



NERD

Notes On Engineering, Research And Development

Volume 6

Issue 2

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GREETINGS

The NERD Team wishes everyone a very Happy New Year! This new year, we have in store for you a number of exciting events and special issue to be released during Techkriti ! Aiming to enthuse, create and communicate, we intend to surpass previous years in our reach and achievements. We expect even more enthusiastic support from our readers!

EDITORIAL

With immense pleasure, the NERD Team brings to you our first newsletter of the new year! NERD has been going from strength to strength throughout its journey as IIT Kanpur's student-led initiative in science communication and popularization through publications, talks, workshops and competitions. This newsletter carries forward our aspirations by aiming to enthuse you about science and technology, by showcasing interesting work cutting across disciplines being carried out by fellow students all over the country, as well as informing you about the legacy scientists in India have to uphold! From Bharat Ratna Dr. C.N.R. Rao to Team Pushpak, from chemicals assisting osmosis to autowale, we aim to inspire!

This is just a fleeting glimpse that might make you guess NERD's theme for our next magazine issue. NERD feels proud to bring you our special issue during Techkriti-14. After a lot of thought and survey, it was a collective decision to have the theme 'Space Technology and Applications' for this special issue of NERD. With so much going around and about to happen this year, in addition to what is already there in research regarding the effective utilization of spaceborne sensors and probes on board some innovative designs, the theme acts as a guide to collectively spread awareness on the same.

All suggestions are welcome! Just drop in a mail at nerd@iitk.ac.in.

Cheers,
Editorial Board,
NERD

India's 'Doctor Science'

On the 16th of November, 2013, the Prime Minister of India, in a press release, announced to the world that the Government has decided to confer the highest civilian award, the Bharat Ratna, on eminent scientist Prof C.N.R. Rao. He joins the 'tikadi' of three other eminent people from the field of science and technology who have been conferred the Bharat Ratna in the past - Nobel Laureate and physicist C.V. Raman who was awarded in 1954; civil engineer M. Visvesvarayya (on whose birthday, National Engineer's Day is celebrated) in 1955 and most recently, aeronautical engineer and India's 'missile man', APJ Abdul Kalam in 1997.



Dr. C.N.R. Rao
Scientist Extraordinaire
Head,
Scientific Advisory Council to Prime Minister of India

Chintamani Nagesa Ramachandra Rao, the 79-year-old scientist, who is known for his work in solid state and structural chemistry, heads the Scientific Advisory Council to the Prime Minister, is the National Research Professor, Linus Pauling Research Professor and Honorary President of Jawaharlal Nehru Centre for Advanced Scientific Research, Bangalore, which he founded in 1989. Dr. Rao has served as the Director of IISc. Bangalore and as the Head of the Department of Chemistry here at IIT Kanpur, which he became at the age of 29 years, showing the faith Dr. Kelkar (IIT Kanpur director then) had in him. He was also the Dean of Research affairs in IIT Kanpur's formative years.

Rao, one of the most prolific scientists in the field of chemistry and material sciences is still inexhaustible while he still spends hours in laboratory and in course has more than 1500 research publications. Recently he has been exploring the properties of the novel material referred to as 'graphene' which consists of thin films of carbon. His work on transition metal oxides has led to basic understanding of novel phenomena and the relationship between materials properties and the structural chemistry of these materials. Besides, his work on hybrid materials is unparalleled.

“I wish, in 20 years, India will be in the top three or four countries in the world in science. I really want to see India shine!”

Dr. Rao is also immensely interested in popularizing science and in the pursuit of research in scientific and technical disciplines. He serves on the board of the “Science Initiative Group” (SIG), an international team of scientific leaders and supporters aimed at promoting science in the developing countries.



BHARAT RATNA

The Bharat Ratna is the Republic of India's highest civilian honor, awarded “for performance of highest order in any field of human endeavor.” Any person without distinction of race, occupation, position or sex is eligible for the award.

