

Introduction

Gandhian Young Technological Innovation Awards are given away each year to promote culture of innovation amongst the young minds of the country. Techpedia.in and SRISTI (Society for Research and Initiatives for Sustainable Technologies and Institutions) have established three national awards for innovative student/faculty projects in engineering, pharmacy, science and applied technologies.

Techpedia, an initiative at **SRISTI** aims at putting the problems of micro, small and medium enterprises, informal sector, grassroots innovators and other social sectors on the agenda of the young technology students across the country. We can no longer afford to ignore the huge talent distributed in thousands of polytechnics, diploma and degree colleges of engineering, pharmacy, medical science, agriculture etc. SRISTI is providing a platform for the industry and academic institutions to collaborate, co-create and foster distributed and horizontal innovations. Most of the ideas mentioned here have been implemented in the state of Gujarat in close cooperation with Gujarat Technical University and initial results are extremely encouraging.

Key goals of Techpedia.in are :

- Promotion of originality among technology students by making it impossible for them to do what has been done before. This will be possible only when they can find out what has been done before. Techpedia.in already has 1.4 lakh technology projects done by 3.5 lakh students from more than 500 colleges in India.
- Connecting the technical students with the problems of informal and unorganized sector and grassroots innovators
- Putting the technical problems of MSMEs on the agenda of students so that affordable solutions can be generated in a real time.
- To harness collaborative potential of students across disciplines and colleges to solve persistent problems of our country in formal and informal sector
- Explore *kho kho* model (relay) of product development. Idea here is that if one student group has brought the solution of a particular problem to a specific stage, then next group within that department or somewhere else should be able to build upon it to take it forward.
- To pose challenges to students to address unsolved problems of our society. Industry association, government and others can offer attractive prizes for solving those problems which have remained unsolved so long.
- Developing high tech capabilities through network platforms so that India becomes a hub for high tech outsourcing for the world in future and does not serve only the low tech needs.
- Promoting both IPR protected and open source technologies and eventually develop techpedia.in into an online virtual incubator.
- Creating real-time online NMN (National Mentoring Network) to harness skills, insights and experience of senior tech experts for mentoring young students.

It is obvious that no one institution or university can accomplish any of these goals. We have to create a collaborative culture so that problems of small enterprises, informal sector and local communities in disadvantaged regions can be solved in a time bound manner. Every time a student solves a real life problem, he /she does not merely become a better technologist but also a better human being.

Not all expertise for guiding a student team may be available at the same college or department. Mentors from various sectors, retired scientists, and fellows of national academies should be able to guide the projects in which they have interest. Techpedia.in is, thus, an aggregator of aspirations of young students to make India a creative, collaborative and compassionate society.

Contents

Nanofinishing of Freeform Surfaces of Prosthesis Knee Joint Implants	6
Highly Gas Impermeable Elastomeric Rubber-Rubber Blend Nano Composites.....	8
Saree cutting machine for mat making handlooms.....	10
Robotic Dredger	13
Vision for the blind using ultrasonic sensors	16
Re-arranging Unused Contacts in Mobile Phones for Quick Access.....	18
Mosquitocidal Endotoxin from Vellore Poultry Farm Wastes	20
Development of a Geo-hazard Warning Communication System.....	22
Snippets-Memory Aid for People With Disability	24
Target Oriented Niosome Based Delivery of an Antitubercular Drug, Development and Charecterisation.....	26
Ambulatory Health Network App	28
Laser Ignited Internal Combustion Engine.....	30
Clubfoot Orthosis	32
Chetna - Celebrate Your Pregnancy	34
Reactor & Catalyst development for oxygen evolving step in Sulfur-Iodine cycle for Hydrogen production.....	36
E-diagnoser: An Advanced Low Cost Patient Monitoring Watch	38
Self-Cleaning Functional Molecular Material.....	40
Automatic Fish Scaling Machine	42
Semi-Automatic Rubber Tapping Machine	44
Electronic Support System for Physically disabled(Deaf & Dumb)	46

Apparatus for Making Silk Fiber Based Lamellar Biomaterials to Solve Problem Of Lower Back Pain.....	48
High Performance Cooking Stove	50
Ultra Low Cost Tunable Nano Scale Patterns	52
The Third Eye	54
Sancharak: A Cell-Phone for Blind People	57
Cross Linked Antibacterial Hydrogel.....	59
Hybrid Classifier for Marine Vessel based on Propulsion	61
VAJRA(vessel desk).....	64
Comprehensive Protection from Electrocution	66
Multifunctional Nano-in-Micro Alginate Microspheres for Biosensing, Drug delivery and MRI	68
Graphics Model for Power Systems in CIM Framework and Design of Online Web-based Network Visualizations and Integration of Control Center Applications.....	70
Prognosis of pre-diabetes and type 2 diabetes based on the non-invasive estimation of blood glucose using infrared thermography against the bio-marker	72
Spectral Eye.....	74
Novel Stand-alone 1-Phase AC Generator for Rural Electrification using Renewable Energy	76
Cow Dung based Microbial Fuel Cells (CDFCs) to Light up Indian Villages	78
Saral parikshan (सरलपरीक्षण)- An advancement in cutting edge technology for rural areas to detect vitamin B12 for pernicious anemia	80
Hydro-operated Square-Bottom Paper and Jute Bag Making Machine	82
Development Bamboo-epoxy nanocomposites for manufacturing of helmets and other structural applications	84
Digital Pen	86
A Portable and Efficient Electronic Filter for Sub-Micron Particles from Fluids	88
Design of a Smart Automotive Ventilation System for Parked Vehicles.....	90

SHE- Society Harnessing Equipment	92
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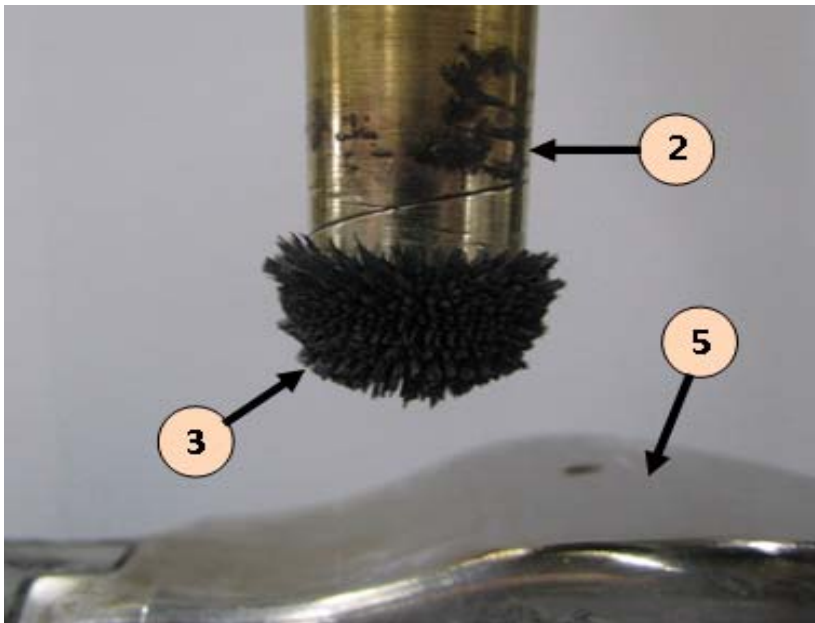
Nanofinishing of Freeform Surfaces of Prosthesis Knee Joint Implants

Student(s)-Sidpara Ajay Muljibhai

Guide- Prof. V K Jain

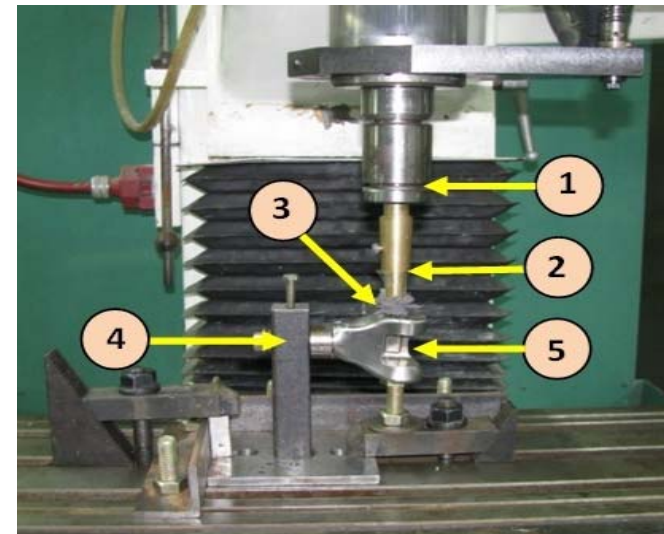
Institute- IIT Kanpur

The components having freeform surfaces (surfaces which cannot be defined accurately mathematically) have been widely used in aerospace, automobile, medical, consumer products and the die/mold industries to meet specific requirements.



(b) A close view of MR polishing fluid (1 – CNC milling machine head, 2 – MR finishing tool, 3 – MR polishing flexible brush, 4 – fixture for knee joint implant, 5 – knee joint implant)

Nanofinishing of knee joint implant is one of the most important and costly process steps to make the implants suitable for patients.



Therefore, the knee joint implants are often inaccessible to people from poor parts of the world. Moreover, the life of the implant is short when it has high surface roughness. That makes it difficult for the patient to undergo a surgery to remove worn implants and replace it with the new one. A comprehensive in-house facility for finishing of these implants with cost effective and efficient technologies would provide long-term support to orthopedic industries and also lead to savings of a considerable amount of foreign exchange. Therefore, a new process

called magnetorheological fluid based finishing process has been developed for nanofinishing of knee joint implants. This technology will significantly impact the orthopedic-implants industry by improving the functionality and extend the life span of knee joint implants. Minimum surface roughness of 28 nm has been achieved with a variation up to 97 nm which is within the ASTM standard of knee joint implant.



Profile: Dr. Sidpara Ajay obtained his B. E. from Government Engineering College, Bhuj (Gujarat University) and M. E. from M. S. University of Baroda. He recently completed his Ph.D. in Mechanical Engineering from Indian Institute of Technology Kanpur. He has published 14 research papers in international journals, 4 book chapters, and 14 research papers in national and international conferences.

Inspiration: When I joined IIT Kanpur as a Ph.D. student, I started my research on nanofinishing of flat single crystal silicon which was a sponsored project from Bhabha Atomic Research Centre (BARC), Bombay. After satisfactorily completing that work, BARC sanctioned another project related to development of technology for nanofinishing of curved and sculptured surfaces. The prime objective was to develop a cost effective and efficient nanofinishing process

for prosthesis implants. I found this very interesting as well as challenging.

Current Shortcomings: The present prototype is installed on a 3-axes CNC milling machine. Therefore, it has only 3 degrees of freedom. As a result, the time taken for nanofinishing of complex surfaces is more. In the next version of prototype, a 5 or more axes controller will be used which will reduce finishing time significantly as uniform final surface roughness will also be achieved. An automatic feeding and retrieval of Magnetorheological fluid from the tool is also envisaged.

Future Plans: The developed technology is an efficient and cost effective process for nanofinishing of complex surfaces. An Indian patent has been already filed with collaboration with BARC, Bombay. A lot of R&D is underway, in which my colleagues and I from IIT Kanpur are involved. To take this technology to the market, support from the industries which deal with CNC machines and precision machining is required. There are hardly any industries in India which deal with nanofinishing of complex surfaces. Therefore, this technology will overcome many problems of conventional finishing processes. Commercialization of this process will also reduce dependency on imported technologies related to finishing.

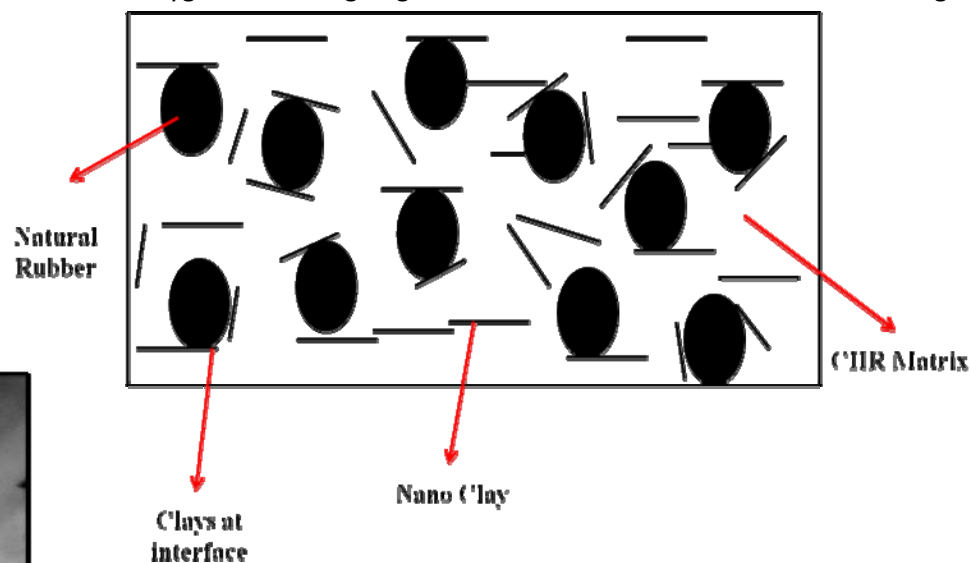
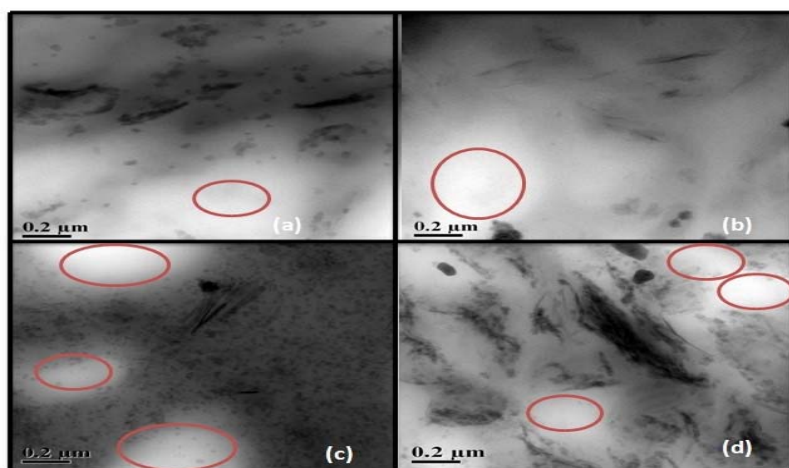
Highly Gas Impermeable Elastomeric Rubber-Rubber Blend Nano Composites

Student(s)- Ajesh K Zachariah

Guide- Dr. Sabu

Institute-Mar Thoma College, Kerala

A novel strategy for the preparation of natural rubber/chlorobutyl rubber/nanoclay (CIIR/NR/ Cloisite10A and Nanomer I.44P) nanocomposite membranes is reported for the first time for barrier applications towards oxygen and nitrogen gases. The membrane formulations consisting of 70 phr chlorobutyl rubber and 30 phr natural rubber to which Cloisite 10A nanoclay having 2MBHT organic modification and Nanomer I.44 P having 35-45 wt. %, dimethyl dialkyl (C14-C18) amine having high cation exchange capacity (CEC) of about 70–150 meq/100 g were added. Composites containing 0, 2.5, 5, 7.5 and 10 phr of Cloisite 10A and Nanomer I.44P nanoclays were evaluated. The permeability of the nanocomposite membranes to



nitrogen and oxygen gases was carefully measured. The incorporation of clay into natural rubber (NR)/chlorobutyl rubber (CIIR) nanocomposites provides highly impermeable membranes which are superior to expensive CIIR nanocomposite membranes. In this invention, low amount of fillers were used to achieve a highly impermeable system. The current systems were arrived at without the addition of carbon black, processing oils etc. Therefore, the invention is a green approach towards the development of

impermeable membranes towards oxygen and nitrogen.



Ajesh Zachariah

Profile: Ajesh is currently working as Assistant Professor in the Post Graduate and Research Department of Chemistry at Mar Thoma College, Tiruvalla, Kerala. He is also doing Doctoral Research in polymer chemistry at School of Chemical Sciences, Mahatma Gandhi University, Kottayam, Kerala. He has five-years research experience in synthesis of nanomaterials, nanocomposites and its characterization, and has published four internationally cited articles, two books, applied for one Indian patent. Ajesh bagged the meritorious research scholar award from UGC, India in 2009 and young researcher award in Nanosat-2010. The present innovation has been done as part of the doctoral research.

Inspiration: Tire inner liners and inner tubes are composed of chlorobutyl rubber with additives such as silica, carbon black etc. and have poor mechanical strength, thermal stability and gas impermeability and are not cost effective. Compounding of chlorobutyl rubber with layered silicates can result in further performance improvement. But, the major problem for the dispersion of these particles in rubber matrices is the incompatibility. This can be overcome by using suitable organic modification of the nanoclays. To develop economically feasible and high performance nanocomposites, judicious designing of membranes to be done by effective blending of rubbers and addition of nanofillers into it.

Future plans: Recently it has been found that carbon nanostructures are attractive components for the development of composite materials due to their exceptional mechanical, electrical and thermal properties. If we can develop the new tortuous path as observed in 70 chlorobutyl rubber/30 natural rubber/nanoclay nanocomposite systems by using carbon nanostructures, we can achieve a system with zero gas transport, high mechanical strength and high thermal stability. In this context, we require further R&D support for the development of these membranes.

