireless Sensor Network (WSN) based automation in drip irrigation system. The project is developed on timer, volume and sensor based scheduling for the crop irrigation. The hardware consists of pump, moisture sensor, Signal conditioning circuits, Analogy to Digital Converter, Relay driver, water meter, Solenoid valves, Wireless Sensor Network and a PIC microcontroller (µC). The Microcontroller (PIC16F887) after acquiring data from tensiometer (moisture sensor) and water meter does scaling, framing and sends data serially. ZigBee Transceiver will provide wireless communication between microcontroller in field and Graphical User Interface (GUI) on PC with Labview software. LabView provides interactive GUI to measure and control field parameters. Using Labview software, we can generate executable file so that there is no need to purchase the software for user.

WSN consists of ZigBee Transceiver acquires data serially from microcontroller and communicate to GUI. LabView provides interactive GUI to system for field parameter monitoring and controlling.

ACHIEVEMENTS

We have implemented and established the wireless communication using ZigBee protocol between farm and GUI at remote PC at remote place. PIC microcontroller is interfaced with relay card, flow meter and tensiometer successfully. Microcontroller communicates with ZIgBee transceiver using UART in API format. LabVIEW environment is seamlessly to provide developers tools to rapidly design Virtual Instruments for modeling, testing, remodeling and final deployment. We can monitor & control all

transceiver information from GUI. On GUI we can select any of the scheduling method & crop can be selected. We can able to measure the water consumption using turbine type flow meter and it is displayed on GUI. The GUI indicates all drip lines, devices & network address of slave nodes, real time data from the field. The timer and volume based applications are working properly. We can select the crop and no. of lines for irrigation from GUI and turn the solenoid valves on & off accordingly. Sensor based application is also working properly and as per given set point for quantity of water from the GUI, solenoid valves are turning on & off.

In future, the database & report generation application using the database connectivity tool kit and MySQL for database management, we will develop algorithm based on genetic & artificial intelligence techniques in LabVIEW for the Crop irrigation scheduling. This will increase productivity of crop. We would also like to create a standalone application for our irrigation computer and improve the efficiency and design of the code. We will implement this application can be monitor & controlled from anywhere using Internet using mobile having run time engine & .exe file loaded.

Currently with ZigBee transceiver, we have used 1 km outdoor range. We can increase the range using more router devices. ZigBee transceiver can be put into sleep mode for efficient usage of battery. Using this project we can increase saving of water consumption up to 70% by irrigating water at root level.

GRANT RECEIVED FROM IEI & YEAR

` 40,000/- & 2012-2013

IEI EXAMINATIONS

Right from the inception, the IEI was concerned to fulfil its social objective to provide upgradation and dissemination of engineering education. In its role as a qualifying body the Institution has opened up tremendous possibilities for those who aspire to become engineers but are short of the means or the opportunities to pursue a formal engineering degree course. For such aspirants, the Institution in conformity with the provisions of the Royal Charter, conducts examination bi-annually - the Studentship Examination (suspended since 1998) and the Associate Membership Examination in Sections A and B based on well-structured courses in nine engineering disciplines. The course and curriculum have been modified from time to time. In early nineties a re-structured curriculum of courses and syllabi compatible to the changing demands of the period have been introduced from Summer 1993 Examination. In the updated course structure, emphasis has been placed on the basics and common principles of Design, Production Processes and Management Systems as well as on Computer Science, Energy, Environment, etc. The Institution's examinations are held simultaneously at its various Centres all over India as well as at some overseas Centres and there is an ever-increasing demand for enrollment as Technician/Senior Technicians' Members of the Institution to become eligible to sit for the examination.