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► Views on Education and Research

Dr. Rao is also an articulate supporter & follower of inter-disciplinary research. He believes in an inclusive undergraduate curriculum that does not lead too much into narrow specializations and allows the freedom to switch over and explore interdisciplinary research. He has often said how good biology is being studied by physicists and chemists and good materials science by engineers.

Rao is quite outspoken in his support for research and improving the current science education scenario in the country. The eminent scientist has often lamented the fact that Indian science is mostly government funded and has very little connection to and contribution from industry. He wishes Indian industries to collaborate more with research and academia. He is of the opinion that in scientific research, while India's contribution to the global output has increased, it still remains only at a modest level. He has often criticized the prevalent system of academia and the research atmosphere. Within the next 20 years, he wishes to see, India being in the top three or four in the world in science.

► On Indian Universities

The perpetual academician-scientist, Dr. Rao suggests that there is a necessity for a major change in the structure of universities, a majority of which, he feels, are presently unfit for any chemical or biological research and filled with mediocrity. Also, stating that none of the Indian Universities today is among even the top 100 best universities in the world, Rao iterates that the IITs and IIMs are not competent relative to the top class universities like Harvard University, Oxford University, Cambridge University or Massachusetts Institute of Technology (MIT). However, he is ever the optimist and keeps hoping for the best.

Dr. Rao's towering personality in the field of science has earned him the nickname Dr. Science. NERD, along with the nation, bows down before this eminent scientist for whom scientific research is no less than spiritual bliss!

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*source: <http://www.niscair.res.in/jinfo/SR/2013/>
for more visit: <http://www.jncasr.ac.in/cnr Rao/>*



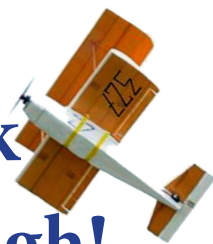
ISRO starts off 2014 with a bang!

The Indian Space Research Organization (ISRO) begins 2014 with a successful launch of the Geosynchronous Satellite GSAT-14 by launch Vehicle GSLV-D5. GSAT-14 is a communications satellite. The rocket engine was completely designed and made in India. Such a feat has come after a long waiting period since 2001. ISRO has now become the sixth space agency in the world after the United States, Russia, Japan, China and France to have success with this type of engine. "Some used to call the GSLV the naughty boy of ISRO," said K. Sivan, GSLV project director at ISRO. "The naughty boy has become obedient." as quoted by Stephen Clark for Spaceflight now. GSAT 14 will be positioned near other Indian satellites, such as INSAT 3C, INSAT 4CR and Kalpana 1, according to ISRO.

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*source: <http://www.isro.org/gslv-d5/pdf/brochure.pdf>
for more visit: <http://www.isro.org/>*

Pushpak Soaring High!



IIT Kanpur's 'Team Pushpak' is dedicated to promoting opportunities for students to apply their knowledge in aerospace related projects. The team is a group of young technocrats spanning various technical departments, who design, fabricate, simulate and fly remote controlled planes. 'Team Pushpak' participated in the SAE Aerodesign East 2013 competition, held at Fort worth, Texas, USA and won laurels. The SAE (Society of Automotive Engineers) Aero Design competition is intended to expose undergraduate and graduate engineering students to real life engineering challenges. The event is closely followed by industry giants like NASA, Lockheed Martin and Boeing. SAE Aero Design features three classes of competition - Regular, Advanced, and Micro classes. Team Pushpak participated in the 'Micro Class Category' which aims at designing an aircraft with highest payload fraction (Payload/(Payload + Empty weight of aircraft)) possible, while simultaneously pursuing the lowest empty weight possible.