Saree cutting machine for mat making handlooms

Student(s)- Vikalp Jambhulkar, Alap Kshirsagar, Abhijit Patil Guide- Dr. Suhas Joshi
Institute- IIT Bombay

The objective of our project is to design a machine which would replace the manual method of cutting old sarees into ribbons for weaving mats on handlooms. After brainstorming over various designs and evaluating each of them, we finalized two designs. First was completely human powered and the second one included an electric motor. The prototype machine consists of 3 assemblies: saree rolling assembly, cutter assembly



and slider mechanism. A full length saree is wound on bobbin shaft using paddles. Then the circular rotary cutters are used to cut saree into ribbons of equal width. The bobbins can be easily removed after cutting.





Profile: Alap Kshirsagar- Third year Undergraduate, Mechanical Engineering, IIT Bombay
Vikalp Jambhulkar- M.Tech., Mechanical Engineering, IIT Bombay
Abhijit Patil – First Year, M.Tech., Mechanical Engineering, IIT Bombay

Inspiration: Handloom weaving has been identified as a sustainable and remunerative livelihood option for visually challenged people, with proper training. A new product called 'Mats made from old sarees' has been developed by Gramin Shramik Pratishthan, an NGO in Latur district of Maharashtra. This activity has considerable potential to generate employment opportunities and can be replicated in different parts of the country on a larger scale. The process of mat-making begins with folding and cutting sarees into small ribbons. This step is very tedious, time consuming and involves a lot of drudgery. To solve this issue we undertook this project.

Current Shortcomings: As the productivity is directly proportional to number of cutters, maximum productivity will be obtained if we cut all the ribbons at one time. Also the operational time of sliding cutter assembly from one position to next position will be eliminated in this case. Therefore we need a fully electric powered machine with minimum user-end operations to reach maximum productivity. Another area of improvement is in wrapping the sari on the bobbin array. To address this issue, a stretching roller type mechanism has to be developed which can be attached to the machine. Developing a mechanism like this will reduce the time required for the entire operation and the productivity will increase.

Future plans: A precise manufacturing of our design can develop it into commercially viable product. For that we require some inputs from the manufacturing and design experts. Also a lot of testing needs to be done before installing the machine on field. R&D can be done in the area of measurement and modeling of cutting forces in fabrics.

Robotic Dredger

Student(s)- Amit Maurya & Digvijay Boob

Guide- Prof. C Amarnath

Institute- IIT Bombay

A dredger is a piece of equipment which can dig, transport and dump a certain amount of underwater laying soil in a certain time. The purpose of dredging is generally to gather bottom sediment and either dispose it at a different location or use these sediments in various products, e.g. sand and gravel for concrete mixtures.

Robotic Dredger -

The current prototype is an automated dredger. Its main features are:

- a) The mechanism is simple and effective.
- b) The prototype construction supports the stability of the two-hull boat and provides large carrying space for the sludge & waste.
- c) It is cheap and environmental friendly.
- d) It has an advantage over current hydraulic alternatives that use a lot of fuel and are only able to clean the shore. This prototype can be used in the middle of the pond too.





Profile: Founded by Prof C Amarnath, UMIC (U. Mashruwala Innovation Centre) at IIT Bombay aims to foster an atmosphere of creativity, innovation, discovery and exploration on the campus. UMIC provides infrastructural facilities to nurture inventions among students from various disciplines. Over the years UMIC has evolved from nurturing small hobby projects to solving complex industrial challenges and representing IITB at national and international competitions.

Amit and Digvijay are B.Tech (Mechanical Engineering) students of IIT Bombay, who are actively involved in UMIC.

Inspiration: The water in the Powai lake near IIT Bombay was found to be non-potable because of the indiscriminate use of the lake for disposal of domestic sewage by nearby residential and slum colonies. The lake is now used for recreation, gardening, cattle washing and fishing. The land in the catchment area was converted into a development zone. This led to reduction in total water spread and depth due to siltation, encroachment and soil erosion. This prompted us to think about a solution to the problem.

Current Shortcomings: A few shortcomings of the current machine are related to the mechanism for polymer threads and the cleaning speed of the machine.

Future Plans: 1. Improve cleaning speed and automation purposes - use of propeller, wireless RF or xbee will be required to add to existing two hull- boat prototypes.



Digvijay Boob



2. Add mechanism to existing machine which can remove surface hyacinths and other polluting material.

Amit Maurya

3. Use of metallic chains instead of polymer threads to retain better stability of the scoop while it is inside the water. These will require a good actuator (powerful motor).

Vision for the blind using ultrasonic sensors

Student(s)- Amrita Pattnaik, Vinod K., Santosh Kumar Bhandari P.

Institute- SRM University, Chennai

This project mainly focuses on providing light for the blind people and relieving them from the dark world by providing them vision using high frequency Ultrasonic sound waves.

Ultrasonic sound waves are basically high frequency waves and are beyond the range of hearing capability of human beings. These sound waves are used by mammals such as Bats and whales to detect the presence of obstacles in front of them. The practical implementation of the natural phenomenon for use by the visually impaired basically consists of a Microcontroller with the Ultrasonic sensors on the input side and Electrodes on the output side.

Obstacle once sensed by the Grid of Ultrasonic sensor gives input to the Microcontroller as an image pattern which in turn gives the desired voltage level to the grid of output-end electrodes. The electrodes which are placed on the tongue impart vibration(charge) on the tongue nerves which sends the image signals to the visual cortex of the brain. Finally the vibration provides a mental picture of the obstacle to the visually impaired person's and hence perception of vision will be achieved.





Santosh Bhandari

Re-arranging Unused Contacts in Mobile Phones for Quick Access - 581

Student(s)- Bala Vishnu. R, Karthik Kumar. T, Murali Prasanth. P

Guide- Prof. P.Natesan

Institute- Kongu Engineering College, Tamil Nadu

Throughout their lives, people gather contacts on their mobile phones. Some of these are unused contacts that have not been used for a long time and are less likely to be used in future. These contacts distract the user's attention and occupy mobile phone's limited screen capacity. To address this problem, we proposed the idea of contact list interface, which automatically demotes unused contacts by presenting them in a smaller font at the bottom of the contact list. As a part of the information gathering phase, we asked some of our friends to assess for how long they had not used each of their mobile phone contacts. Results show that 47% of all their contacts had not been used for over 6 months or had never been used at all. Then, we demoted these unused contacts using our prototype and asked our participants to locate contacts that they had recently used, with and without the prototype. Online Results and Surveys indicate that the use of our prototype can reduce both the number of key strokes and the retrieval time significantly. The majority of participants indicated that it was easier for them to access their contacts using our software prototype and that they would like to use it in their next mobile phone. The results provide strong evidence for the demotion principle suggested by the user-subjective approach.





Profile: These are Computer Science & Engineering students from the Kongu Engineering College, Tamil Nadu. They have presented many papers and exhibited projects in various reputed colleges across India. They have also conducted a few workshops for their colleagues on 'Platform Independent Mobile Application Development'.

Inspiration: We got this idea as we wanted to figure out a good solution for easy contact retrieval. So in the beginning we thought of an algorithm that could display the used and unused contacts in separate tabs. We fine tuned our idea and then thought of a new efficient algorithm that we have implemented now.

Current Shortcomings: Till now we have done only a prototype and not a market ready product. Moreover, we have implemented it on Android and Windows Phone platform only. Its overall performance also has to be fine tuned.

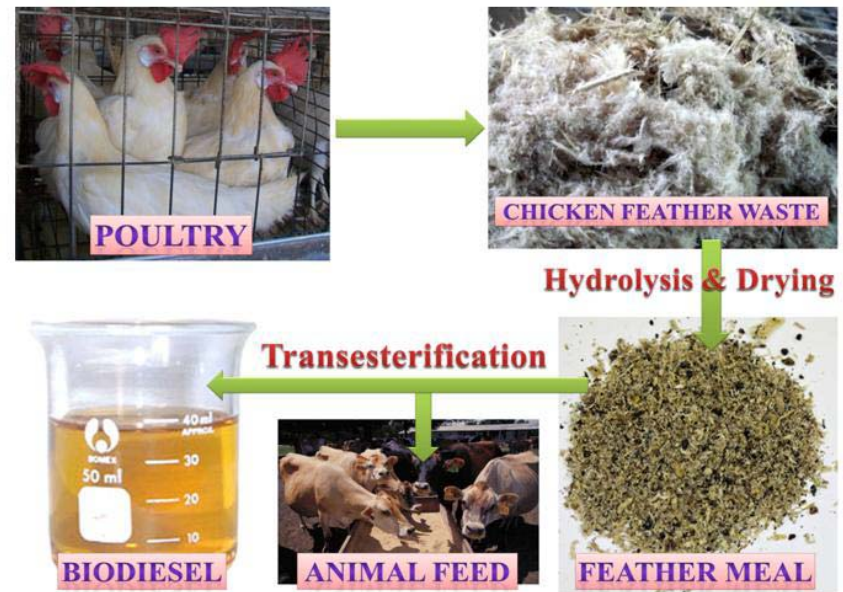
Future Plans: In the near future, we would like to make our app touch screen optimized, user friendly and available to all possible mobile OS in the market. We have planned to use an entirely new open source technology called jQuery Mobile which is platform independent, touch optimized with a great UI. Incubation is necessary for our project as publishing our app in 3rd party stores (like Google Play, Nokia Store) would require registration fees.

Mosquitocidal Endotoxin from Vellore Poultry Farm Wastes

Students(s)- Bishwambhar Mishra

Guide- Dr. Suneetha V. Institute- Vellore Institute of Technology, Kerala

There are many problems related to the huge amount of poultry waste generated throughout the world. The environmental burden due to such wastes is increasing at an alarming rate and there is a need for bioremediation. Previous treatment methods include land filling. But land filling pose problems of secondary pollutants like landfill leachate, greenhouse gases and odour. The modern treatment methods lead to the production of Mosquitocidal Toxins . For the production of Mosquitocidal toxins we used chicken feather powder (0.5%) for the preparation of bacterial culture media, on which we cultured entomopathogenic bacteria (*Bacillus spp.*) which completely degrades feather waste. The *Bacillus spp.* was screened from dumped poultry waste soils, sewage bed, river bed and pond bed of different locations at Vellore and Chittoor and were identified on the basis of morphological, physiological and biochemical characteristics. These bacilli species have the capability of degrading feather by the release of an extracellular enzyme which is referred to as 'keratinase'. The Mosquitocidal toxin is extracted and then assayed by testing on *Culex* larvae. The endotoxins produced are a potent larvicidal agent for mosquito. Thus reduces the overall consumption and harmful effect of commercially available mosquito repellents. Hence the treatment of feather waste can be envisaged.





Bishwambhar Mishra

Profile: Mr. Bishwambhar Mishra has received his engineering degree in Biotechnology from VIT University, Vellore in the year 2010 and presently pursuing his doctoral research work under the guidance of Dr. Suneetha V. in VIT University. He has attended many national and international conferences, seminars and workshop and presented papers and posters in various scientific events. He has published many papers in both national and international peer reviewed journals.

Inspiration: *Bacillus* spp. (VITRARS) provides effective alternatives to a wide range of larvicides without harming the environment. When we spray other larvicides in aquatic environment it kills the aquatic animal and reduces aquatic ecosystem's biodiversity. But the produced mosquitocidal toxin has no ill effects on human and non-target organisms. It effectively reduces the population of mosquito also reducing the consumption of harmful mosquito repellent. The current solution is thus a win-win situation. This was our biggest motivation.

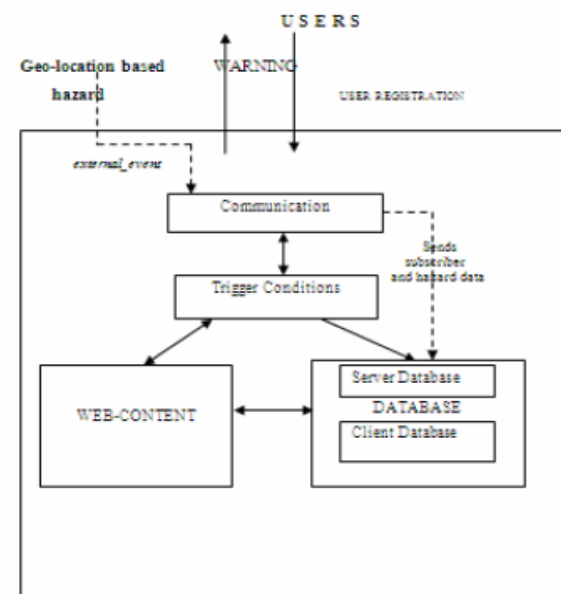
Future Plans: It's very easy to make our own biological and natural mosquito repellent in future. Generally natural products (Citronella Oil, Lemon Eucalyptus Oil, Cinnamon Oil, Castor Oil, Rosemary Oil, Lemongrass Oil etc.) will effectively repel mosquitoes, but they require more frequent reapplication (at least every 2 hours) and higher concentrations. Because of the differences between types of mosquitoes, products that contain multiple repellents tend to be more effective than those containing a single ingredient. So our plan is to develop effective formulations containing the biologically synthesized endotoxins and these above mentioned natural mosquitocidal products.

Development of a Geo-hazard Warning Communication System

Student(s)- Dr. Devanjan Bhattacharya

Guides- Dr. Jayanta Kumar Ghosh, Prof. Narendra Kumar Samadhiya

Hazard warning is necessary for effective mitigation due to disaster. People moving into a hazard prone area need to be made aware of the level of threat. In this study, a system to warn against hazard is being proposed. It aims to be independent, fast and pervasive. It is designed to be a generalized system that could be deployed across any region. The system is modular in structure consisting of four functional units and gets activated once it is fed with threat level with geo-location. The existing cellular network is being utilized for disseminating hazard information as short messages. Currently the system is built for warning hazard due to landslides and classification accuracy was previously tested in this domain. Now the message permeability is shown to be virtually instantaneous with a maximum time lag recorded as 50 seconds, minimum of 10 seconds. On an average, the perceived threat message whether high, moderate or low threat, reaches a mobile user within 30 seconds. Such a handy system could be very useful in a densely populated country like India where existing governmental policies to reach effected people is time consuming leaving the people unaware of the impending hazard. The system is light on resources and expenditure and thus, offers a trade-off between accuracy and usability. The system can be accommodated with any kind of hazard simply by replacing the kernel domain knowledge.



Architecture of Warning System



Profile: Devanjan Bhattacharya holds a PhD and Master of Technology specializing in Geomatics Engineering, and a Bachelor's in Information Technology. He is keen on implementing Geomatics and Information Technology for sustainable development. The focus of his ongoing research is to automate expert decision making in geomatics through software solutions. He is currently pursuing postdoctoral research in Web Based GIS Systems in University of Pardubice, Czech Republic; earlier he was associated with CiSTUP, IISc Bangalore as a postdoc researcher. For this doctoral research work he was guided by Dr. Jayanta Kumar Ghosh, Prof. Narendra Kumar Samadhiya, Faculty Civil Engg Dept., IIT Roorkee and together they apply Geomatics techniques for natural hazard assessment.

Inspiration: Much work has already been done towards warning against disaster. But most of them are infrastructure intensive requiring heavy investments making local administrations reluctant to setup such facilities except maybe in developed countries and even there too a comprehensive warning framework is lacking. So a warning system based on popular usage will help to warn possible users quickly and easily. The casualties and losses can be reduced markedly by warning people in near real time. So it is prudent to look for a system which could be developed with available infrastructure, instruments and set-ups.

Current Shortcomings: The system depends on web-based execution of geospatial data as well as telecommunication over the web. So the inherent bottlenecks of internet are there like data transmission speed interruptions, connection and data loss, and last but not the least authentication issues. We have put these down as the priority areas to work upon. And since this is a communication solution so language utilisation to reach the common masses is also being taken care of since currently it operates to send only English hazard messages.

Future Plans: Multi-hardware data sources are being researched and have to be integrated into the input module. Data from sensing sources such as GPS, online sources, and other field based instruments are to be exploited in real time. The theoretical architecture is already in place but multidisciplinary developers in a team are needed to build a compact system design taking into account all the hardware interfaces. In a nutshell, the system development has many aspects that take us to a new direction. So R & D, incubation, IPR and designing support is welcome.

Snippets-Memory Aid for People With Disability

Student(s)- Devender Goyal (International Institute of Information Technology, Hyderabad), Nirali Savla (K.J. Somaiya College of Engineering, Mumbai), Aditi Srinivasan(PES Institute of Technology)

Guides- Kshitij Marwah and Anette Von Kapri

As we age, our brains start to slowly lose our capacity for memory. When seniors have other debilitating neurological disorders or diseases such as Alzheimer's or dementia, the function of memory may become more and more problematic. We developed a memory aid for the people suffering from memory disorders like dementia, Alzheimer's, etc. We aimed to build a memory aid device that recognizes people and plays back important snippets of conversations with those people. The device will take a snapshot of the person, match it with the user's database of people he knows, and play back the last conversation and other relevant details of the person, thus helping the user remember people.