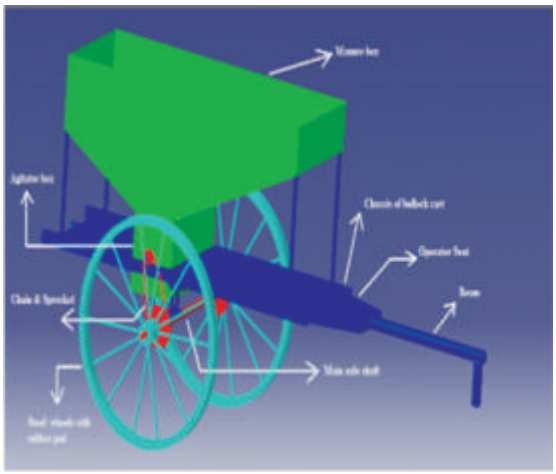
Development and Evaluation of Animal Operated Farm Yard Manure Applicator

Student
Chowda Reddy, M
Branch of Study: Farm Machinery and Power Engineering
Email:chowdas705@gmail.com

Guide
Dr K.V.Prakash, Assistant Professor
Dept. of Farm Machinery and Power Engineering
Email:Prakash_kv07@yahoo.co.in

Institute
College of Agricultural Engineering,
University of Agricultural Sciences
Raichur, Karnataka

Bullock drawn FYM applicator



Three dimensional view of animal operated manure applicator

OBJECTIVE

The present research is under taken to study on the Development and evaluation of animal operated farm yard manure applicator with the following major objectives.

- To study the physical properties of farm yard manure.
- To develop an animal operated farm yard manure applicator for uniform application in the field.
- To evaluate the performance of animal operated farm yard manure applicator.
- To work out the economics of animal operated farm yard manure applicator.

ACHIEVEMENTS

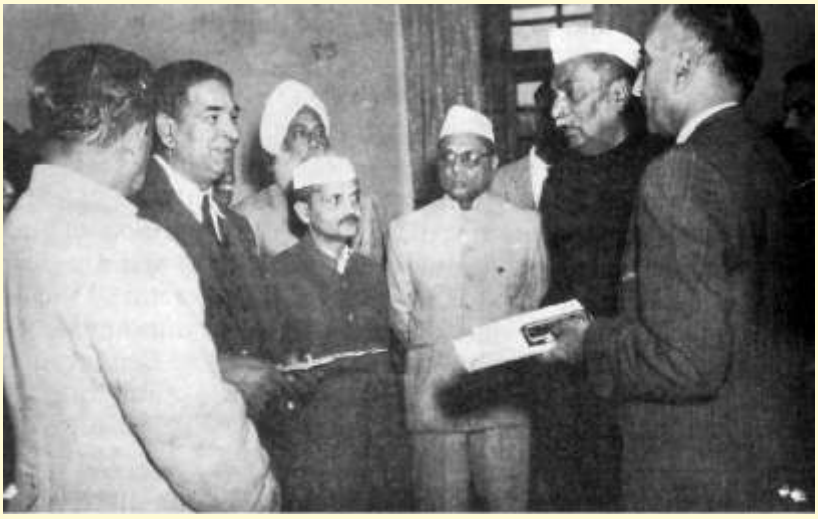
Based on laboratory study and field trials of animal drawn manure applicator, the following conclusions were made.The spreading of manure over the field was statistically significant at the three levels of manure box volume of ½, ¾th and full. The bulk densities of manures measured for vermicompost, donkey manure and FYM are 286.36 Kg m, 203.82 Kg m and 275.15 Kg m, respectively. The laboratory tests conducted by using three types of manures, the moisture content of manures of vermicompost, donkey manure and FYM are 12.8%, 6.56% and 6.77%, respectively and dry mater content of FYM are 87.2%, 93.43% and 93.23%, respectively. The angle of repose of manures for vermicompost, donkey manure and FYM is 34.99°, 36.12° and 39.35° respectively. The co-efficient of friction of manures for vermicompost, donkey manure and FYM are at external material of friction as 0.70, 0.73 and 0.75 and internal material of