Team Pushpak in Lockheed Martin Recreational Area, Fort Worth, Texas



The team stood 8th among all seventy five participating teams from all over the world, while taking 1st position among all Asian teams. They outclassed various other teams with their flying skills, and came up to be the only team with a biplane design. It was a sincere and excellent effort from the entire team and they proved their mettle at an international platform. The standings themselves are an evidence of the level of expertise and knowledge of the team in this field, not only the team members but the huge support from the institute also played a key role in such an excellent performance and that too in the first appearance itself. Moving on to the next level from where they began, this time the team is going to participate in two categories of competitions: 'Micro Class' and 'Advanced Class', where the latter category aims at designing the most efficient aircraft capable of accurately dropping a three pound(3 lb.) humanitarian aid package from a minimum of 100ft. off the ground, making it more interesting and perceptive including the telemetry involved. 'Team Pushpak' has already registered for SAE Aerodesign West 2014 to be held at Fort worth, Texas, USA during 28th – 30th March in both the categories of competitions. This time the team preparation is much fortified and they possess immense confidence in their forthcoming performance. The team has learned a lot from last year's participation and this experience would yield better results this time.

Team Pushpak in Thunderbird Flying Field, Fort Worth, Texas

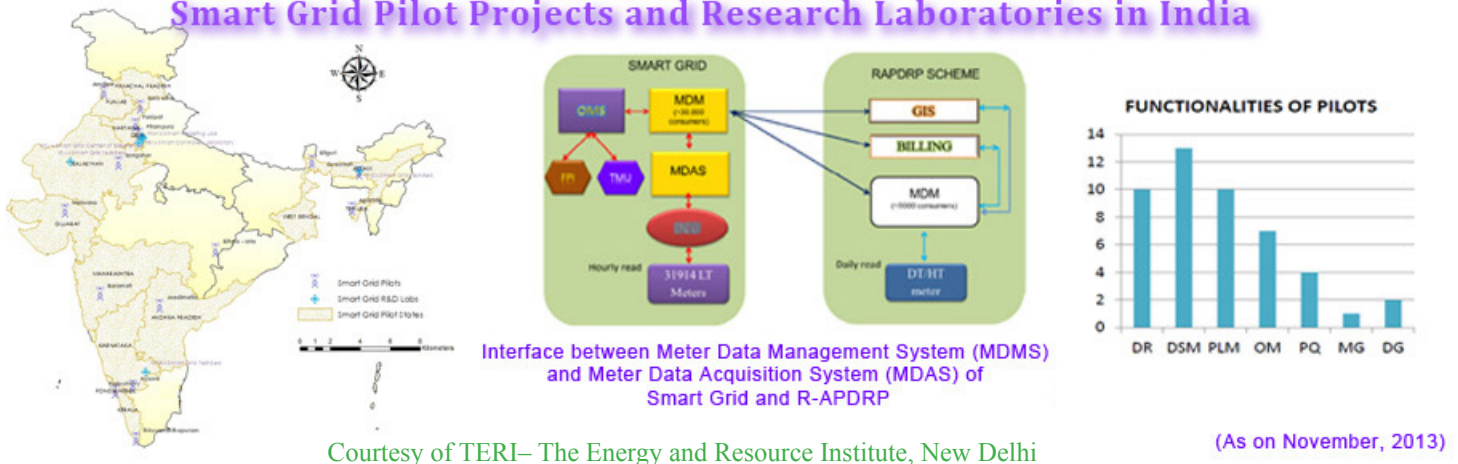


By 'Team Pushpak'
Anurag Kumar, Chirag Jha,
Saurabh Kumar, Uttam Dwiwedi

If you would like to know more, contact the SAE group at saerodesigniitk@gmail.com or visit <http://teampushpak.in/>

Smart Grids: An Indian Perspective

Smart Grid Pilot Projects and Research Laboratories in India



► The Need

An electric grid is a network of transmission lines, sub-stations and transformers that deliver electricity from the power plant to our home. If one power line breaks or if the electricity demand exceeds the supply then blackouts can occur. The July 2012 India blackout was the largest power outage in the history, affecting 620 million people. Our current electric grid was formed 100 years back, when the electricity needs were simple and power generation was restricted to a small area. Most houses had only small energy demands and there was only one way flow of electricity. In the 21st century as the demand rose, it became difficult to meet the requirements. In the past, these problems were solved by building new power plants. But as coal and fossil fuels are used in this process, building new power plants is not a prudent way to meet the demands.