Profile: Devender Goyal is currently pursuing a "Bachelor of Technology in Computer Science and Engineering at International Institute of Information Technology, Hyderabad, India. He is an active coder on spoj(World Rank – 497) and was amongst the TOP 20 Indian winners of programming contest “January 2013 Long Challenge codechef”. His areas of research also include recommendation engines and cloud computing. He is also an elected member of students’ parliament at IIIT-Hyderabad and the captain of his college hockey team.



Devender Goyal

Nirali Savla is a final year Electronics Engineering student at K. J. Somaiya College of Engineering, University of Mumbai. Her interests include Image processing, Digital System Design, Robotics and Automation. She is also very passionate about Marketing, Data Analytics and Entrepreneurship.

Aditi is in her final year of Electronics and Communication engineering at PES Institute of Technology. Her current research focus is in Wireless Communication, specifically equalizer design in the receiver end of a wireless communication system. In her junior year, she devised a microcontroller-based Intelligent Walking Stick for the Blind under Intel Corporation.



Nirali Savla

Inspiration: PES Institute Of Technology, Bangalore collaborated with MIT Media Lab to host the third “Design and Innovation” workshop in Bangalore from 21st to 25th of January, 2013. There were around 150 participants from all over the country. As participants we found ourselves struggling to remember the names of the people we had just recently had conversations with. So my group members and I decided to create a device which would help us remember people and conversations we had had with them. We also realized that such a device would not only be helpful to us but its application could also be extended to aged people and people suffering from memory disorders. Thus we came up with Snippets.

Current Shortcomings: We have most of our code written in Matlab. Due to this the majority of the processing happens on the PC/Laptop. For future development we want all of the processing to happen on the phone so that it becomes more feasible and accessible.

Future Plans: Currently the integration of device with various mobile phones from different vendors is coming out to be a challenge as each has a different O.S etc. Solving this problem of seamless integration and refining the product so that it can be used conveniently by the people who are not familiar with the technology requires incubation support.

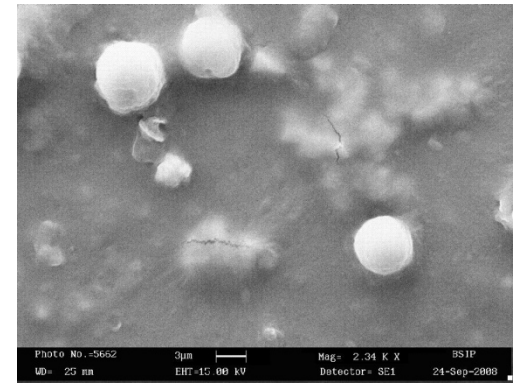


Aditi Goyal

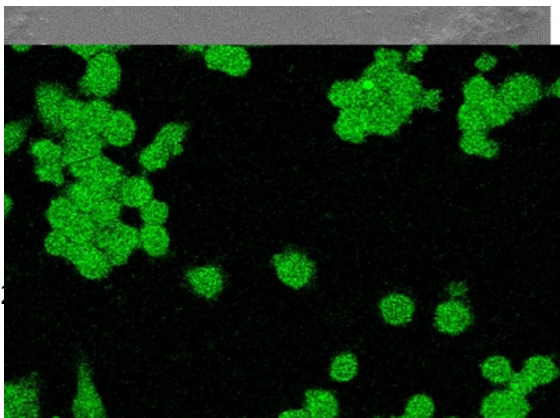
Target Oriented Niosome Based Delivery of an Antitubercular Drug, Development and Charecterisation

Student(s)- Gyanendra Singh, A.K. Srivastava Guide- Prof. Shubhi A. Saraf Institute- IIT (BHU)

Isoniazid (INH) is an effective drug for the treatment of tuberculosis. Niosome is a biodegradable, biocompatible and non-immunogenic carrier in which drug can be encapsulated. Encapsulation of bioactive agent in the Niosome prevents inactivation of drug, targets the biologically active compound to the targeted tissue and provides slow release of loaded drug into circulatory system thereby reducing its toxicity if effective uptake is achieved. Niosomes were prepared by reverse phase evaporation method in the present study and charged by charge inducing agent (Di Cetyl Phosphate). Drug entrapment efficiency was spectrophotometrically estimated. Formulated niosomes were characterized by determining particle size, polydispersity index (PI), zeta potential, scanning electron microscopy and stability. In vitro drug release studies were performed and evaluated using Koresmeyer Peppas equation, Higuchi kinetics and coefficient of regression. Cellular uptake of niosomes by macrophages was studied using mouse macrophage J744 A.1 cell lines and uptake was determined by fluorescence microscopy.



SEM Image of niosome-II



Fluorescent image of niosome



Gyanendra Singh



A K Srivastava

Profile: Mr. Gyanendra Singh is pursuing his Ph.D in Department of Pharmaceutics, IIT-BHU, Varanasi as a Ph. D Research Scholar. He did his B. Pharma from Institute of Pharmacy, Jiwaji University, Gwalior, MP and M. Pharma from Babu Banarsidas National Institute of Technology and Management, Lucknow UP. Mr. Singh has also qualified the “Graduate Aptitude test for Engineering”, in (GATE-2004) and Graduate Pharmacy Aptitude Test, in (GPAT-2011). He has also award of “Rajiv Gandhi National Fellowship” for Ph.D in 2010, given by University Grant Commission, New Delhi and he is also selected in “Pharmacy, Engineering and Technology Fellowship” for Ph. D in 2012 given by University Grant Commission, New Delhi. Mr. Gyanendra Singh has also written a book on “Niosomal delivery on Antitubercular Drug”, he is an active author of “International Pharmaceutical Writers Association” (IPWA) and he is a adviser, member of editorial board and Reviewer of different national and international journals.

Mr. A. K. Srivastava is working in the Department of Pharmaceutics, IIT-BHU as an Associate Professor, of Pharmaceutics. He did his B. Pharm and M. Pharm degree from the Department of Pharmaceutics, IIT-BHU, Varanasi. Before joining the academics in the department, he served in Pharma Industry in production. Mr. Srivastava has vast experience of teaching and research. He has more than 30 years of teaching experience. He has guided about 70 research Scholars in M. Pharm including 3 Ph. D scholars. He has about 30 research papers in national and international research journals of repute. He is the recipient of a gold medal from Indian Drug Manufacturer Association, Mumbai (IDMA) as well as gold medallist in B. Pharm and M. pharm degree course.

Current Shortcomings: Research is an always and on-going process and there is no place called perfection so refinement shall have to continue in the way of life. In our future research program it may be possible I will choose the same drug delivery system for targeting the human brain.

Ambulatory Health Network App

Student(s)- Jayesh Khasatiya Guide- Mrs. Ankita Shah Institute- Naranarayan Shashtri Institute of Technology, Jetalpur

Ambulatory Health Network application is a simple and easy-to-use Android based mobile application. Its purpose is to provide details of the nearest hospitals to a patient including doctors and facilities available. It is especially useful in emergency situations. This app can also be used to inform doctors of the relevant hospital of the patient's condition so that the necessary equipment can be pre-arranged.





Profile: Jayesh completed B.E. in Computer Science and Engineering from Naranarayan Shashtri Institute of Technology, Jetalpur and also complete Diploma in Computer Engineering from Government Polytechnic Ambavadi, Ahmedabad.

He got the First Prize in the Late Shri Dewang Mehta IT Awards 2012 for Ambulatory Health Network Application.

Inspiration: Two years ago, my friend had an accident and I accompanied him to the hospital. The experience of calling the ambulance, getting to the doctor and waiting for treatment was extremely time-taking and frustrating. I also noticed that a serious patient,

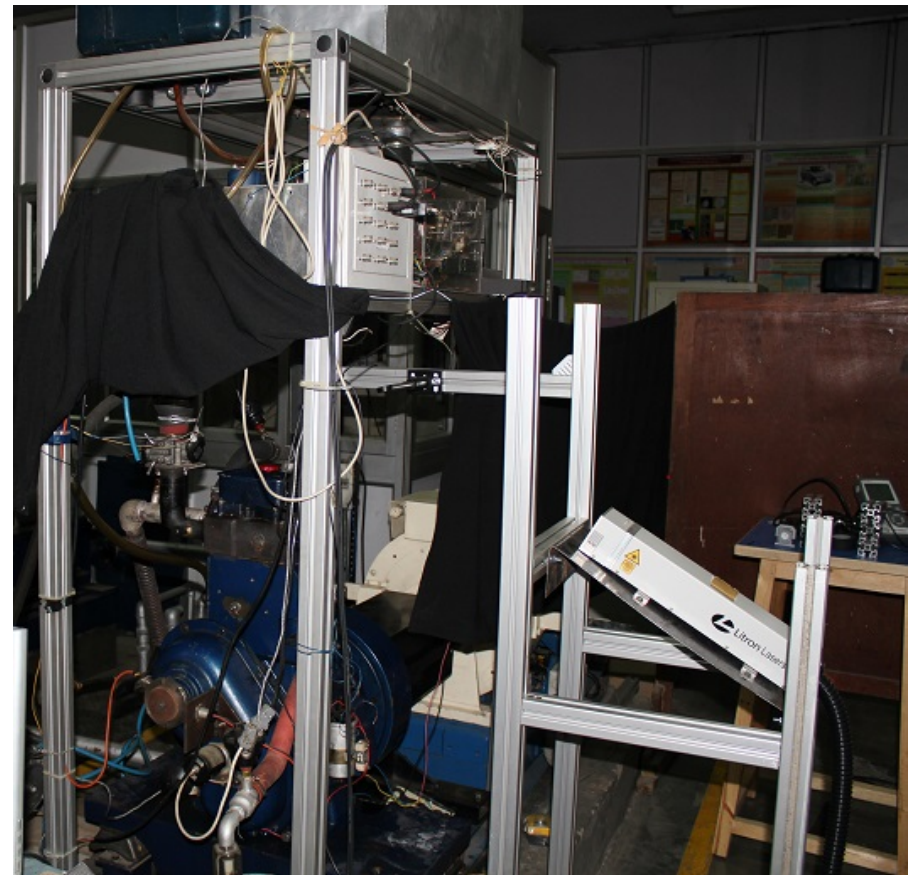
who arrived at the same hospital, had to be taken to another one since the only ICU available was occupied. This caused me to think about such an app.

Future Plans: I am undertaking a lot of R&D for this project at NSIT. The present prototype is Model based and soon it will be implemented in Real Environment. In future I will implement Global Positioning System and Collaboration with all hospitals and 108 ambulance network.

Laser Ignited Internal Combustion Engine

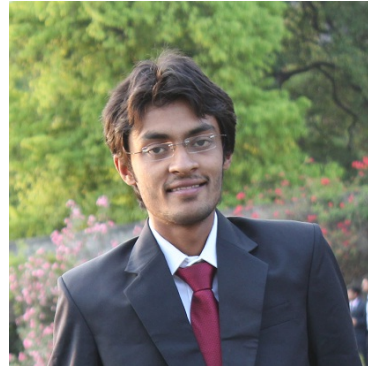
Student(s)- Kewal Dharamshi, Dhananjay Srivastava Guide- Prof. Avinash K. Agarwal Institute- IIT Kanpur

With increasing restrictions being placed on engine emissions and increasing demands for energy efficiency, the traditional spark ignition system is quickly reaching its practical durability limits as well as its effectiveness in igniting ultra-lean fuel/air mixtures. Since, the engine field is very diverse, the main emphasis and basis of operation boils down to lower power requirements, better output and reliability of the system. An alternative solution to standard spark plug is the use of pulsed laser. Use of Laser as a ignition source removes most limitations of conventional system by providing flexibility to position plasma, combustion of leaner mixtures, higher lifetimes, lower NO_x emissions, precise ignition timings and lower energy requirements. This electrode-less technique provides opportunity to use hydrogen as a fuel removing one of the major barriers : "Spark plug hotspot".





Dhananjay Srivastava



Kewal Dharamshi

Profile: Dhananjay Srivastava is a Research Scholar student and Kewal Dharamshi is a Master student of IIT Kanpur. The project was carried out at Engine Research Laboratory in IIT Kanpur.

Inspiration: Stringent exhaust emission norms and high thermal efficiency demands can be achieved by igniting of lean air-fuel mixture in spark ignition engine. However, lean combustion is associated with slower flame propagation speed and reduced power output. Conventional spark plug system is reaching its practical limit such as electrode erosion, high pressure operation, spark location, heat losses at the electrodes etc. in developing the future spark ignition engine. Advantages of using Laser as an ignition source could help to remove the limitations of conventional ignition system and hence could prove to be a corner stone of next generation IC Engine technology. Over the years to come, with substantial research in the field, maybe we would see the world running with engines ignited by Laser Ignition technique.

Future Plan: Our objective is to develop a commercially viable laser spark plug that could easily replace the existing spark plugs in automobile industry. To fulfill this objective, our plan of action is as follows:

- 1) Testing of Laser spark plug on multi-cylinder turbo-charged engine.
- 2) Laser ignition of hydrogen fueled engine.
- 3) Miniaturization of Laser to suit for engine application.
- 4) Testing of durability and thermal resistance of laser spark plug in engine condition.
- 5) Transportation of laser beam through optical fiber.

Clubfoot Orthosis

Student(s)- Kanwaljit Singh Khas Guide- Dr. P.M.Pandey Institute- IIT Delhi

Clubfoot often technically referred to as 'congenital talipes equino varus' (CTEV) is a complex foot deformity which is present from birth and causes one or both feet of the new born baby to be twisted along three axes from ankle. If the clubfeet are not treated in infancy, the persons will have to walk on the outer edges of their feet throughout life. Every year more than 35000 babies are born with clubfoot in India and more than 200,000 babies are born with clubfoot globally. The present method of treatment is by repeatedly applying plaster on the feet of the baby. For the full treatment by this method minimum eight castings of plaster are required which is very costly and very annoying for the new born baby. Also this method has so many complications such as skin dehydration, formation of ulcers, blood circulation problem, etc. In the present work a novel design of orthosis has been conceived which will eliminate the need of plaster on the feet of the baby. The method involved to use the proposed orthosis is very simple to apply and orthosis can be put on / off by the parents of the baby. The cost of the clubfoot treatment will be drastically reduced by the designed orthosis because it will save the cost spent on plasters for treatment. The number of hospital visits will also be reduced. Moreover, only one orthosis can be used by many patients.





Kanwaljit Singh Khas

Profile: Kanwaljit Singh is presently a Ph.D scholar in the Mechanical Engineering Department at Indian Institute of Technology Delhi, New Delhi, India. He did his M.E from Punjab Engineering College (PEC University) Chandigarh, India, B.E from Guru Nanak Dev Engineering College, Ludhiana, India. He joined the teaching profession after gaining the experience of industry for a few years. His research interests are biomechanics, biomodelling, medical devices and rapid prototyping. He has applied for two patents (Indian Patent Application No. - 1336/Del/2012 and Indian Patent Application No.-619/Del/2013) and one design registration (Indian Design Application-245068) has been granted for his work.

Inspiration: For the full treatment of clubfoot minimum eight casting of plaster are required which is very costly and very annoying for the new born baby. Also this method has so many complications such as skin dehydration, problem of ulcers, blood circulation problem. So we were interested in replacing the plaster by some bio-mechanical device.

Current Shortcomings: Research in this area should continue further to make the orthosis lighter, stronger and cheaper.

Future Plans: Collaboration with any reputed company commercially supplying the products related to pediatric health care is being sought.

Chetna - Celebrate Your Pregnancy

Student(s)- Amit Ranjan, Jagriti Kumar

Guide- Keyur Sorathia

Institute- IIT Guwahati

India continues to contribute about a quarter of all global maternal deaths with Assam being the highest contributor of 407 maternal death per 1,00,000 live births. Educating women about pregnancy issues, pregnancy complications, health care and raising their awareness can play a vital step in reducing maternal and child death as well provide safe and healthy motherhood.

We present Chetna-Celebrate your Pregnancy, a personalized mobile health device for pregnant women in Assam. It proposes an added service in collaboration with National Rural Health Mission (NRHM). It provides a platform to educate about antenatal care, government health schemes, pregnancy related tests and checkups, possible problems and precautions and emergency contact information. It maintains health record of mothers and updates doctors accordingly. Unique identification number is provided to each health device, which helps each pregnant women avail all government services during migration. This information is context specific and provided in Assamese language through an easy audio visual interface.



Profile: Keyur Sorathia is currently working as Assistant Professor at Department of Design, IIT Guwahati. He runs a lab called Embedded Interaction Lab (EILab), focused on designing and developing tangible user interfaces and gestural user interface for developing regions with special focus on health, agriculture and education. He is an IBM Research SUR award winner for year 2012. He has published research papers, workshops and tutorials in various international conferences.

Amit Ranjan is a graduate from Department of Design, IIT Guwahati and currently working as Interaction Designer with Shoonye Technology Solutions Pvt Ltd in Bangalore. He has previously worked in Infosys among several other companies

Jagriti Kumar is a graduate from Department of Design, IIT Guwahati and currently working as Interaction Designer with Myntra.com. Before Myntra, she worked with Clarice Technologies on various projects to design mobile applications.

Inspiration: The project is an outcome of a serious concern to improve maternal health scenario in Assam, India. The idea is an outcome of in-depth ethnographic research and analysis of tea gardens and rural areas of Assam

Current Shortcomings: The project needs to be on large scale and we would like to conduct a pilot with atleast 500 pregnant women in Assam, for which we need investment and technology support to build large number of devices. The next version plans to do the same.