friction as 0.65, 0.61 and 0.72 respectively. The power transmission was done at the speed ratio of 1:3 to agitator assembly which rotates 36 rpm incorporating chain and sprocket assembly. The application rate of manure applicator for vermicompost, donkey manure and FYM spreading, the maximum application rate was found to be 25.40 tons/ha, 63.22 tons/ha and 53.89 tons/ha. The lowest application rate was found at 18.16 tons/ha, 30.79 tons/ha and 24.41 tons/ha. The width of spread measured for manure applicator for vermicompost, donkey manure and FYM spreading, the maximum width of spread was found to be 0.91 m, 0.91 m and 0.85 m. The lowest width of spread was found at 0.87 m, 0.87 m and 0.80 m. The co-efficient of uniformity of manure applicator for vermicompost, donkey manure and FYM spreading, the maximum coefficient of uniformity was found to be 94.08 %, 92.98 % and 93.13 %. The lowest coefficient of uniformity was found at 86.35 %, 88 % and 87.75 %. The breakeven point of bullock drawn applicator has been worked out as 79.19 hours. The payback period of animal operated applicator has been worked out as 3.81 years. The benefit cost ratio of animal operated manure applicator has been worked out as 2.61. For FYM spreading using manure spreader, the labor saving was found to be 94.20 %, when compared to the traditional method of manure spreading of FYM. The financial savings of 5.2 % was observed, when compared to traditional method of manure spreading of FYM.

GRANT RECEIVED FROM IEI & YEAR

` 60000/- & 2012-2013

Legacy of IEI



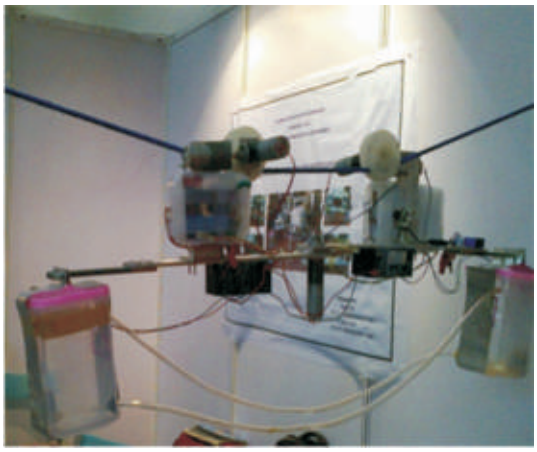
Formal Inauguration of the New Building of the Central India (L to R);- Mr C D Deshmukh, Mr T R Mehandra (Hony Secy) of the C I Centre, Mr Lal Bahadur Shastri, Mr K C Reddy, Dr Rajendra Prasad (President of India) and Mr F C Badhwar (Chairman of the C I Centre)

Transmission Line Inspection and Maintenance Robot

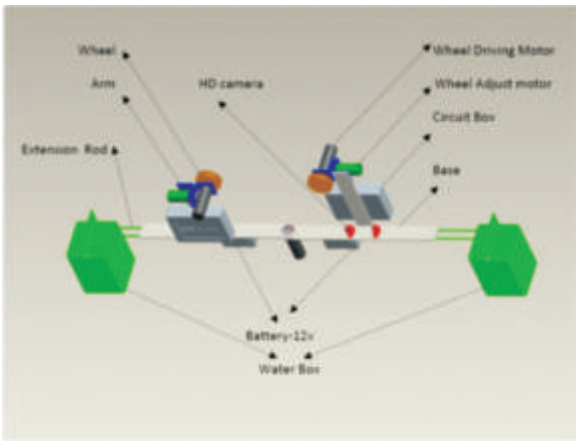
Student
Deep Seth
Branch of Study: M.Tech-Manufacturing Engg.
Email:sethdeep12@gmail.com

Guide
Dr. V Vasu
Dept. of Mechanical Engineering
Email: vvvasu@gmail.com

Institute
National Institute of Technology, Warangal
Kazipet, Warangal



Developed model



CAD model

OBJECTIVE

This robot was developed in order to automate the inspection of very-high voltage transmission lines. It is a robot composed of two wheels that are placed over the transmission lines. As it moves, it collects very detailed information of the lines, in a way that would be impossible for line men. Robot was designed to operate a time, and to overcome most of the obstacles present in the lines. Robot is able to cross even the formidable obstacles of towers (suspension clamps) due to its particular structure: a two arm body connected to the two active wheels on its top, and a 2 degree-of-freedom manipulator in its bottom. In the end of the Base plate there are two counter-weight boxes with water circulating system. Therefore, by changing the configuration of the water in both the boxes, it is also possible to change the position of the centre of mass, thus modifying the posture of the robot.