► Concept

A smart grid introduces two way communication and facilitates distributed energy generation, where electricity and information can be exchanged between utility and its consumers intelligently. Smart Grid is not just about utilities and technologies; it is about giving you the information and tools you need to make choices about your energy usage.

“A smart grid introduces two way communication and facilitates distributed energy generation, where electricity and information can be exchanged between utility and its consumers intelligently.”



Courtesy –
The Energy and Resource
Institute, New Delhi

Since renewable energy sources are intermittent in nature it is very difficult to integrate them with the present grid. Communication options available for grid integration include a hybrid mix of technologies, such as fibre optics, copper-wire line, power line communications, and a variety of wireless technologies. This makes it environmentally sustainable.

Smart grids enable efficient transmission of electricity by employing intelligent meters which allow for automated and complex transfer of information between service provider and consumer. They provide utilities with greater information about the extent of consumption.

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Smart Grid

IT- Development

Electric grid

It also allows for quick fault detection and rerouting the power automatically in case of accidents like those during monsoons using appropriate means. A smarter grid will enable:

- 1) An unprecedented level of consumer participation.
- 2) Advanced metering infrastructure.
- 3) Demand response strategies.
- 4) Decentralized production.

► Smart Grid in INDIA

The implementation of Smart Grid is not going to be an easy task as the Indian power sector poses a number of issues such as transmission and distribution losses, power theft, inadequate grid infrastructure and lack of awareness. The 'Power Grid Cooperation of India' jointly with The Govt. Of Pondicherry, is developing a smart grid pilot project at Pondicherry.

According to them it would cost around INR 6.55 billion and is supposed to be completed in three years.

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source: www.smartgrid.gov/the_smart_grid#consumer_engagement

24x7 Dial-a-Rickshaw...



"autowale.in" is an online commuting service started by Mukesh Chandra Jha and Janardhan Prasad, two IIT Kanpur students who were hassled by an errant auto rickshaw driver in Pune on October 24, 2010. The investors of the company include GSF (Global Super Angels Forum) Superangels, a bunch of some very inspiring, experienced and accomplished investors, businessmen and mentors.

Hitching a ride in one of those yellow – green machines just got simpler – just dial for one. No longer you have to stand along the roadsides as the auto driver refuses to take you on a particular route or demands outrageous fares. 'autowale.in' has come to your rescue...



Auto wale uses a unique technique. Over 100 auto rickshaws are attached to the online service. Instead of employing their own fleet, Autowale makes use of the existing autos on the roads. The caller to the hotline has to give details of the pick-up point and destination. The caller's mobile phone will receive a text message, confirming the trip. The online service zeroes in on its subscriber's base and uses the location tracking system to pick the nearest auto rickshaw. Details are texted to the driver, who picks up the commuter.

One of the major concerns of the passengers travelling in an auto is safety. The best thing about this online service is that it uses GSM (Global Satellite Medium) towers to track their vehicles, write algorithms and help in planning travel for both passengers and drivers. This unique technique has helped in minimising traffic congestions and to tackle the problems of empty rides often faced by the drivers on their way after dropping passengers.

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for more information visit: <http://autowale.in/>