Future Plans: The proposed project needs support for investment to develop it on large scale and provide a platform for implementation on the field. We would also seek support for IP and patent registration. In future, creator would also seek incubation opportunities to help this product sustain and further develop.



Reactor & Catalyst development for oxygen evolving step in Sulfur-Iodine cycle for Hydrogen production

Student- Kishore Kondamudi

Guide- Dr. Sreedevi Upadhyayula

Institute- IIT Delhi

The present project focuses on the mass scale hydrogen production using sulfur-iodine cycle, in which water is dissociated into oxygen and hydrogen. In this process one of the reactions involves decomposition of highly corrosive H_2SO_4 to produce SO_2 at elevated temperature (850 C), which is the one with the highest energy demand. This can be reduced by developing the suitable catalyst, which lowers the required energy demand and improves the efficiency of the process. These two objectives were successfully achieved. Thus, the catalyst developed has shown highest theoretical conversion of H_2SO_4 to SO_2 , with high stability (life time). It can withstand high thermal fluctuations and high pressures. It is also an economical, regenerable and environmentally benign catalyst. The pilot plant installed has been scaled-up to 150 times of the lab scale setup with corrosion resistant materials and can produce about 150 l/hr hydrogen when integrated with other sections of the S-I cycle.





Kishore Konamundi

Inspiration: Proposal was submitted to ONGC Energy Centre (OEC) for funding, since it is the highest efficiency process (>50%) for Hydrogen production using Sulfur-Iodine cycle.

Future Plans: Extensive data was collected & analyzed from the pilot plant. In the next stage, It will be integrated with other sections of the cycle to build the continuous hydrogen production plant. Already a second proposal "Mechanistic Studies on Catalytic Decomposition of Sulfuric acid in the S-I Cycle for Hydrogen Production" has been submitted to ONGC Energy Centre and after that a proposal for total integrated plant will be submitted to OEC.

The present IP support is by ONGC and IIT Delhi.

E-diagnoser: An Advanced Low Cost Patient Monitoring Watch

Student(s)-Anoop P, Libin Varghese, Adarsh S, Shibin Joseph, Nithya Merrin, Chithira Jacob, Pillai Sareesh Sashidharan

Guide- Reshmi V.

Institute- Amar Jyoti College of Engineering, Kerala

Existing patient monitoring devices have been used extensively in many areas of health care from the hospital ICU to care at home. Although commercialized patient monitors provide highly reliable data and many facilities they are limited from user's perspective. They are inconvenient i.e,1)They are bulky and need to be connected to several electrodes to measure various vital bio signals 2)They have poor mobility and restricted usage in hospital and indoors 3)They are relatively expensive to be used all the time and hard for poor people who cannot afford them .Due to these limitations, existing patient monitoring systems are unsuitable when monitoring has to be accomplished over periods of several weeks or months, as in the case of elderly and patients at risk of potentially critical events. So an integrated portable and wearable system would benefit the elderly and patients in critical life. The cost of this watch is expected to be below Rs.6000.





Left to right: Nithya Merrin, Chithira Jacob, Libin Varghese, Saresh Pillai, Shubin Joseph, Adarsh S, Anoop P.

Profile: These are Electrical and Electronics Engineering Students From Amal jyothi College of Engineering,Kerala.

Inspiration: While reading the reports of WHO(World health organisation)and other agencies, we came to know that the doctor to patient ratio in India is 1220:1 and we also learnt that many youngsters die due to the late diagnosis of disease. In further readings, we found that it was also difficult to the relatives to provide full attention and care to their old ones in their busy life. So in order to solve these problems we have come up with this project, which will provide full attention and care to everyone.

Future Plan: We have got the incubation support from IIT Jodhpur last week. So we are planning to develop it as a product. Till now we have developed two variants of our projects. In the final edition, we are planning to bring out the product without any errors. We are also in talk with certain companies regarding the marketing of our project. We hope our product will come into the market soon.

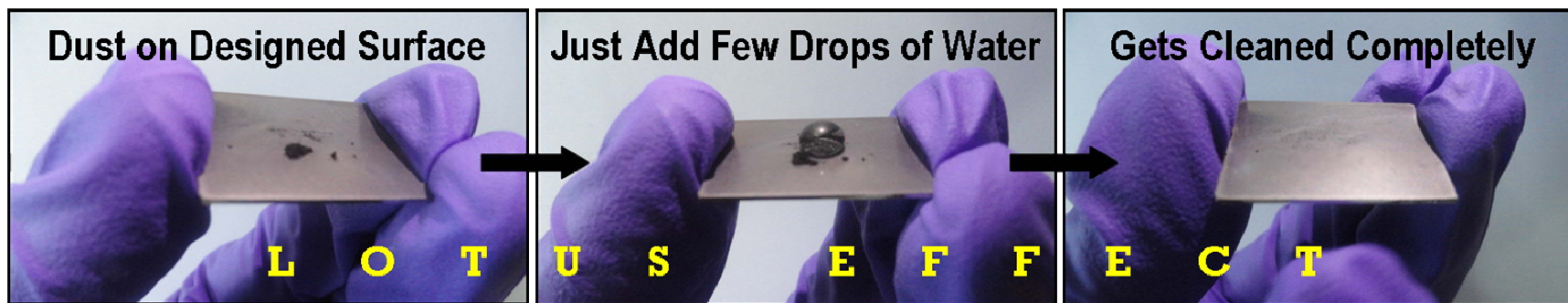
Self-Cleaning Functional Molecular Material

Student(s)- M B Avinash in collaboration with E Verheggen and Dr. C Schmuck from Lehrstuhl Für Organische Chemie, Germany

Guide- T. Govindaraju

Institute-Jawaharlal Nehru Centre for Advanced Scientific Research, Delhi

The ability of a surface to clean its dirt and dust by itself is known as self-cleaning. Naturally occurring lotus leaves possess this unusual self-cleaning property. Such a self-cleaning mimic was successfully fabricated by a simple solution processing technique. Usage of simple, solution-processable molecules facilitates reduced cost, easy processability and large-scale fabrication. Moreover, these surfaces are chemically inert and durable for long term usage. In addition, we have shown for the first time that fluorescent dyes can also be incorporated into these architectures and by using three primary colors- red, green, and blue- in appropriate ratios, white-light-emitting as well as any rainbow-colored hydrophobic decorative architectural coatings can be realized; besides its applications in organic electronics, cell-sorting and others.





M B Avinash

Profile: M. B. Avinash obtained his Integrated M.Sc. (Hons.) in Applied Chemistry from Kuvempu University, Karnataka, India in 2008. He secured 2 Gold Medals for being the topper in the University. He was selected for the Project Oriented Chemical Education (POCE, 2004–2006) and Summer Research Fellowship (SRF, 2007) programs of Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR). After his post graduation he worked as a Research and Development personnel of Council for Scientific and Industrial Research- Centre of Excellence (CSIR-COE) in Chemistry at JNCASR. Currently he is pursuing his PhD at New Chemistry Unit, JNCASR under the supervision of Dr. T. Govindaraju. His research interests include Bio-Inspired Design Strategies to develop Advanced Functional Molecular Materials.

Inspiration: Nature's archetypal designs with all their subtleties and complexities has always intrigued me and has invoked a strong urge in me to understand their functioning, which has been an integral part of my research studies. Ever since I learnt about the self-cleaning property (on which I had given a course-work seminar) of lotus leaves, I was curious to design a new system. Accidentally it so happened during an experiment that a naphthalenediimide derivative resulted in a honeycomb-like architecture. With my previous knowledge about the self-cleaning surface, I had to put in lot of time and effort in ultimately fabricating a mimic with novel additional properties.

Current Shortcomings: A very thin coating of ~50-100 nm of gold was employed for our final product to facilitate chemical inertness and durability. It should be noted that, in spite of using gold, the final product price will turn out to be cheaper than the other commercial products available in the market. However, we still wish to reduce the net price by finding suitable alternatives for gold and as a result even the most common man can afford to utilize our final self-cleaning product.

Future Plans: Certainly like any other scientific venture, there is enough scope to continue our research project further. The project can be pursued primarily with three main objectives:

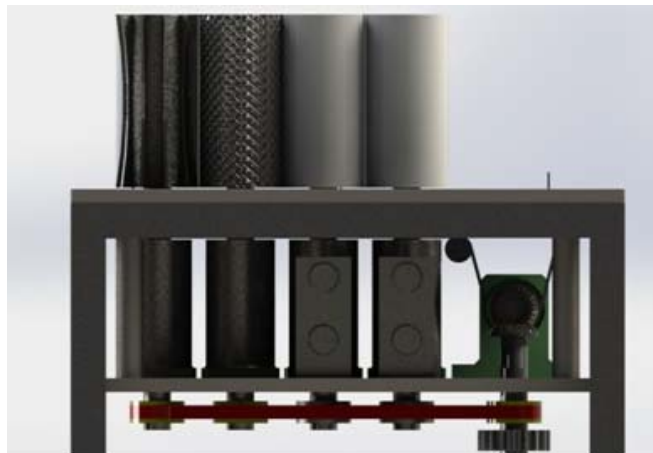
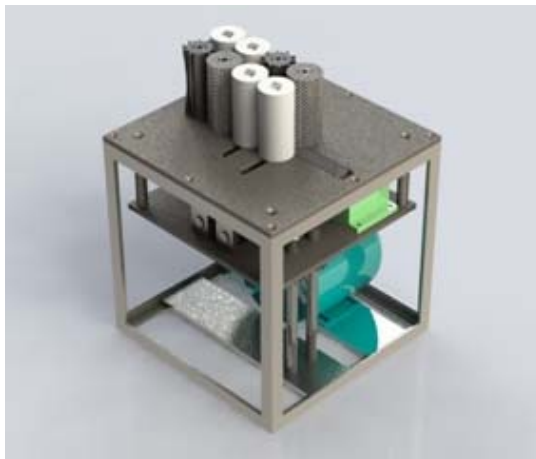
- 1) To find the optimal ratios of fluorescent dyes that can be incorporated into the honeycomb architecture so as to have hydrophobic decorative exterior architectural coatings across the full range of visible spectrum.
- 2) Since our functional molecule, naphthalenediimide, is an organic n-type semiconductor; utilization of suitable p-type semiconductor can in principle also facilitate construction of solar cells. As a result, the exterior coating might in principle lead to solar energy harvesting as well as for decorative purposes.
- 3) To incorporate suitable chemical modifications for our functional molecule or to make novel designs so that the self-cleaning surface can be fabricated in a single step.

In our opinion, all the above proposed developmental aspects could be achieved with some financial assistance and man power.

Automatic Fish Scaling Machine

Student(s)- M.V.Krishnamoorthy, C.Mathan, Mahesh Mithilesh Guide- Dr.P.Rajesh Kanna Insitute- Velammal College of Engineering and Technology, Madurai

In general, the fish scales are removed manually by using knives, wire brushes etc. This may hurt our hands which lead to bleeding, and human blood contaminates the fish. Moreover laborers at fish markets suffer from physical pain due to continuous action of scale removal. Their hands get withered due to the moisture content of the fish which is unhygienic. There is no Indian product to tackle this problem. The device that we have developed completely removes the fish scales in a short time. Our device consists of knurled rollers and blade rollers which are fixed and rotate on its own axis. Supporting rollers are provided with compression spring of very less stiffness in order to adjust according to the shape of the fish and to provide required pressure to hold. The rotation of knurled rollers and blade rollers are opposite to the fish scales. The supporting roller pushes the fish towards these rollers. Hence this action results in complete removal of fish scales. The salient features of our innovation are time consumption is very less, scales are completely removed, skilled labour is not mandatory, and the machine is compact and economical.





C Mathan



M V Krishnamoorthy



Profile: They are 3rd year Mechanical Engineering students at the Velammal College of Science and Engineering, Madurai.

Inspiration: Our aim was to find a problem faced by people in the daily lives and identify a mechanical solution for it..

As a result, we selected this project. We wish to reduce the burden of workers in the fish food industry.

Inspiration: The Indian market has a device for cleaning chicken but none for fish scale removal, specially because fish are slippery and scaling is a difficult process.

Current Shortcomings: In our present model, most of the parts are made of mild steel. Hence it is very heavy. In future we have decided to replace the parts using various other materials to reduce the weight as well as the cost of our device.

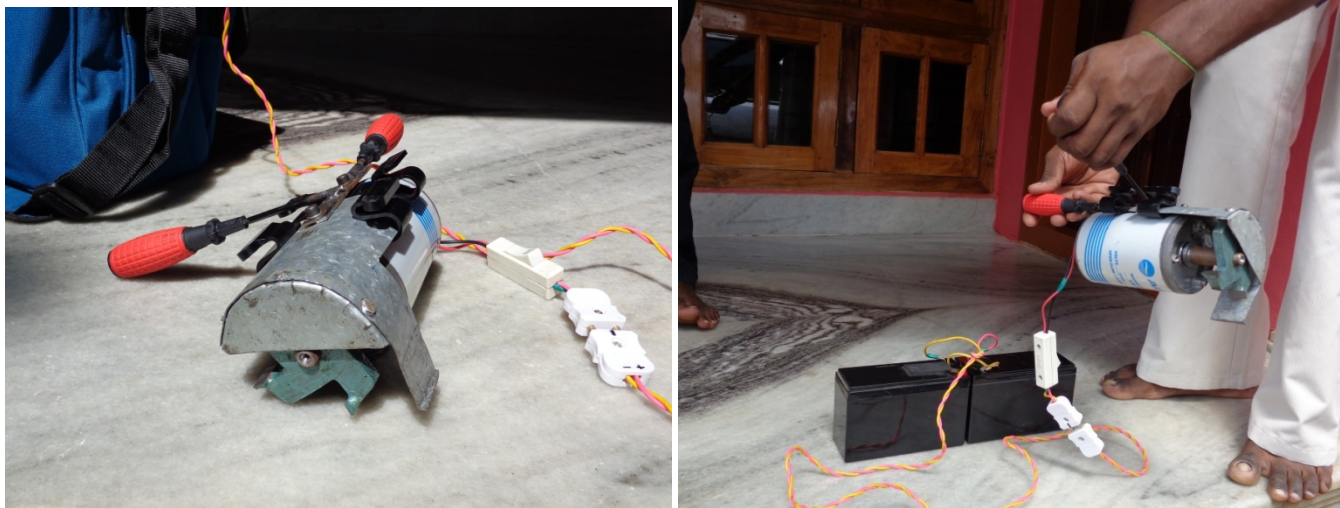
Future Plans: We look forward to funding and incubation support in Madurai.

Semi-Automatic Rubber Tapping Machine

Student(s)- Malarmannan.G.R, . M. Venkatesh, S. Emmanuel Richards Guide- Dr.P.Rajesh kanna Institute- Velammal College of Engg & Tech

Every day, rubber harvesters are facing shortage of labour for rubber tapping. The work is intensive and work hours are unfavourable. Hence, we designed a new motorized concept to address the requirement of the harvesters. The proposed machine consists of an electric motor, rotary cutter and protecting shield. It is compact and easy to carry. It also has a simple construction, reducing the need for much maintenance. The machine consists of 24V, 0.22 A electric motor; MS-Shield; CI-Cutter and 24V, 7A rechargeable battery. This proposed machine will act as a tapping knife. The total cost of the machine may be around Rs.3200/-.

Patent Filled: Ref No 3734/CHE/2012. This innovation was shortlisted for demonstration by Rubber Research Institute of India (RRII), Kerala.



VenkateshEmmanuelMalarmannan

Profile: : G.R.Malarmannan is pursuing B.E Mechanical Engineering from Velammal college of Engg & Tech, Madurai, Tamilnadu. He worked for a year as Act-Apprentice Trainee at TVS Sundram Fasteners Limited, Krishnapuram, Madurai and 10 months as Junior Engineer Trainee(JET) Winwind Power Energy Pvt Ltd, Chennai.

He won the Gold Medal in a national level design contest organised by National Design and Research Forum (NDRF), IEI-Bangalore. The Department of Mechanical Engineering, Velammal college of Engg & Tech, Madurai has nominated him for the Best Student Award (2009-2013 Batch) for India Society for Technical Education (ISTE). He also presented two of his projects at the National Fair organized by Department of Science and Technology (DST), Govt. of India at IIT-Delhi.

Inspiration: I came across an advertisement by the Rice Research Institute of India (RRII) regarding an open contest to design a motorized tapping knife. Then I underwent a field visit and met tapping laborers to get a better idea. I compared those ideas with the RRII requirement and finally I made a design and prototype. I did a trial test and demonstrated at RRII also.

Current Shortcomings: There are some accuracy problems that need to be solved.

Future Plans: For better performance, I am looking into reducing the cutter size with suitable number of cutting edges to minimize vibrations. Further ahead, the machine's capacity can be changed and varied for better power consumption.