With this robot, workers no longer need to risk their lives moving on energized lines. They may control the robot from the ground by a portable control unit, using the video provided by several cameras and telemetry information to operate Robot wireless. The automation of Robot free the operator from having to worry about every single detail of the motion, which saves considerable time when performing repetitive tasks such as overcoming cable spacers.

ACHIEVEMENTS

We demonstrate this project in “GRIDTECH-2013”, the international conference and exhibition on load dispatch, transmission, innovation and communication, organized by Power Grid Corporation Of India, in Pragati maidan New Delhi, and got a consolation prize of Rs 10000/- with certificate shown in picture below.

GRANT RECEIVED FROM IEI & YEAR

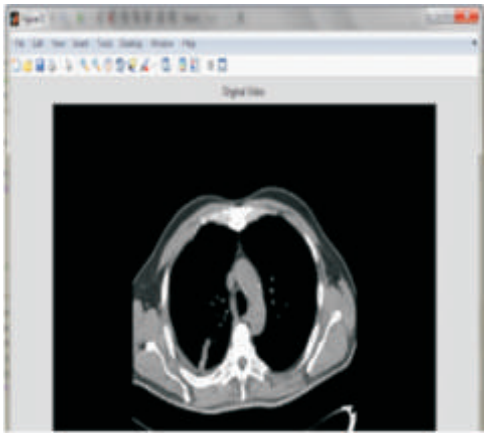
` 60,000/- & 2012-13

Automatic Estimation of Lung's Air Volume and Visualize Variations throughout CT Images

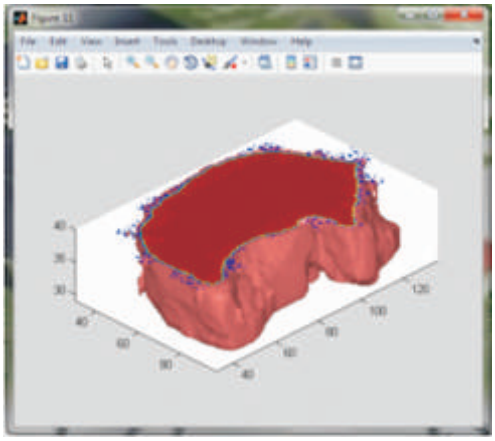
Student
Miss D. Jeeva Priya
Branch of Study: Computer Science & Engineering
Email: priya.jeeva13@gmail.com

Guide
Dr. G. Wiselin Jiji
Dept. of Computer Science & Engineering
Email: jijivevin@yahoo.co.in

Institute
Dr. Sivanthi Aditanar College of Engineering, Tiruchendur



Input image



Volume rendered image

OBJECTIVE

The main Objective of the project :-

to estimate the lung air volume through the CT Image sequences and visualise its variations through CT Images.

ACHIEVEMENTS

It would be very helpful to doctors to give medicine in right manner. This technique can be used in clinical applications, such as lung brachytherapy, where the lung's air volume in a respiratory sequence are needed. This automatic method may improve complex semiautomatic algorithms and it is currently used for ejection fraction estimation. The method can also be used in other biomedical applications, where important physiological parameters need to be extracted.

Papers Published in Journals/Papers Presented in Seminars/M.tech Thesis/Ph.d Thesis/ Patent Generated from this Project

Research Work was successfully Completed. The results were published in Two Conferences.

1. "Estimation of Lung's Air Volume using Intelligent Techniques" in IEEE Sponsored International Conference on Applied Mathematics & Theoretical Computer Science in St.Xaviers Catholic Engineering College, Chunkankadai.
2. “Estimation of Lung's Air Volume using Segmenattion Technique" in National Conference on Emerging Trends and Applications in Computer Science at Dr.Sivanthi Aditanar College of Engineering, Tiruchendur.