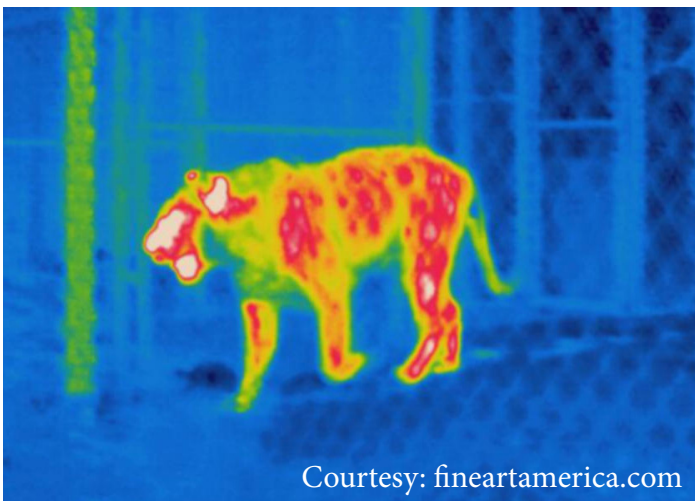
Thermal Imaging: The real ‘sixth sense’ technology — Innovation at its best.

Thermal imaging is where the photographs or videos comprises of heat signatures rather than spectral reflections of light. This means that things that would otherwise be hidden and invisible are completely revealed. Though the idea of thermal imaging is already about fifty years old, its applications had been limited initially to defence due to restrictions based on the costs involved in the technology.

“Why do you need thermal imaging when we have always been able to get by with thermocouples or temperature probes?” This may have made sense when electronic designs were simple and all the components were accessible for contact measurement by temperature probes, but times have changed. This may have also made sense when this technology was far from affordable and its application to the industry was not feasible.

But no more! Apart from just visualization, this technology can provide a temperature profile of the entire surface of the object/scene being observed. Thermal imaging applications extend from microelectronics to scanning wide areas of the earth from space. Airborne systems can also be used to see through smoke at forest fires.

Using this technology, law enforcement can make a judgement call based on more than just your wonky walk.



Courtesy: fineartamerica.com

“ We see that thermal imaging has a potential of serving as a powerful tool almost in every existing field and its numerous applications are limited only by our imagination. Thermal Imaging has emerged as the sixth sense for human activity to ‘see’ what’s out there in ways the human eye can’t. ”

No long can people drive after boozing. Drunk driving is a severe crime.

No more do thermal imaging applications have to be limited to only military and defence. Now thermal imaging finds useful and path breaking applications in industries, electrical lines monitoring, traffic monitoring, forest fire sensing and suppression, surveillance, and multi-spectral earth imaging. And is that all? Hardly!

Thermal imagers can now even pick out drunk people in crowds. Even your best intentions to look sober might not work out anymore. The turncoat here is, as always, your face. Booze causes the blood-vessels in your visage to dilate, and the researchers have used this principle to compare facial scans against a database of tipples-free mug shots. It has been found that when under the influence, the nose gets warmer, while the forehead cools down which is another visual check that the infrared can help identify.

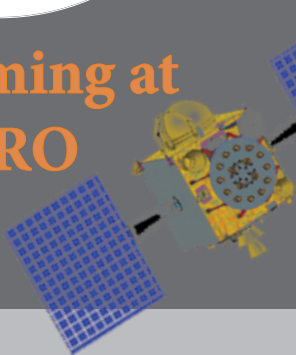


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sources: www.securityinfowatch.com/article/11195430
www.engadget.com/2012/09/05/thermal-cameras-spot-drunk-people/



Upcoming at ISRO



With the successful launch of GSAT-14 on GSLV-D5, ISRO's scientific secretary, V Koteswara Rao, has announced the launch of three satellites this year: IRNSS-1B, IRNSS-1C and IRNSS-1D. Indian Regional Navigation Satellite System (IRNSS) is an independent regional navigation satellite system designed to provide positional information in the Indian region and 1,500 km around the Indian mainland. It is a collection of 7 satellites, to be completed by 2016-17.

In 2017 ISRO may also launch Chandrayaan-II. Interestingly, in 2009, ISRO's Vikram Sarabhai Space Centre in Thiruvananthapuram had given a project to IIT Kanpur's mechanical engineering and electrical engineering departments to build a rover that would be launched along with Chandrayaan-II, but it is yet to be collected. When it does, IITK will have added another feather to its cap!

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*for more information
visit: www.isro.org/satellites/IRNSS-1A.aspx*

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