M Venkatesh



S Emmanuel Richards

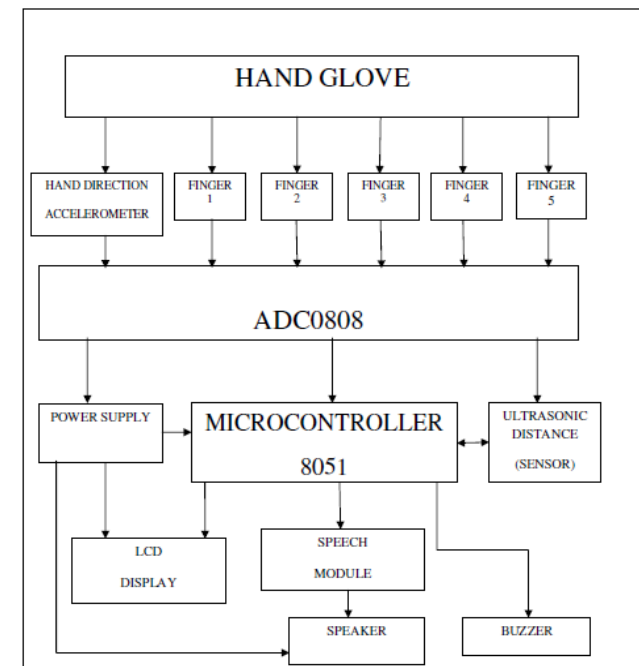


G R Malarmannan

Electronic Support System for Physically disabled(Deaf & Dumb)

Student(s)- Margie A Joshi, Vishal M Patel, Chirag J Patel, Jay M Patel Guide- Dipti N Patel Insitute- Gujarat Technological University Ahmedabad

Gesture Vocalizer is a large scale multi-microcontroller based system being designed to facilitate the communication among the dumb and deaf communities and their communication with the normal people. This system can be dynamically reconfigured to work as a “smart device”. In this project, microcontroller and sensors-based gesture vocalizer is presented. It is basically a data glove and a microcontroller based system. Data glove can detect the movements of a hand and microcontroller based system converts some specified movements into human recognizable data and displays it.



Block diagram



Profile: These are final year students of B.E. Electronics & Communications Engineering at Gujarat Technical University. They like to work on projects that aim to benefit society and are always keen to put their classroom knowledge into practical use.

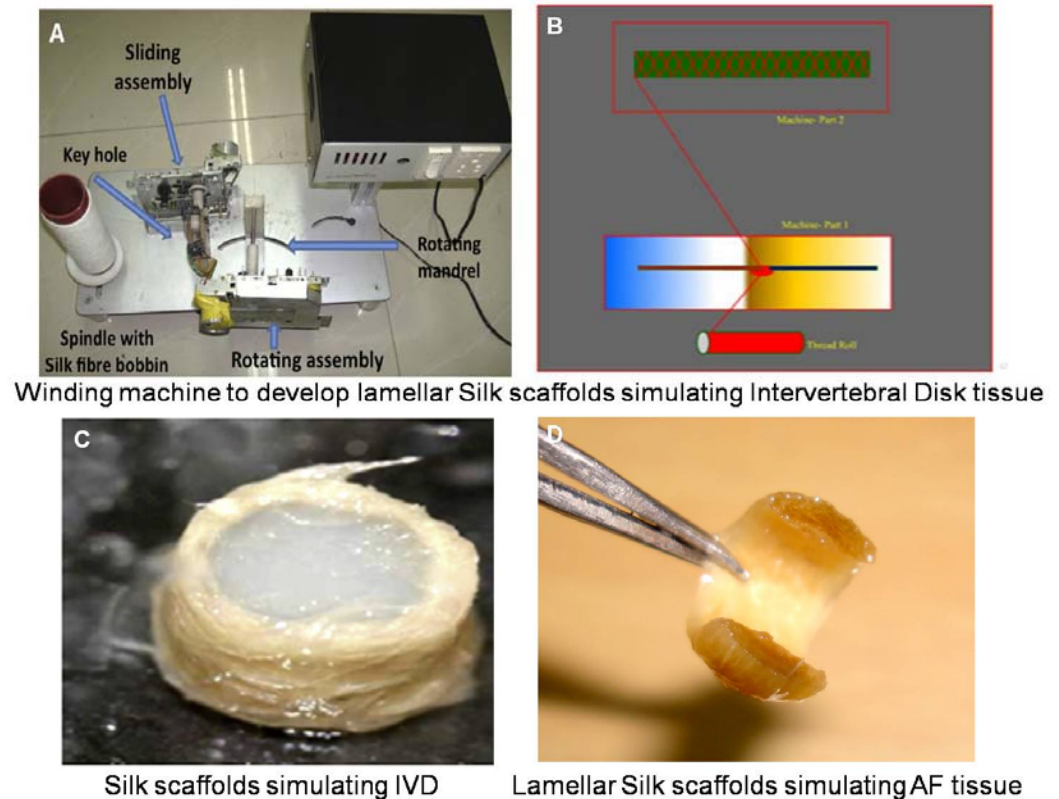
Inspiration: The inspiration was in daily life. We could observe how difficult it is to communicate with deaf and dumb people, Real world problems inspire us to do something. And this is our small contribution to the world.

Future Plans: We would like to work on further R&D to make this device more efficient and user-friendly.

Apparatus for Making Silk Fiber Based Lamellar Biomaterials to Solve Problem Of Lower Back Pain

Student(s)- Maumita Bhattacharjee Guides- Dr. Sourabh Ghosh and Prof. Alok R. Ray Institute- IIT Delhi

Millions of elderly people around the world are suffering from a severe health issue of lower back pain whose prime reason is the degeneration of Intervertebral disc (IVD) present in our spinal column. We have designed a rapid prototyped silk winding machine using stepper motors of old tape recorder and developed custom-made aligned silk fibrous scaffold with a multilayered lamellar architecture at low cost and fast speed. These silk scaffolds guide the alignment of cells and deposition of ECM proteins to a stipulated angle in lamellar fashion which provides tensile reinforcement to withstand the large circumferential tensile stresses during in vivo compression of the intervertebral disc.





Maumita Bhattacharjee

Profile: Maumita is a Ph.D. student at IIT Delhi. She obtained M.Sc. in Applied Microbiology and Biotechnology from Banasthali University. She is part of a group, working on Tissue Engineering and Medical Textiles using silk polymer.

Inspiration: Several researchers have tried different combination of polymers and cell types for IVD tissue engineering, but none of these advancements could prove itself to be an effective therapy. Thus the use of silk fibers (being the most fascinating natural polymer having unique mechanical properties) could be a promising option to mimic the collagen fibers of the native tissue and the fabrication of silk fibers based scaffold (having patterned orientation) using the winding machine could simulate the precise architecture and typical microenvironment of the intervertebral disc.

Current Shortcomings: Mechanical testing and in vivo testing to be done.

Future Plans: Further work on the project with animal trials followed by clinical trials so that the research could be translated to product level. As a future perspective, this bioengineered intervertebral disc graft can be used for establishing “in vitro” disease model systems for degenerative disc disease. This may allow to measure effects of growth factors, cytokines and protease inhibitors introduced directly into the Intervertebral disc by injection, on the metabolic activity (synthesis and degradation) of disc cells in a controlled environment resembling in vivo conditions.

High Performance Cooking Stove

Student(s)- Mayur Rastogi

Guide- Prof. S Ray Institute- IIT Kharagpur

The High Performance Cooking Stove (HPCS) has higher efficiency, cleaner combustion and lower smoke emission as compared to conventional village stoves. It would mitigate the high levels of indoor air pollution, which greatly affects the environment and health of women & children during cooking.

The stove has the following characteristics:

1. Twin reduction facility to ensure maximum thermal cracking of tar/oils.
2. Easy to use and maintain (clean/repair)
3. The flame is similar to an angithi/chulha flame. So the people in rural areas won't find it difficult to work with.
4. Minimizes smoke emission during start-up and shut-down.





Mayur Rastogi

Profile: Mayur is a 4th year undergraduate in the Department of Chemical Engineering at IIT Kharapur.

Inspiration: I was a part of NSS at IIT Kharagpur. During one of the NSS visits to nearby villages I saw for the first time, the stove/chulha on which people cook food in villages. I saw women cooking food and kids too were playing nearby. I talked to them and found that the fumes and smoke from the chulhas were a big health hazard for them. The efficiency of the chulhas was very low and as a result there was wastage of wood. The village women told me that they needed a stove that consumed less wood and released minimal smoke. This conversation inspired me to design the High Performance Cooking Stove under the guidance of Prof. S Ray.

Current Shortcomings: Till now we have been able to develop and test two versions of the stove and both of them required a battery powered fan to provide air. The third design (ready but not fabricated) eliminates this fan, thus enhancing the applicability of the product. The other objectives for further research would be to make it more efficient and operable on more fuels. A computational analysis of fluid dynamics and heat and mass transfer inside the stove can also be done to optimise the design.

Future Plans: I would like to fabricate the 3rd design of the stove, that which doesn't require a battery powered fan to supply air. This design would further enhance the applicability of the stove in areas that have limited access to electricity. If successful, the design can be taken forward for implementation and installation in villages.

For the same, I might require certain design (R&D) and funding/incubation support.

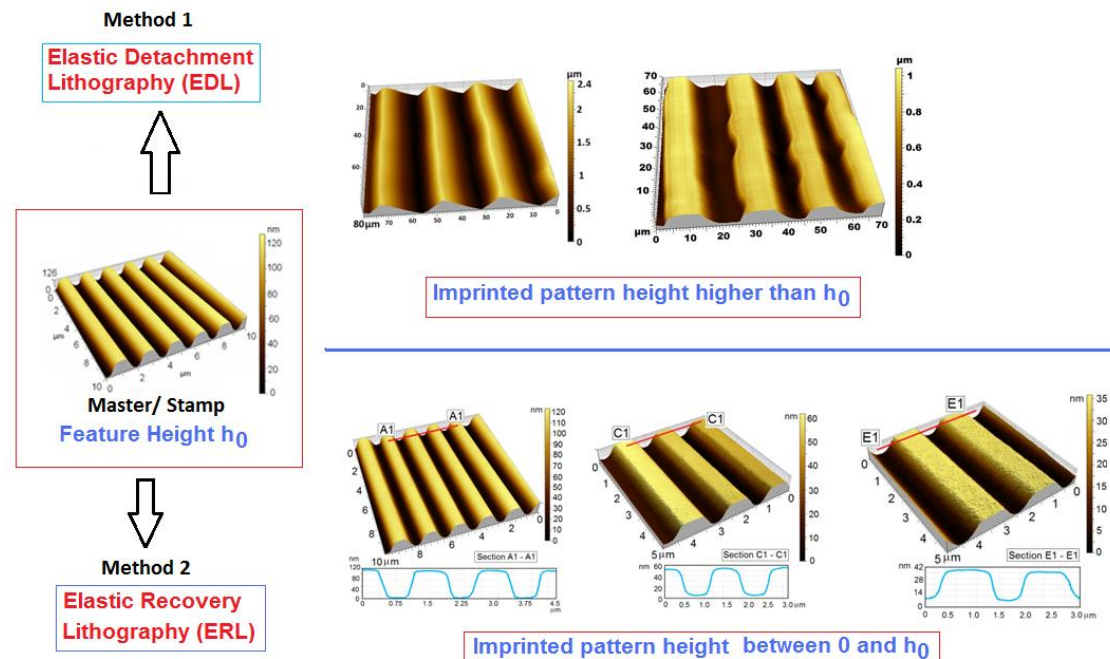
Ultra Low Cost Tunable Nano Scale Patterns

Student(s)- B. Nandini

Guide- Dr. Rabibrata Mukherjee

Institute- IIT Kharagpur

We introduce two New Soft Lithography based Nano Patterning Techniques with focus on ability to create patterns of any feature height using a simple stamp, at extremely low cost. Majority of the nano patterning techniques require extensive facilities and set up. Even the affordable soft lithography techniques depend on other more expensive lithography methods such as Photolithography for fabrication of the 'original' stamp as most of the Soft Lithography techniques are capable of generating a perfect negative replica of the original stamp. Our innovations allow fabrication of structures with programmable feature height (higher or lower than the feature height of the original stamp) using a single stamp! This makes Soft Lithography less dependent on other Lithography techniques, makes the whole process cost effective and gives scientists the power to create patterns with any programmable feature height using a single stamp. There are no existing lithographic techniques by which this can be achieved.





Profile: Nandini is a Chemical Engineer by education. After doing my schooling from Kendriya Vidyalaya, Kharagpur, she did her B. Tech. in Chemical Engineering from GVP College of Engineering, Vizag (JNTU) in 2010. She returned to her home town of Kharagpur to pursue higher studies in the department of Chemical Engineering at IIT Kharagpur and joined the M Tech program July 2010. As a part of her M. Tech. dissertation, which was under my academic mentor Dr. Rabibrata Mukherjee, I started working on the submitted project. Her M. Tech. thesis fetched her the INAE (Indian National Academy of engineering) Innovative Student projects Award 2012. She is now doing a Ph.D. at IIT Kharagpur. She has 2 papers published in international journals and 1 patent. Few more papers and one more patent are due to be submitted soon.

Inspiration: The objective of my Masters project was to investigate the durability of various structurally superhydrophobic surfaces under different conditions. Most of the natural superhydrophobic surfaces (eg: lotus leaf, bird feather) are only intermittently exposed to water and remain dry most of the time.

But for practical applications like coatings on ship hulls, these surfaces should be durable to long time saline water exposure. The initial studies were performed on the durability of biomimetic replicas of lotus leaves in different pH environments. For complete analysis, we required of studies on surfaces with ordered features with different heights to capture different wetting regimes. Due to lack of costly fabrication facilities, we only had the foils of CDs/ DVDs as stamps. This need led us to think of alternative ideas for fabricating surfaces with different roughness and feature heights with the available stamps. Hence with the adequate motivation and inputs from Dr. Mukherjee, we came up with two new techniques for achieving it.

Future Plans: One can study issues like how a living cell attaches or moves on a surface with differential feature height. The high aspect ratio patterns generated by Elastic detachment Lithography are also ideally suited for fabricating surfaces that exhibit structural super hydrophobicity. We also propose to extend these methods to fabricating topographic gradient surfaces that exhibit continues variation in wettability and other properties along the length of a surface.

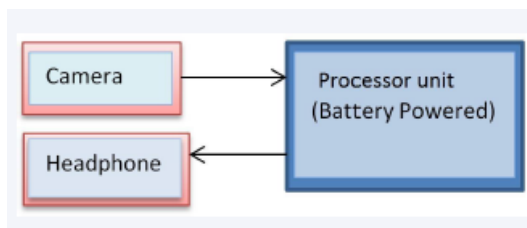
The Third Eye

Student(s)- Naveen Kumar Rai

Guide- Dr. Amit Sethi

Institute- IIT Guwahati

The proposed device will assist visually handicapped people in navigating the outdoor environment. It will look out for three specific types of visual patterns that are of high importance. These are written text and road signs, vehicles or moving objects, and land/road surface patterns (steps, roughness etc.). The device will be portable and wearable. It will include a small camera mounted on sunglasses, a small computer, and a headphone. When the device is switched on, the camera will capture a video stream of what lies ahead. The computer will process this information using video processing and pattern recognition techniques. Based on the importance of different patterns, it will send audio messages to the headphone.



Block diagram



Multiple objects tracked



Text detection



Profile: Naveen is pursuing B.Tech in Electronics and Communication Engineering from Indian Institute of Technology Guwahati. His research interests lie in Computer Vision, Machine Learning and Embedded systems.

Inspiration: This device is inspired by the needs of visually handicapped people to navigate urban streets, crossing roads etc. The vision was to build a portable, wearable and most importantly a low cost technology device. To achieve the vision, the idea was to give emphasis on developing state-of-the-art software instead of expensive hardware making it affordable to a large section of the visually handicapped population. Also according to the statistics, this device can help over 15 million visually handicapped people (in our country) in navigation purposes both in outdoor and indoor scenarios.

Current Shortcomings: The main shortcoming of the current version of the prototype is that it cannot work in evening and nights (source of light is very low). We plan to solve this problem in the next prototype. Also, more functionality can be added in the device like GPS, text detection for other languages, etc.

Future Plans: On the large market scale, this project needs investments for manufacturing and research for further enhancements of the device. We are also looking to add more team members for more research and development. There is no current plan for IP support. However we are looking to build a business plan and search for investments as soon as we finish fully prototyping the device. We are a technical team so we will need a business mentor.

Sancharak: A Cell-Phone for Blind People

*Student(s)- Rohit Singh, Navnath Mane, Hitarth Patel, Rahul Kapoor, Tanmay Shinde Guide- Dr. K T V Reddy
Institute- Mumbai University*

The Mobile phones today have changed human lives in many ways. There is a great need to extend various features provided by cell phones for blind persons. We strongly believe that these benefits will contribute at large in increasing work-efficiency. To achieve this challenging task, we propose novel mobile phone design which shall act as an essential handled device for blind people that can be used for managing call and SMS effectively. Proposed cell phone technology has been developed after rigorous consultation with a large number of blind organizations and is demonstrated with use of buzzer, QWERTY keyboard, ICE calling, etc. features with Braille language support. The main purpose of our Project is to develop a communicator for blind people.



Rohit Singh Hitarth Patel Navnath Mane Tanmay Shinde Rahul Kapoor

Profile: Rohit Singh, Hitarth Patel, Navnath Mane, Rahul Kapoor & Tanmay Shinde have completed their Diploma in Electronics and Telecommunication from MSBTE and they are pursuing their degree from Mumbai university with the reward of J.R.D. TATA scholarship in Electronics and Telecom. Their fields of interest are Embedded technology, Innovative Projects, Industrial Automation, Robotics and they have proved their developmental skill by winning National Honour 5 times and one State level Honour. They have also been Members of IETE committee since 2010.