GRANT RECEIVED FROM IEI & YEAR

` 16,000/- & 2012

Identification of Ayurvedic Medicinal Plants using Image Processing Techniques

Student
Nitheesh C.N
Branch of Study: Electronics and Communication
Email: nitheeshcnrose@gmail.com

Guide
Nisha George
Dept. of Electronics and Communication
Email: nishadinakar@gmail.com

Institute
Lourdes Matha College of Science and Technology
Kuttichal, Thiruvananthapuram, 695574

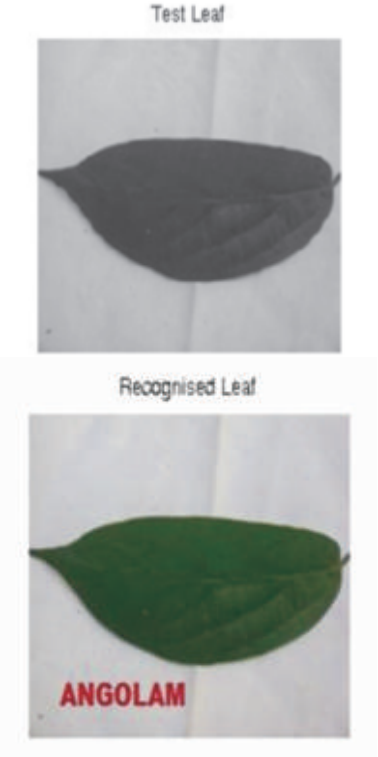


Image showing test leaf and the recognised image from the database

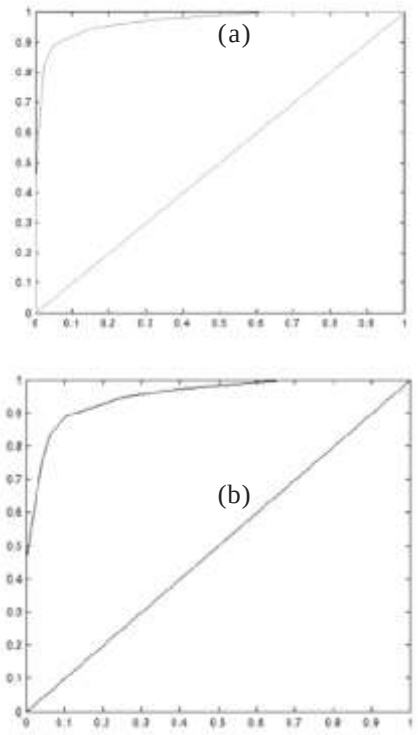


Image showing test leaf and the recognised image from the database

OBJECTIVE

Ayurvedic form of medicine is believed to be existent in India for thousands of years. It employs various techniques and things to provide healing or relief to the ailing patients. One of the things that Ayurveda uses is medications of plant origin. The many medicinal plants that are found in India (and elsewhere) are routinely used by the practitioners of Ayurveda.Computer recognition of plant forms and discrimination between plants by computer feature extraction are gaining more attention among scientists. Medicinal Plants reflect significant information by their features for humans, these features can be observed from different plant parts such as fruits, flowers, roots, and leaves. Computer vision and further feature extraction could have many implications including plant taxonomy, the diagnosis of certain plant diseases and detection of medicinal values of plants. Recently, some studies addressed plant type recognition depending on the morphology of the leaf for identifying the diseases. The previous work has showed the possibility of plant species identification depending on a simple leaf of different plant species. Few studies

have addressed plant identification based on a plant compound leaf, which is considered more complicated due to the higher variation in morphology compared to a simple leaf. This study aims at proposing a methodology to identify ayurvedic medicinal plants that have simple or compound leaves according to the similarities and dissimilarities. The plant leaf considered an obvious feature for recognition by implementing image processing techniques..The work will be based on implementing image processing techniques through features extracting from plant leaf. The proposed methodology used image processing techniques to pre-process the images, and then to extract the proposed morphological and geometrical features from a plant compound leaf image.

ACHIEVEMENTS

In computerised plant leaf recognition, each image is represented by a large number of pixel values. Linear discriminant analysis is primarily used here to reduce the number of features to a more manageable number before classification. Each of the new dimensions is a linear combination of pixel values, which form a template. The linear combinations obtained using Fisher's linear discriminant are called *Fisher faces*, while those obtained using the related principal component analysis are called *eigenfaces*. In this way, we obtain a lower dimensional representation of the data that removes some of the noisy directions. In our work Fisherfaces has best results. We studied classification efficiencies of Fisher's Linear Discriminant Analysis and Eigenface methods, where the centers and covariance appearing in the population discriminant rule can be estimated by their sample counterparts, or by plugging in robust estimates. This work has been analysed under Receiver Operating Characteristics (ROC). To build our virtual multimodal database, we have chosen 250 images. The images are randomly sampled as training samples, and the remaining are left as test samples. Then, each sample of the image in database is randomly combined with one sample of the database. The performance of a system can be shown as a Receiver Operating Characteristic (ROC) curve that plots the Genuine Accept Rate against the False Accept Rate (FAR) at different thresholds on the matching score. The ROC shows Genuine Acceptance Rate and accuracy .And the results on ROC shows promising results for Fisher Linear Discriminant Analysis(FLDA) than Eigenface methods. In future more analysis can be done on different feature extraction methods such as Independent Component Analysis, Advanced LDA etc. \

GRANT RECEIVED FROM IEI & YEAR

` 30,000/- & 2012-2013

Legacy of IEI

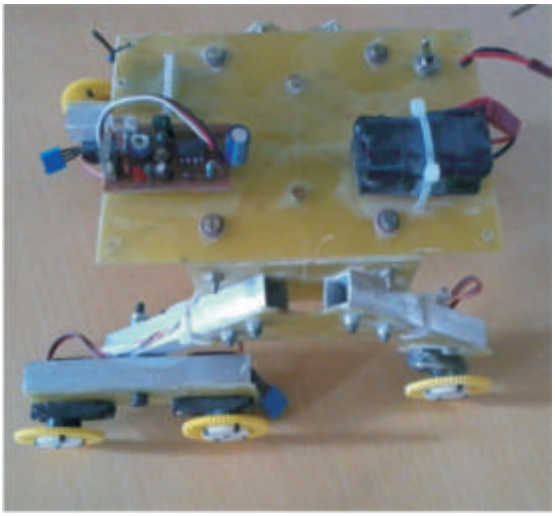
Shri Pranab Mukherjee, Respected President of India, inaugurating 27th Indian Engineering Congress at New Delhi on December 14, 2012

Rocker Bogie Mobility System

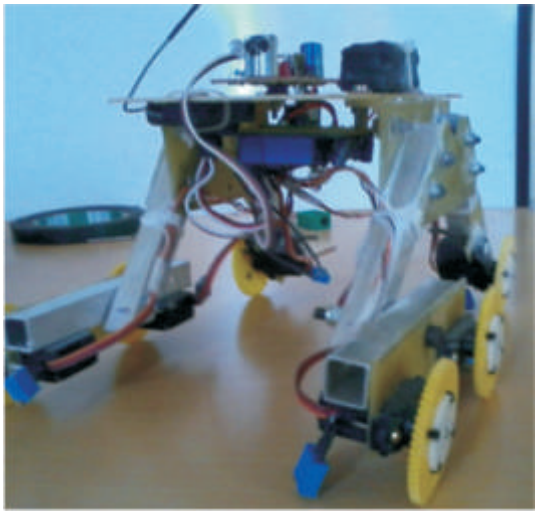
Student
Rohit Bagora, Anupam Sohni,
Priyanka Jain, Zubairkhan Kittur,
Sadia Khattak
Branch of study: Mechanical Engineering
Email: rbagora333@gmail.com,
anupamsohni@gmail.com,
36priyanka.jain@gmail.com,
zkittur@rediffmail.com,
khattak-s@hotmail.com