Rohit Singh

Inspiration: Last year we saw a newspaper article about a blind person trying to lodge a police complaint about the theft of his mobile phone and the police inspector on duty refusing to do so. The reason for not registering the complaint as stated in the newspaper article was that the police inspector was not ready to believe that a blind person can use a cell-phone. Instead the inspector assumed that the blind person was lying,.

After searching on the internet and meeting blind persons we came to know that the blind persons use the standard mobile phone available in market and face many problems in doing so. Hence we thought of designing a cell-phone keeping blind people and their needs in our mind.



Hitarth Patel

Current Shortcomings: The next step is to reduce the size of the prototype. Currently, the cell-phone is only capable of making and receiving calls and sending sms. So the next version of the prototype will be able to run the mobile apps.

Future Plan: Investment and R&D should be carried out so that the Sancharak would be able to run the mobile apps also very soon. Investment is also required so that the cell-phone could be implemented using solenoid components.



Cross Linked Antibacterial Hydrogel

Student(s)- Soyeb Chakavala

Guide- Nirav V Patel

Institute- Anand Pharmacy College, Anand, Gujarat

In India, over 1,000,000 people are moderately or severely burnt every year. Burns are among the leading causes of disability-adjusted life-years (DALYs) in low- and middle-income countries. In patients with severe burns over more than 40% of the total body surface area lead to death and from that 75% of them are related to sepsis from burn wound infection. We have developed novel Cross Linked Antibacterial Hydrogel of silver sulfadiazine containing chitosan and polyvinyl alcohol for severe burns. The developed hydrogel was more swellable, flexible and elastic, which significantly improved the wound healing effect compared to the gauze control, the hydrogel without drugs and the conventional product. Thus, it is a potential wound dressing with excellent forming and enhanced wound healing.





Left to Right: Mr. Soyeab R. Chakavala, Dr. Vaishali T.Thakkar ,

Profile: Mr. Soyeab Chakavala is working as a research scientist in F & D Dept. at Vovantis laboratories Since 6 months. He has published an article and also won the 1st prize in poster presentation in national level Seminar and presentation.

Inspiration: During my literature survey, I found that more than 1 million peoples died due to severe burns injury and 12 million people were hospitalized due to moderate burns in India only, and at the same time we rely on traditional dosage forms which have very low healing rate and cause allergic reactions, drying of wounds, wrinkling, aging, fluctuating etc. In Third-Degree Burn Treatment, Hydrogel helps grow new, scar-free skin .So we have decided to developed antibacterial hydrogel with best characteristics by implementing polymer science knowledge.

Current Shortcomings: Shortcomings of our project work are that we have not incorporated growth factor enhancing biomaterials and we have performed the in-vivo study using Wistar rats. In our next prototype we will incorporate growth factor enhancing biomaterials and perform the in vivo study of optimized formulation using Male Pig animal (Pig has nearer to equal anatomy of skin as humans compared to rats)

Future Plans: We want to develop our project further by enhancing the cross-linking ability and formulating hydrogel using the Growth factor enhancing bio materials like interleukin hormone, fibroblast, dehydroepiandrosterone etc. which further enhances the rate of healing and provides the skin as natural skin. Growth factors are also being explored as key components of biomaterials and biomaterial systems. We can also take another combination of hydrophilic-hydrophobic polymers to find out different mechanical properties of hydrogel. The successfully developed, stable and biologically active hydrogel will be applied for patent and once it will be granted, further communication will be done with pharmaceutical companies to take scale up batches of hydrogel. Once it will be finalized at larger scale, it will be better utilized by human beings for the treatment of severe burns.

Hybrid Classifier for Marine Vessel based on Propulsion

Student(s)- Piyush Aggarwal Guide- Mukta Goyal Institute- Jaypee Institute of Information Technology, Noida

Finding features which can reliably classify ships using radiated acoustic signals is an important and classical problem. It becomes more challenging when the signal traverses the underwater channel to reach the receiver as multiple ships radiate acoustic signals and underwater channel changes very rapidly with time. Moreover underwater channel is non-stationary, impulsive and has severe multipath. Here, a new hybrid classifier combining various features and classifying algorithms, to classify the marine vessel based upon their propulsion (Diesel, Gas, Steam) has been suggested. Computer simulations show that suggested method works well even at low SNR (Signal-to-Noise-Ratio).

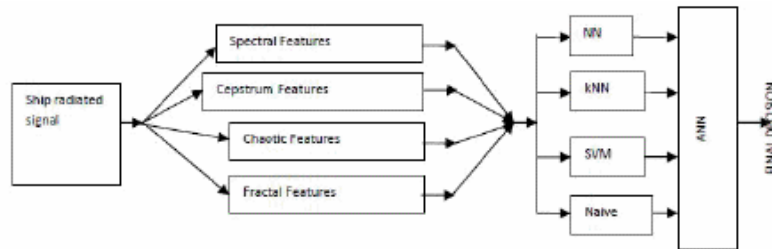
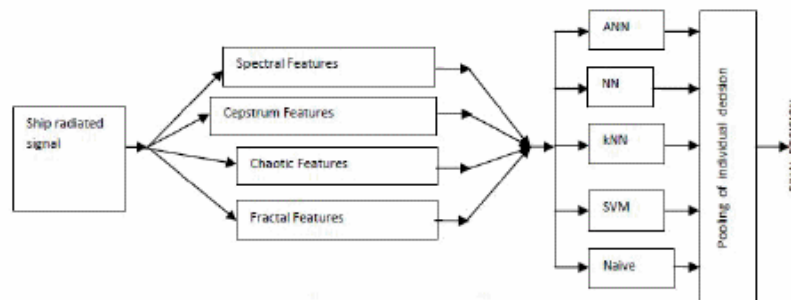


Figure 1: Type-I classifier



Profile: Piyush has worked with Community Based Organizations and has developed various voice based applications, helping them increase their outreach at various levels. He strongly believes that developing technologies for a social cause is the best service one can render as an engineer. He's interested in building solutions that can help neglected, downtrodden people, particularly women in time of distress and exigency situations. He recently started his own initiative, IDidNotReport, to promote Citizen Journalism and to catalogue all the unreported incidents geographically.

Inspiration: A trained operator sits on each marine vessel and classifies them into various classes by listening to the sound generated by these approaching vessels. This human-driven, subjective system is prone to human error. This objectivity might be crucial at certain time, and with the advancement of technology it is possible to automate this system. The objective of this work is to provide Indian Navy a completely automatic system, with minimal human intervention to classify the sound of approaching vessels.

Current Shortcomings: Designing a complete surveillance system is a gigantic task. Our work is only a small contribution towards that. We have studied the performance of the designed system in a very limited framework which needs to be expanded and the results of this testing should be incorporated in the design to complete the present work. Moreover, if we can design a system which can classify our navy marine vessels from enemy ships with full accuracy it will complete our success story as this system will have a great role to play in the security of any nation.

VAJRA(vessel desk)

Student(s)- Raghunath Lohar

Labour community across India is lifting, carrying and moving objects over head since a long time. VAJRA is a simple, low-cost device for them. It distributes load from head to shoulders and solves the complex traumatic problems caused by work drudgery. Also, it is a multipurpose device that can be used for a wide range of jobs.





Raghunath Lohar

Profile: Raghunath is an Aeronautical Engineer and received his qualification from the Ganesh Institute, Chennai. He received an award from the National Innovation Council in 2012. He lives in Kolapur, Maharashtra.

Inspiration: An incident happened 4 years back that led me to think about the people at the 'bottom of the pyramid'. A woman carrying bricks on her head near my home lost her balance. The bricks damaged her fingers and left her with no work. That prompted me to think of a solution for the drudgery faced by labourers. I came up with Vajra after 4 years of dedicated effort.

Current Shortcomings: The current prototype is made of sheet metal but subsequent versions should be made of plastic.

Future Plans: Currently I am working in an incubation center to develop VAJRA. The project needs a small seed funding to finalize 1st phase of project and a loan support for the next phase. I am also looking for mentoring by experts in plastics and design registration.

Comprehensive Protection from Electrocution

Student(s)- Ramdas M U, Ashfaq Muhammed T, Shahin T A, Sonu Unnikrishnan K, Sreelakshmi Suresh, Sruthy A

Guides- Dr. Sudha Balagopalan & Mary P Varghese Institue- Vidya Academy of Science and Technology, Kerala

The service done by technicians on distribution power lines has a high risk of accidents. One common dangerous situation, which the technician is exposed to, is when they pass over the minimum security distance. According to the survey report of Kerala State Electricity Board (2009), more than two people per month lost their life due to electrocution from the overhead power lines. As upcoming Electrical Engineers we thought on above situation and studied. This project is based on a development study for an electronic device capable of detecting the electric field coming from high voltage distribution power lines. It is small enough to be installed on security helmets. This way, it can be classified as individual security equipment.





Left to right (standing): Asfaq, Sonu, Sreelakshmi, Sruthy, Shahin, Ramdas
Left to right (sitting): Mary P Varghese, Sudha Balagopalan

Profile: These are final year B.Tech Electrical Engineering students from Vidya Academy of Science and Technology, Thrissur, Kerala. This is their B.Tech 'mini project'.

Inspiration: Many power personnel have died by electrocution due to wrong perception on the live nature of lines because of miscommunication. Just before we chose this project, one of our seniors fell victim and was prosecuted for 2 deaths, one an overseer who got onto the tower under the impression he was working on a line which had never been energized and second, the fireman who climbed up to bring the man down and also got electrocuted. This senior and our supervisors were insistent that we detect electric field and not magnetic field and we came up with such a circuit.

Future Plans: We wish to make it more comprehensive including more eventualities and including sophistication such that it is easier to use, cheaper and aiming at a situation when even procedural lapses do not result in loss of lives.

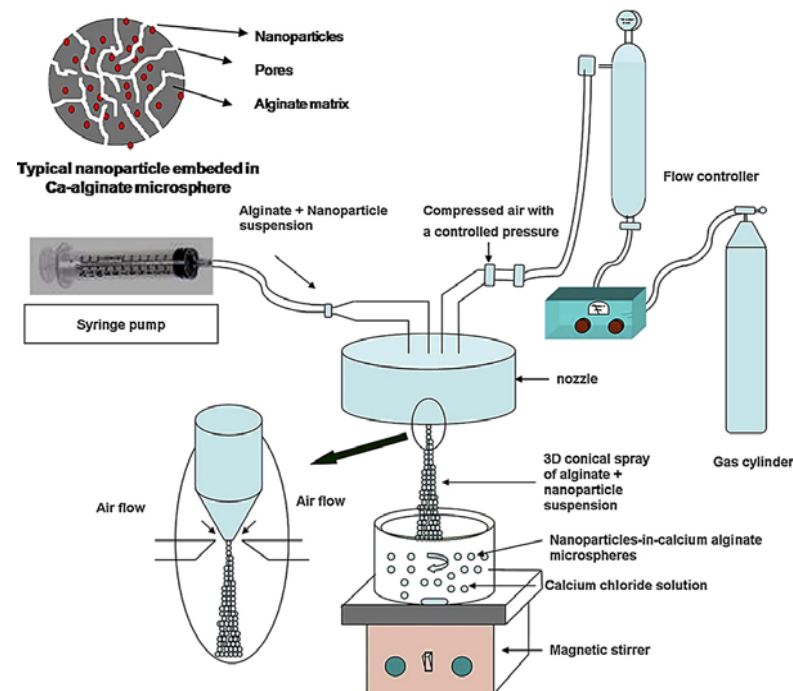
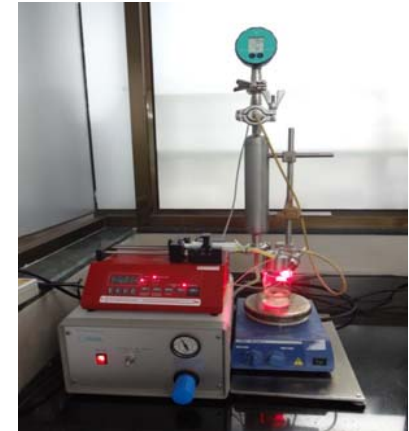
Multifunctional Nano-in-Micro Alginate Microspheres for Biosensing, Drug delivery and MRI

Student(s)- Rashmi Chaudhari

Guide- Abhijeet Joshi

Institute- IIT Bombay

The current innovation aims at developing an implantable multifunctional system that can detect changes in levels of glucose during diabetes monitoring using small micron sized particles. The system also contains an imaging agent and drug for visualization and treatment of diseases. In order to combine all the three functions together we have developed micron sized particles by a spraying technique and tested for their efficiency. These particles can be implanted under the skin and can bring about continuous disease monitoring. All the functions in a single system will help in improving patient compliance and reduce the cost of therapy.





Profile: Rashmi Chaudhari is a PhD student in Biomedical Engineering at IIT Bombay. Her current research area is “Development of Multi-analyte Biosensors” for diagnosis of kidney diseases. In her research endeavours, she has been able to file an Indian patent application and two research publications in a peer reviewed journal of high repute. She has presented her research in several national and international conferences. Her supervisor is Dr. Abhijeet Joshi.

Led by Prof. Rohit Srivastava, theirs is a leading group in IIT Bombay which focuses on working on biosensor development and solutions for cancer diagnosis and therapy.

Inspiration: The basic inspiration behind developing this innovation is to combine diagnosis and treatment of diseases using a single solution. A lot of effort, time and money are used up in employing detection techniques and treatment

method separately. By combining these functions together in a single system, we can improve healthcare. The idea was also based on the earlier research capability to produce alginate microspheres using atomization technique. Alginate microspheres being biocompatible in nature are used for developing a multifunctional system.

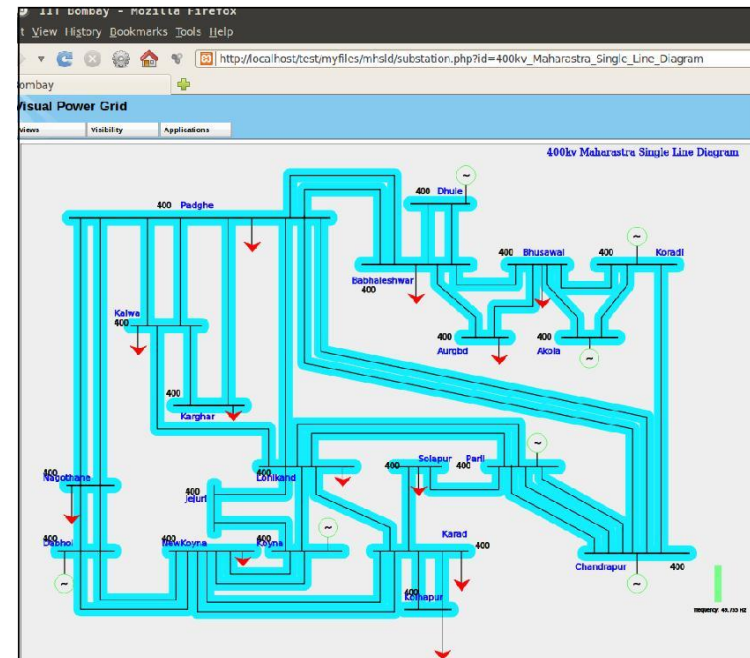
Current Shortcomings: The multifunctional alginate microspheres involve encapsulation of enzyme based biosensor system which limits the storage stability. Attempts will be made to improve upon the stability of enzymes in the microspheres.

Future Plans: Multifunctional alginate microspheres need to be biocompatible and biodegradable so that activity is maintained for whatever period the assay is inside the body. The method studied detection of glucose as analyte for monitoring of diabetes. The technique can be adopted for developing multiple analyte sensors in single sensors, so that physical condition can be monitored by measuring different analyte concentrations inside the body effectively. Also, such matrices need to be transformed into cheap medical devices so that they reach the ultimate consumers. Infrastructural support for scale up of technique will be required along with financial investments. IP support will be helpful for protecting the innovation and in order to develop cross disciplinary systems with additional developments.

Graphics Model for Power Systems in CIM Framework and Design of Online Web-based Network Visualizations and Integration of Control Center Applications

Student(s)- Gelli Ravikumar Guide- Prof. S. A. Khaparde Institute- IIT Bombay

The objective is to design Graphics model for power systems as well as design of Online web enabled power system networks for visual power grid and for future control centers. The system motive is to provide technological edge as well as new technology aligned remotely accessed power system network applications for the power sector domain. Typical power system is culminated with large power networks and myriad software systems from different vendors are developed for performing analysis, monitoring and operating the grid efficiently and reliably. The incompatibility across the multi vendor system arose and thus any two vendor system are interoperable to each other. With this motive, common information model (CIM) has been a delved research topic for power engineers. We have fulfilled the objective with developing CIM oriented systems and thus achieving seamless integration of multi vendor systems.



Maharashtra 20-Bus Network Diagram with Single Islands



Gelli Ravikumar

Gelli is currently working towards Ph.D. degree in Department of Electrical Engineering at Indian Institute of Technology Bombay, India. His research interests include Business Process Models, BPMN, architectures for common information model (CIM) based SCADA / EMS systems, CIM oriented database design, EMS applications integration with CIM database, CIM network model creation and topology processing, design and development of Power System Graphics Model. He is an active member of CIM panel under Bureau of Indian Standards (LITD-10). He is a graduate student member of the IEEE Mumbai section.