Guide
Prof. A S Kittur
Dept. of Mechanical Engineering
Email: akittur@rediffmail.com

Institute
Chameli Devi Group of Institutions
Near Toll Naka, Khandwa Road,
Umrikheda, Indore 452020



Top view



Front view

OBJECTIVE

The Rocker Bogie Mobility System is designed to be used at slow speeds. It is capable of overcoming obstacles that are on the order of the size of a wheel. However, when surmounting a sizable obstacle, the vehicles motion effectively stops while the front wheel climbs the obstacle. When operating at low speed (greater than 10cm/second), dynamic shocks are minimized when this happens. For many future planetary missions, rovers will have to operate at human level speeds (~1m/second). Shocks resulting from the impact of the front wheel against an obstacle could damage the payload or the vehicle. This project describes a method of driving a rocker bogie vehicle so that it can effectively step over most obstacles rather than impacting and climbing over them. Most of the benefits of this method can be achieved without any mechanical modification to existing designs with only a change in control strategy.

ACHIEVEMENTS

The test track uses motors and gearboxes that are capable at driving the vehicle at speeds in excess of 1m/sec. The wheelie manoeuvre has been used at these speeds successfully. The initial front wheelie is initiated when an obstacle gets within one wheel diameter of the front wheel. At this point the rear wheel is slowed and the middle wheel has the PWM signal given to it increased by 30%. When the obstacle is directly under the front wheel, the wheel speeds are turned back to normal, causing the front wheel to ride down the forward side of the obstacle. Based on the speed of the wheels, the middle wheel wheelie is

initiated at the appropriate time, and the wheel speeds are returned to normal at a time when the object should be under the middle wheel. The initial sensing is currently done with IR proximity sensors.

GRANT RECEIVED FROM IEI & YEAR

` 50000/- &: 2012-13

R&D Activities of IEI over the years

The Institution of Engineers (India) initiated an effort to Promote R & D activities in applied research at college / university level by direct financial support in 2001. In the first year, 9 (nine) project proposals were given financial support amounting to Rs 2.26 lakhs. With sincere and dedicated effort to promote Research and Development in the country with the passage of time there was a remarkable increase in the numbers of projects being sanctioned allocating larger sum of grant-in-aid. Over a period of 10 years, in 2010 total number of sanctioned projects jumped to 64 with an outlay of Rs 25.34 Lakhs. In 2011 the total outlay stands at 43.68 Lakhs to 76 project proposals. During the FY 2013-14 the total budgeted amount has been enhanced to Rs 60 Lakh to facilitate more students in taking up the R&D projects.

One of the unique features of the R&D Grant-in-Aid program is that this particular program is targeted mainly for students in Under Graduate Level. This has been done to encourage and inculcate among the students the passion for Research and Development. When these students grow up this embedded passion of R&D will be the driving force to put them in the trajectory of Advanced Research.

To broaden the Horizon of the R&D effort of IEI and to enhance the visibility and accessibility of the R&D, new concepts are nurtured continuously. One of the most promising proposals is formation of IEI Research & Innovation Group - IERIG. This is actually a model through which various engineering institutes across the country and The Institution of Engineers (India) can partner each other and jointly promote R&D culture in the country.

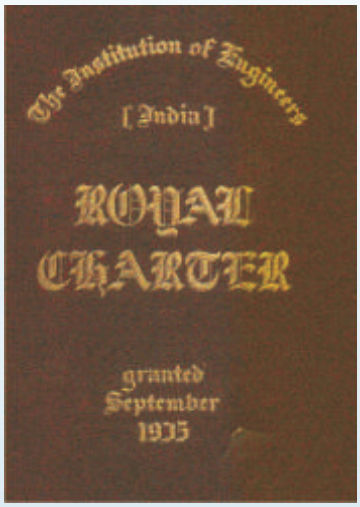
The Institution of Engineers (India) has also initiated setting up of R&D Centre at its Headquarters, which will facilitate the utilization of the in-house talents for carrying out R&D. This will add another feather in the crown of the Institution and it will be in a position to be rightly called as an R&D Institute.

The ever increasing interest of the students across the country for R&D project coupled with the prospects of joint venture with other engineering institutions and the nurturing of the in-house talent at the proposed R&D facility at headquarters, the R&D effort of The Institution of Engineers (India) will definite get a boost and move thumping ahead through the path of success in future.

IEI Research & Innovation Group – IERIG

Broad scope of activities:

- Disaster Mitigation Engineering
- Small (Micro and Nano) Satellite technology
- Power Grids / Quality Power Distribution
- Green Manufacturing
- Bio-Medical Instrumentation / Customised Implants
- Energy-efficient Buildings
- Alternate Energy Sources in Rural Sector
- Micro Vehicle / Unmanned Air Vehicles
- Surface Engineering
- Digital Manufacturing / 3D Printing
- Sustainable Technologies / Sustainable Designs
- Remote Infrastructure Management
- Computer Aided Engineering / FEM Methods
- Composite Structures



ROYAL CHARTER

AT THE COURT AT BUCKINGHAM PALACE,

The 13th day of August 1935

PRESENT,

THE KING'S MOST EXCELLENT MAJESTY

IN COUNCIL

The objects and purposes

(a) To promote and advance the science, practice and business of Engineering in all its branches (hereinafter referred to as "Engineering") in India.

(b) To establish, subsidise, promote, form and maintain local Associations of members belonging to the Institution and others engaged or interested in Engineering so as to assure to each individual member as far as may be possible equal opportunity to enjoy the rights and privileges of the Institution.

(c) To diffuse among its members information on all matters affecting Engineering and to encourage, assist and extend knowledge and information connected therewith by establishment and promotion of lectures, discussions or correspondence; by the holding of conferences; by the publication of papers, periodicals or journals, books, circulars and maps or other literary undertaking; by encouraging research work; or by the formation of a library or libraries and collection of models, designs, drawings, and other articles of interest in connection with Engineering or otherwise howsoever.

(d) To promote the study of Engineering with a view to disseminate the information obtained for facilitating the scientific and economic development of Engineering in India.

(e) To establish, acquire, carry on, control or advise with regard to colleges, schools or other educational establishments where students and apprentices may obtain a sound education and training in Engineering on such terms as may be settled by the Institution.

(f) To encourage, regulate and elevate the technical and general knowledge of persons engaged in or about to engage in Engineering or in any employment manual or otherwise in connection therewith and with a view thereto to provide for the holding of classes and to test by examination or otherwise the competence of such persons and to institute and establish professorships, studentships, scholarships, rewards and other benefactions and to grant certificates of competency whether under any Act of the Government of India or Local Governments regulating the conduct and qualifications of Engineers or otherwise howsoever.

(g) To give the Government of India, the Local Governments and Municipalities and other public bodies and others, facilities for conferring with and ascertaining the views of Engineers as regards matters directly or indirectly affecting Engineering and to confer with the said Governments, Municipalities and other public bodies and others in regard to all matters affecting Engineering.

(h) To encourage inventions and investigate and make known their nature and merits.

(i) To arrange and promote the adoption of equitable forms of contracts and other documents used in Engineering and to encourage the settlement of disputes by arbitration and to act as or nominate arbitrators and umpires on such terms and in such cases as may seem expedient.

(j) To promote efficiency and just and honourable dealing and to suppress malpractice in engineering.

(k) To do all such other acts and things as are incidental or conducive to the attainment of the above objects or any of them.

The Institution of Engineers (India)

8 Gokhale Road, Kolkata 700 020

Phone : +91 (033) 2223-8311/14/15/16, 2223-8333/34

Fax : +91 (033) 2223-8345

Website : http://www.ieindia.org

e-mail : technical@ieindia.org

iei.technical@gmail.com