Prognosis of Pre-Diabetes and Type 2 Diabetes Based on the Non-Invasive Estimation of Blood Glucose Using Infrared Thermography against the Bio-Marker

Student- S. Sivandandam

Institute- SRM University

The application of the non-invasive infrared thermography in the diagnosis and prediction of the type 2 diabetes against the bio-marker (HbA1c) was studied based on the evidence that insulin has a profound impact on the metabolism; diabetes and the core body temperature and that was measured from the skin surface temperature based on the standard practice of the European Academy of Thermology. The study subjects n=62 were classified into the control and diabetic as per the diagnostic criteria (HbA1c $\geq 6.5\%$) set by the American Diabetes Association and the World Health Organization.





S. Sivanandam

Sivanandam is currently working as an Associate Professor at SRM University, Chennai. He obtained an M.E. with specialization in Medical Electronics from College of Engineering Guindy (CEG), Anna University, Chennai.

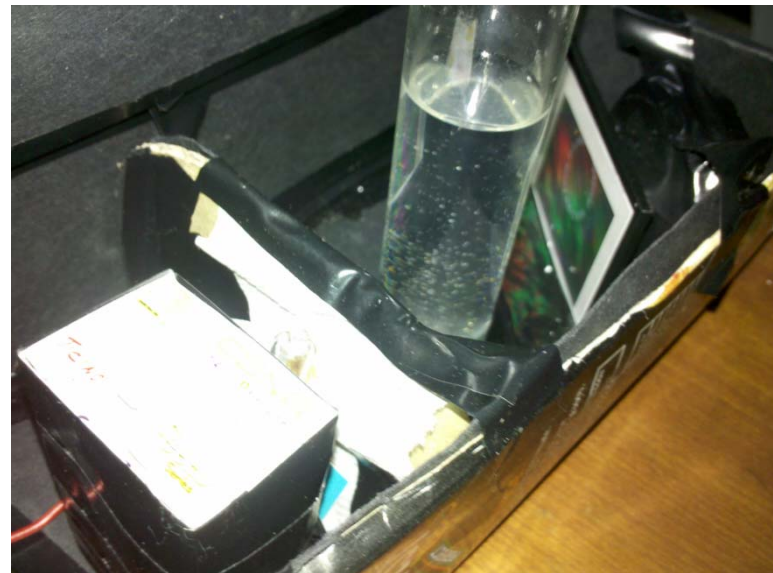
Spectral Eye

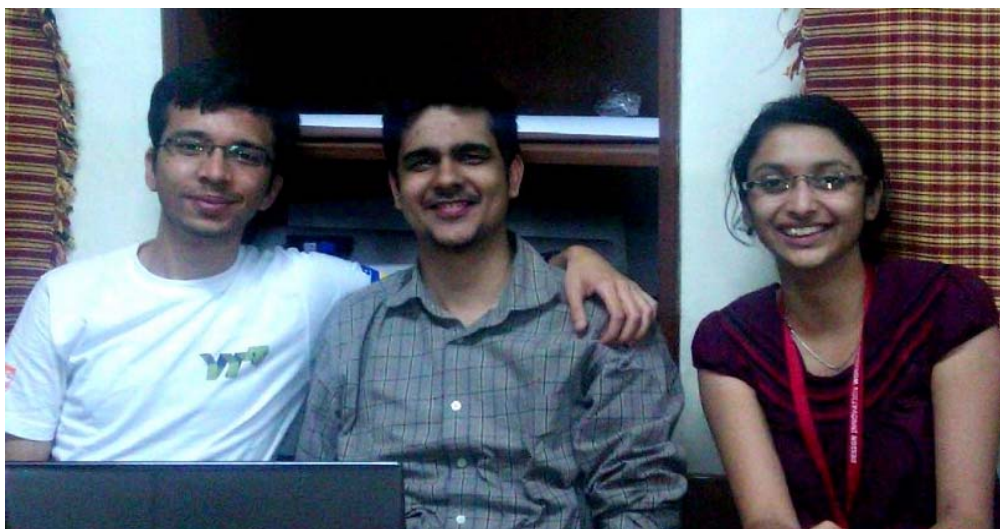
Student(s)- Sai Gole, IIT Madras; Saket Choudhary, IIT Bombay; Yashesh Gaur, Dhirubhai Ambani Institute of Information and Communication Technology, Gandhinagar

Every year, countless people die due to water poisoning. The chemical industries often contaminate the surrounding water bodies and these hazardous metals more than often find their way into the water bodies through which we derive our drinking water. Our aim was to come up with a low cost and portable device that can be used to monitor/check the quality of water.

Spectral Eye is a low cost and portable spectrometer, designed to detect and measure the amounts of various impurities in water. It can be used to detect any impurity which leaves a spectrometric signature. This device can be easily coupled with a cell phone.

Thus every person has the ability to analyse samples. The resulting spectrograms of the samples can be stored in an online database. With time, the size of the online database will increase and the detection/recognition of impurities will become increasingly accurate.





Yashesh, Saket and Sai

Inspiration: We all are from different colleges, backgrounds, cities with an aim to do something for society, to have impact on society; this was the main thing which prompted us to work together. We met in a workshop organized by MIT Media Labs in Bangalore (Design Innovation 2013) in January, where we started thinking of this idea and started working on similar lines.

The problem related to water safety is not new for us, but the current means of monitoring on water quality, especially in India, are not sufficient. Proper health measures are also not available at many remote regions, thinking about all these factors we reached the idea of SPECTRAL EYE. The positive results which we got initially encouraged us to work further; we started working online on chats, video chats etc. refining our codes, discussing about new things happening all around the world. It is love for innovation and technology which keeps us working and alive!

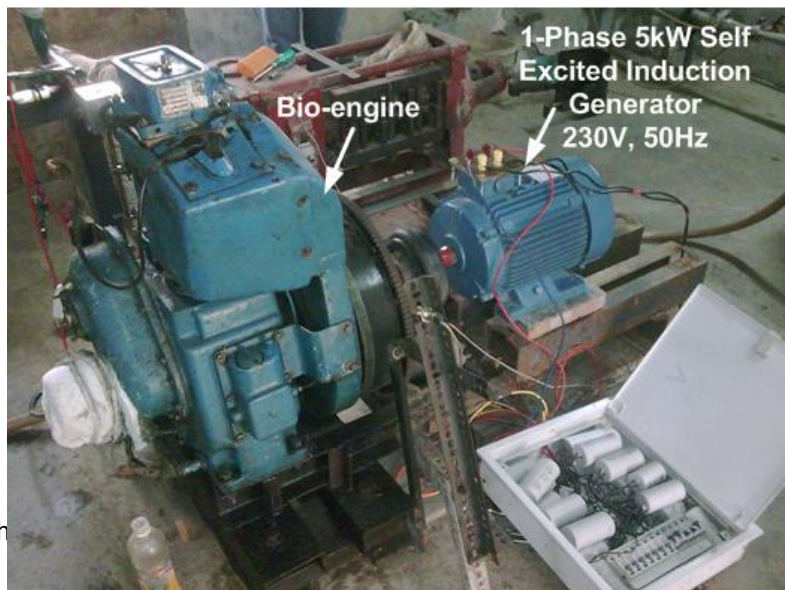
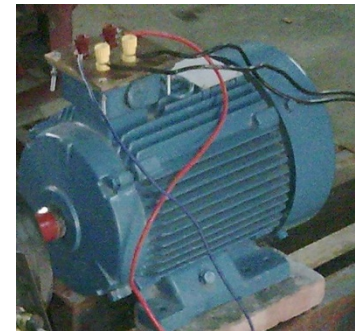
Novel Stand-alone 1-Phase AC Generator for Rural Electrification using Renewable Energy

Student(s)- Vuddanti Sandeep

Guide- Prof. S S Murthy & Prof. Bhim Singh

Institute- IIT Delhi

Bio, Pico-hydro and wind are important renewable energy sources suited to small off-grid power applications in rural/remote areas with significant potential in India. For such units used by domestic/commercial consumers, single-phase supply is the prime need. Thus this project reports a first successful effort on design and development of 5kW, 50Hz, 230V, 4-pole single-phase AC Generator which is simple, rugged, cost-effective, brushless, maintenance free and user friendly like remote area power supplies used by less “techno-savvy” population. Based on the design, a prototype has been fabricated with the help of an industry and tested for suitability.





V Sandeep

Profile: Vuddanti was born in Buchireddypalem, Nellore dist., Andhra Pradesh, India in 1986. He received the B.Tech. degree in Electrical Engineering from Visvodaya Institute of Technology & Science, Kavali, A.P. in 2007, and the M.Tech. degree in Power Electronics & Drives from Vellore Institute of Technology (VIT) University, Vellore, in 2009. He is currently working toward the Ph.D. degree at the Department of Electrical Engineering, Indian Institute of Technology (IIT) Delhi, New Delhi (2009- 13). His dissertation is titled “Investigations on Renewable Energy based Single Phase Power Generation using Self Excited Induction Generators”. He has published 7 research papers in international journals and conference proceedings. His current research interests include renewable energy systems, design of electric machines, energy conversion and micro grids. He worked as an Intern Researcher at General Electric (GE) Global Research Centre, Bangalore during May- July 2010. He is a Graduate Student Member of IEEE (USA) and Associate Member of IET (UK).

Future Plan: Future plan/road map is prepared to demonstrate the innovation and make it into a commercially viable product. We have identified many remote/ rural areas in India where the scope of power generation using locally available renewable resources – bio and small hydro- is good. We want to demonstrate these working units in some places to prove the advantages of this technology. After successful field trial, the technology will be open for commercialization. Currently this research project is sponsored by Ministry of Micro, Small and Medium Enterprises (Govt. of India) and supported by Foundation for Innovation and Technology Transfer (FITT), IIT Delhi.

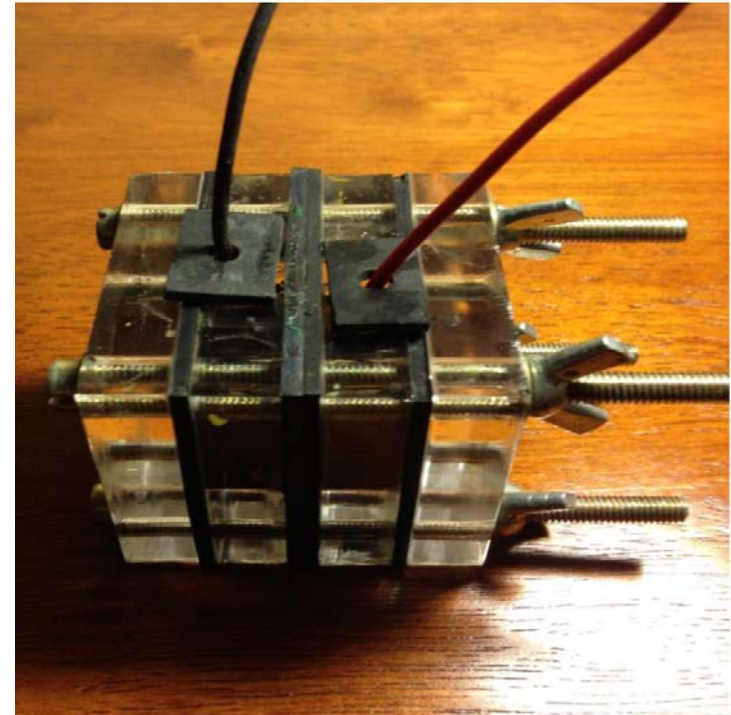
Cow Dung based Microbial Fuel Cells (CDFCs) to Light up Indian Villages

Student(s)- Vishnu Jayaprakash

Guide- Dr. T.S Natarajan

Institute- University of California, Berkeley, USA

Rural areas in India and around the world face acute power shortages, leading to a poor standard of living. In India alone, approximately 300 million people are disconnected from the national grid and are reliant on the localized combustion for power and lighting. To provide lighting in rural areas via ultra-bright LEDs, an inexpensive cow-dung based microbial fuel cell (CDFC) is presented here. With a total cost of 3 USD, these CDFCs can provide lighting for a village home, allowing for greater economic and academic productivity.





Vishnu Jayaprakash

Profile: Vishnu is currently an undergraduate student at UC Berkeley. He started working on cow dung based microbial fuel cells when he was in the 10th grade under the guidance of Dr. T. S Natarajan at the physics department in IIT-Madras.

Inspiration: When I visited some family friends near Karikundi, Tamil Nadu a few years ago the reality of the rural energy crisis hit me. I already knew about microbial fuel cell technology and when I saw the rural landscape, the idea of cow-dung based microbial fuel cells came to my mind.

Current Shortcomings: The series power output of three of these fuel cells is only sufficient to power one ultra-bright LED lamp. In order to improve the scope of applications, we need to produce higher efficiencies. The approach mentioned above presents the most effective way to improve performance.

Future Plan: The biological environment in the anode and the electron transfer mechanisms involved in power generation are not fully understood yet. In order to improve the power output of the fuel cell, we intend to look at ways to optimize these electron transfer processes using simple and cost effective methods. Doing so would potentially allow these fuel cells to be used for larger scale applications.

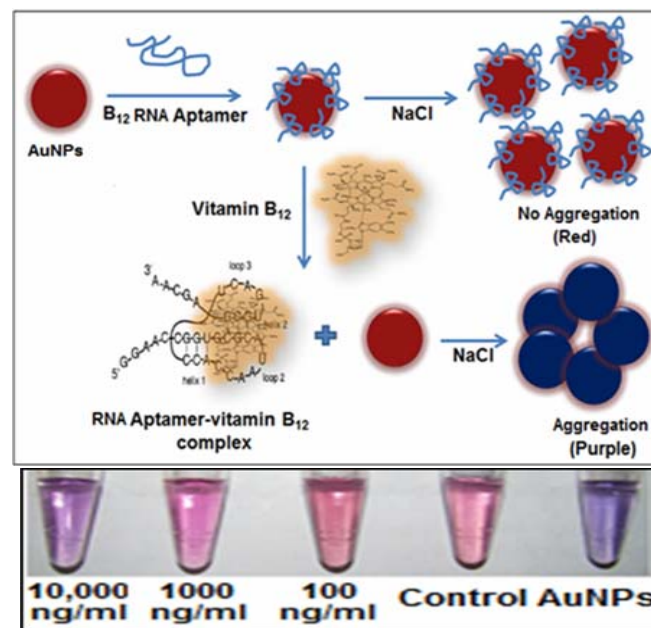
Saral Parikshan (सरलपरीक्षण) - An Advancement in Cutting Edge Technology for Rural Area to Detect Vitamin B12 for Pernicious Anemia

Student(s)- Sagaya Selvakumar L
Research Institute, Mysore

Guide- Prof.M.S.Thakur

Institute- Central Food Technological

The current innovation is the concept of simple, sensitive and inexpensive visual colorimetric detection for vitamin B12. Aptamer-conjugated gold nanoparticles (AuNPs) act as probes which cause dramatic color change from red solution to blue. Uniqueness is the visual detection of vitamin B12 using inexpensive AuNPs as signal enhancer with duration of 15 minutes in analysis. The biosensor's limit of detection was 100 mg/ml. The researchers tested the efficacy of the biosensor using samples containing vitamin B12. Natural RNA or DNA aptamer is nuclease sensitive, therefore, nuclease resistant aptamer are generated for biosensing application by replacing costly antibodies. Our method provides not only an alternative method to the current lab detection, but also a way for early screening of vitamin B12 as "Yes or No", especially for clinical fields and looking for possible alternative food sources for vitamin B12 for developing countries. This concept can be applied by any person, at home or in the field, to detect any contaminants, carcinogens and hazardous materials in the food- clinical and environmental samples.





Profile: Sagaya is a third year doctoral student at Central Food Technological Research Institute (CFTRI) under Prof. M.S thakur, Cheif Scientist. Recently he has submitted his thesis entitled "Studies on the biosensing techniques for the analysis of vitamin B12 in selected foods". His core interest is in Biosensor, Immunosensors, Biophotonics, Nanosensors, Aptasensor, Vitamin B12. He was selected for “8th Technology Led Entrepreneurship Programme”

for PhD scholars conducted by Council of Scientific & Industrial Research, held at IICT, Hyderabad from July 4-18, 2011. His work on dipstick based chemiluminescence were part of Nature Highlight in April 2012.

Inspiration: Innovations in developing new protocols based on aptamers and nanotechnology are helping in improving the survival rate and the life quality of masses affected by serious, life-threatening diseases or deficiencies. With a concerted effort, concept could not only reduce the cost of food safety field assays, but also allow for widespread implementation of those assays by local health inspection agencies thereby empowering them with the tools necessary to enhance public health protection.

Current Shortcomings: Visual based prototype needs improvisation for quantitative detection with the help of hand held spectrophotometer to measure the intensity of colour.

Future Plan: Aptamer research in India should be in forefront as statistics of biosensor market shows that next generation of diagnostics are in the hands of aptamer biosensor specialist. The applications of aptamers are so numerous that studies describing their use appear in the literature on a weekly basis. The results and developments described above show how aptamer technology is rapidly maturing from a simple research tool into a major technology with commercial potential. Given that aptamers mimic and extend many of the features of monoclonal antibody reagents, we must expect a similar development of commercial applications over the next few years. In addition, the rapid expansions of our understanding in interactions with nanoparticles are likely to spur newer formulations of the basic aptamer concept. It is clear that no one working in the field of molecular microbiology can ignore the potential of aptamer technology any longer. And I wish to be a pioneer of this technology.

Hydro-operated Square-Bottom Paper and Jute Bag Making Machine

Student(s)- Anirudh Thakur

This is a hydro-operated machine which performs four tasks simultaneously:-

1. Make Square bottom paper bag
2. Make jute bag
3. Generate electricity
4. Filter water

The machine also places a base-supporting card in the bag after producing it.

The machine is fully automatic and eco-friendly. It can be easily connected to an electricity supply by attaching a 2 HP motor.



Profile: Anirudh is quite a serial innovator and has developed a pen for OMR sheet, 'intelligent engines' and a single slot carton box making machine among others.

Inspiration: I live in Himachal Pradesh, which is a well known tourist spot. Due to the large number of tourists, there are a lot of plastic bags. Thinking about the pollution caused by these bags, I decided to start producing eco-friendly paper bags. On research, I found that there are no paperbag making machines produced in India. And international equivalents are too expensive.

So, I decided to make a low-cost, multipurpose machine. My machine is significantly lesser in price, a tenth of the weight of the Chinese equivalent and 4 times more efficient!

Future Plan: In next version we will place a mechanism that will place handles in paper bags as well as punch a handle in jute bags. I wish to take this machine to every corner of the world so that we all can use eco-friendly products.

Development Bamboo-epoxy nanocomposites for manufacturing of helmets and other structural applications

Student(s)- Vivek Kumar Guide- Dr. Sanat Mohanty Institute

Bamboo fiber is widely used in all types of structural applications. We have done some initial work in developing laminated epoxy-bamboo nanocomposite sheets and epoxy-fly ash–bamboo composite sheets with compression moulding. Some early studies using asphalt and coal tar with bamboo sheets were also done to look at the feasibility of roofing sheets. Prototypes were also developed using moulds that were compressed by weights easily available in rural areas, such as bricks and stones (which were pre-weighed for documentation purposes). The use of fly ash did not affect the flexural strength but increased compressive strength by about 40%. This allows us to reduce the epoxy component of the product as well as the cost. Fly ash, coal tar, asphalt etc. all are very cheap and easily available materials. Prototypes of helmets and display panels have been developed. Impact strength and compressive strength of bamboo-epoxy nanocomposites was found to be comparatively high.





Profile: Vivek Kumar is Project associate in the Chemical Engineering Department at IIT Delhi.

Inspiration: It has been found that replacing 30% glass fiber with 65% hemp fiber in thermoplastic composites produces a net saving of energy consumption of 50, 000 MJ (about 3 ton CO₂emission) per ton of thermoplastic. Also, by substituting 50% of the glass fiber by natural fiber in automotive applications, 3.07 million tons of carbon dioxide emissions and 1.9 million m³ of crude oil can be saved. These facts are major driving forces for the growing need of

biofiber composites in place of synthetic and wood fiber composites due to the positive environmental benefits such as biodegradability, renewable character, availability in a variety of forms throughout the world, raw material utilization and free from health hazard. The bamboo fiber has great potential to be exploited as nonwood renewable fiber and the composite industries can extensively use bamboo fiber for social and economical empowerment of rural peoples. Bamboo as a fiber with different polymers and fillers is a good option for high performance structural applications. Conventional composite fabrication techniques tend to become less effective mainly in rural areas because they are costly.

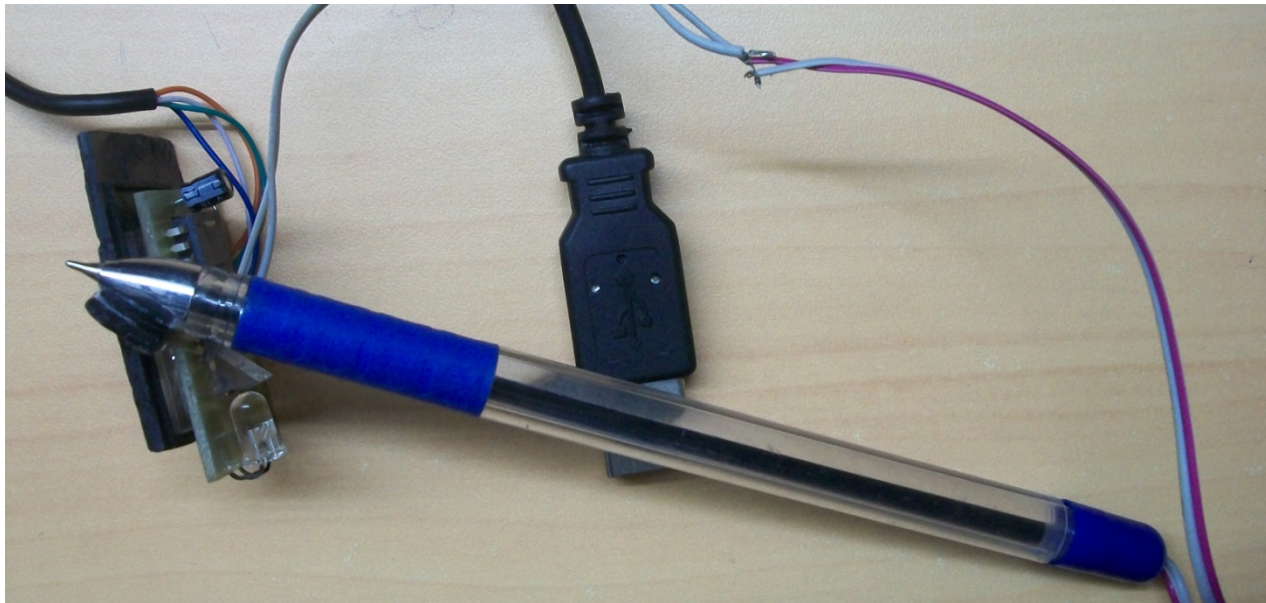
Current Shortcomings: We will try to improve the finishing of developed bamboo nanocomposites prototypes.

Future Plan: The use of bamboo-epoxy nanocomposites could be extended to Food packaging both flexible and rigid (containers and wrapping films): Excellent barrier and mechanical properties of nanocomposites resulted in considerable interest in natural fiber nanocomposites in food packaging applications, both flexible and rigid. Specific examples include packaging for processed cheese, confectionery, cereals and boil-in-the-bag foods, also extrusion-coating applications in association with paperboard for fruit juice and dairy products, together with co-extrusion processes for the manufacture of beer and carbonated drinks bottles. The use of natural fiber nanocomposite formulations would be expected to considerably enhance the shelf life of many types of food.

Digital Pen

Student(s)- Kalpesh Wani, Vivek Bavishi, Venkat Rao Institute- Visvesvaraya National Institute of Technology, Nagpur

Most of the digital pens (computer input device) available in the market need their own specific surface (which are pressure sensitive) and are very costly (ranging from \$22 i.e. Rs.1100 to \$99 i.e. Rs.5,000). The Digital Pen which we are making will work on most of the surfaces (except glossy surfaces) and will cost lesser.



Inspiration: I have always wondered why we should learn a machine to adapt with it. Consider the simple example of writing. Since our childhood, we have learnt writing on a paper with pen and now if we have to write on a computer we have to use a keyboard. Why should we learn to use the keyboard to write? Why should we adapt to machines rather than developing machines which will be suitable to us? This gap between human and machines is gradually reduced by developing new ways of interaction such as touchscreens and sixth sense techniques. Now technology replaced computers by laptops and smartphones with more advanced and easy to use interfaces such as touchscreen. I am quite confident that one day we will completely fill this gap and machines will learn human ways. This project is just one step towards it.

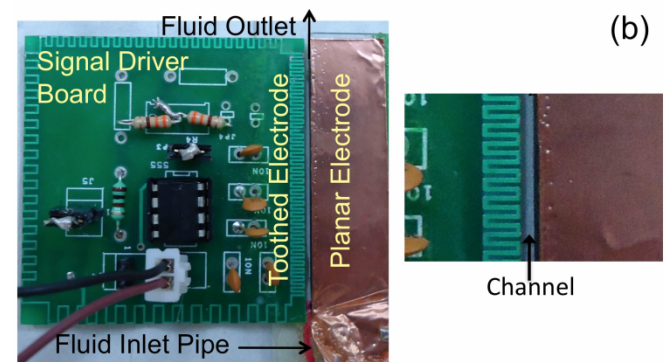
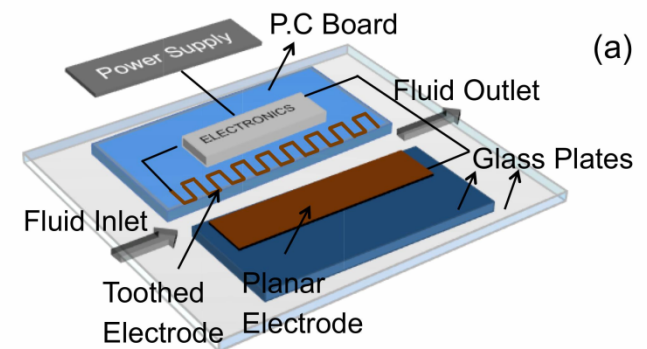
Current Shortcomings: I want to improve the design and reduce the size of the electronic circuitry in the next prototype.

Future Plan: I need to do changes in the design to increase the accuracy of the device and to improve its functionality. Mentoring from an expert in these areas and funding for further research would definitely be helpful for the project.

A Portable and Efficient Electronic Filter for Sub-Micron Particles from Fluids

Student(s)- Aswathi Nair Guide- Dr. Sanjiv Sambandan Institute

A portable, low cost, low-power system for the removal of sub-micron level particulate impurities from fluids has a wide range of applications from water filtration to biomedical applications such as dialysis, blood purification etc. We have developed such a filter for a general category of fluids. The filter works on the principle of polarizing the particulates in the fluid and chaining them up into clusters, thereby removing them from the fluid as the filtered fluid flows through.





Aswathi Nair

Profile: Aswathi is an M.Tech candidate at the Department of Instrumentation and Applied Physics, Indian Institute of Science, Bangalore.

Inspiration: The need to bring low cost biomedical and health related products to the people is the main motivation. The system has multiple applications - dialysis, water filtration, cancer cell isolation from blood for diagnosis in early stages are some of the applications. Apart from providing a valuable solution, the physics is interesting from the point of a purely academic pursuit.

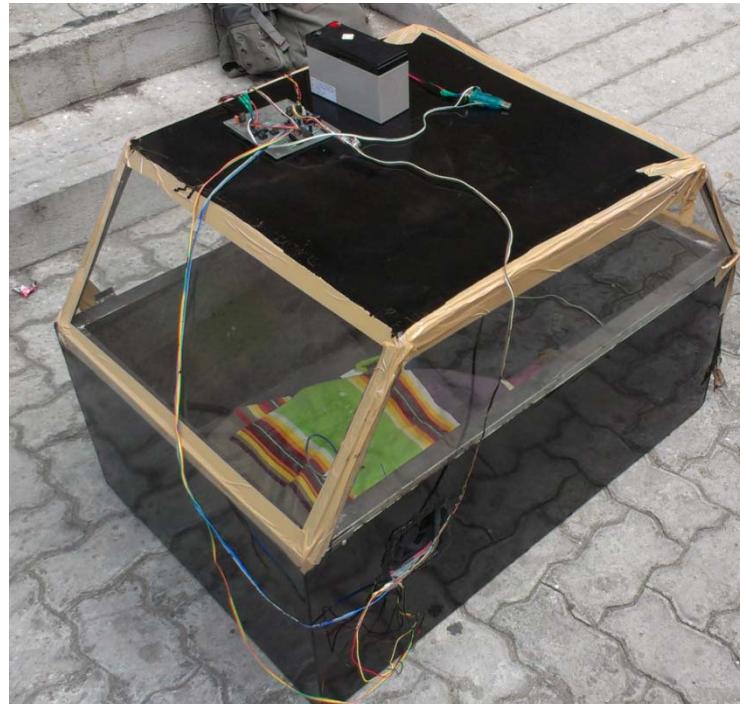
Current Shortcomings:

Future Plan: First, we plan to approach hospitals for advice on how the system can be designed to suit their requirements to achieve targets such as dialysis, cancer cell detection, blood purification etc. We then plan to scale up the system to achieve larger throughput for applications related to portable water filtration. We have initiated contact with NGOs working towards water purification. We are currently seeking funding from the Indian Institute of Science and other organisations. We are currently attempting to file an Indian Patent through the SID at IISc.

Design of a Smart Automotive Ventilation System for Parked Vehicles

Student(s)- Gaurav Kumar, Mohit Gandhi, Sanket P Phalgaonkar, Harshal Upadhyay, Ankit Agrawal Guide- Dr. Vasudevan Rajamohan Institute- Vellore Institute of Technology, Tamil Nadu

On a very hot sunny day, parking a car directly under the sun can be problematic since entering a car even after five minutes of direct exposure can be very uncomfortable, if not dangerous. Our aim is to be able to regulate the temperature inside the car-cabin in the absence of a driver with the help of our smart ventilation system.





Ankit Agarwal



Sanket Phalgaonkar



Harshal Upadhyay



Gaurav Kumar



Mohit Gandhi

Profile: These are Mechanical Engineering students from VIT university.

Inspiration: In my Automobile Engineering class, when my professor brought up some regular day-to-day problems we face in automotive industry that still need to be addressed, I came up with the idea for solving one of the problems of over-heating in the cars parked directly under the sun, with the help of automation (my area of interest). Along with my colleagues with similar interest, we brought our idea to the notice of Dr. Ganesan, Director of TIFAC CORE in Automotive Infotronics, VIT University, who supported our idea and so we took this on as a project.

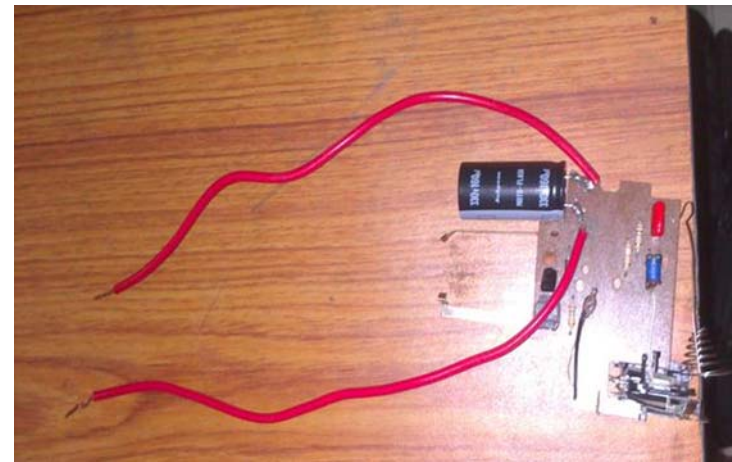
Current Shortcomings: There still needs to be testing on a real car and the final design will have to be according to that.

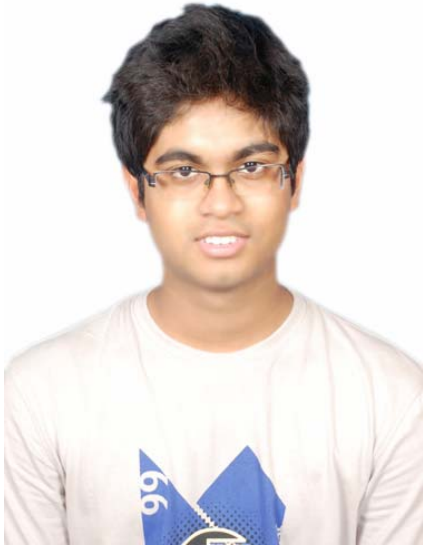
Future Plan: The next step is to implement our prototype on a real car and make relevant changes.

SHE- Society Harnessing Equipment

Student(s)- Manisha Mohan, Niladri Basu Bal , Rimpi Tripathi Institute- SRM University, Chennai

The system devised is an inner wear, actuated with sensors and electric shock circuit board, for women. Along with this, GPS and GSM modules are attached to this setup. The inner side of the undergarment is insulated with a polymer. The circuit is placed near the bosom because in the attempt of rape or road-side eve-teasing, as per survey, women are attacked first on their bosom.





Niladri Basu



Manisha Mohan



Rimpi Tripathy

Profile: Manisha is a student of Aeronautical Engineering, while Niladri and Rimpi are students of Instrumentation & Control Engineering, at SRM University, Chennai.

Inspiration: Studying in a convent girls school, we were always taught to be good to everyone around and bear a cheerful smile. After stepping into the real , cruel world we realized that our smile could not last for long as the threat to our purity and integrity always lingered on. Since the law makers take ages to come up with just laws and even after that, women are unsafe. Hence, we have initiated the idea of self-defense which protects the women from domestic, social and workplace harassment. We came across many such incidents of harassment during our survey in women's hostel. So we decided to make this project which can be implemented easily .We have used technologies which are being used in day to day life (G.P.S,G.S.M,presure sensors) in our innovation to bring a simple solution to this serious problem existing in our society.

Current Shortcomings: The device needs to be more compact.

Future Plan: We want to interface this system with a smart phone using bluetooth and infrared. The pressure sensor will send a signal to the smart phone through bluetooth which will in turn send stress messages instantly.