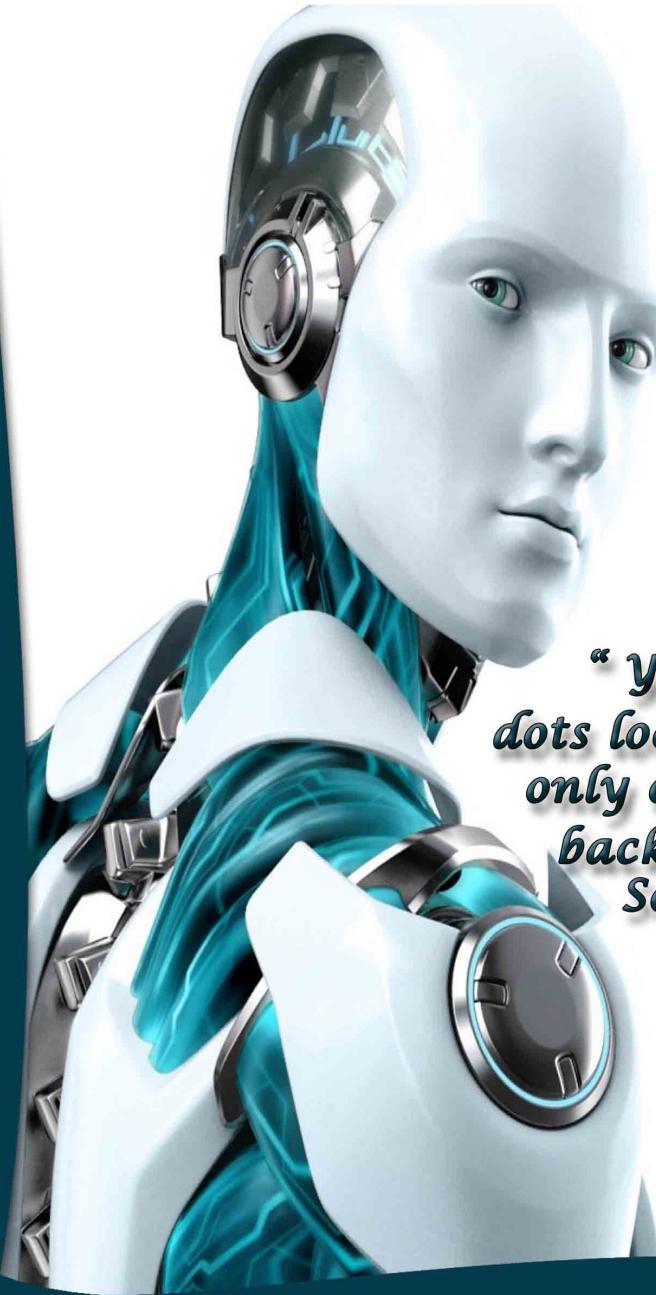


Presents

અન્ધેરાત



“ You can't connect the dots looking forward; you can only connect them looking backwards.

So you have to trust that the dots will somehow connect in your Future.”

– Steve Jobs

ANVESHAN

[DISCOVER, EXPLORE, RESEARCH]

**"EXPLORATION IS THE ENGINE THAT DRIVES INNOVATION.
INNOVATION DRIVES ECONOMIC GROWTH.
SO LET'S ALL GO EXPLORING."**

SPEC

(SOCIETY FOR PROMOTION OF ELECTRONICS CULTURE)

BRINGS YOU 'ANVESHAN' ,

THE COMBINED EFFORT TO BRING TOGETHER
THE PERSPECTIVES , VIEWS AND IDEAS OF
FACULTY, ALUMNI AND STUDENTS OF NITH .
IT'S TIME TO OPEN A NEW CHAPTER IN LIFE
AND TO EXPLORE A LARGER CENTRE.

SPEC'S MOTTO IS TO DISCOVER, EXPLORE,
PROMOTE AND SPREAD THE IDEAS,
TECHNOLOGIES, NEW DEVELOPMENTS IN
TODAY'S TECHNICAL & ELECTRONICS WORLD.

'ANVESHAN' IS A CREATION OF SPEC
TO ENLIGHTEN YOUR MINDS WITH SCIENCE -FICTION FACTS,
NEW DISCOVERIES IN ELECTRONICS WORLD &
FUTURISTIC PROJECTS GOING ON AT THE MOMENT.
EVERY EXPERIENCE IS A FORM OF EXPLORATION,

'ANVESHAN' IS A COLLECTION
OF EXPERIENCES OF STUDENTS,

ALUMNI AND TEACHERS

OF THEIR YEARS OF
EXPLORATION IN ENGINEERING WORLD.

AS YOU TURN AND FINISH THE
GOLDEN PAGES OF 'ANVESHAN',

IT WILL MAKE YOU CONTENDED AND FILL WITH KNOWLEDGE
AS YOU WILL BE EXPLORING THROUGH THE VIEWS OF
INNOVATIVE AND YOUNG MINDS .

SPEC PLEDGES TO RISE UP MORE AND MORE IN THE COMING YEARS ,
WITH THE POTENTIAL, THOUGHTS AND LOVE OF EVERYONE.



**SOCIETY FOR PROMOTION OF
ELECTRONICS CULTURE,
NATIONAL INSTITUTE OF TECHNOLOGY,
HAMIRPUR, HIMACHAL PRADESH (INDIA).**



ANVESHAN

2014-15



VISION STATEMENT

“To build a vibrant multicultural learning environment founded on value based academic principles, wherein all involved shall contribute effectively, efficiently and responsibly to the nation and global community.”



**Er. Desh Raj Rana
Head,
E&CE Department**

MESSAGE

The field of electronics is pivotal in all respects of our lives. A student pursuing electronics and communication engineering should possess good knowledge and equip himself/herself with the latest advancements of this field based on sound fundamentals.

They, not only have to serve this stream but also the nation and furthermore the world in the interest of the society. For this very purpose our department has shown decent growth in recent times. We have fully equipped laboratories to match with the highly qualified staff to impart the required knowledge, as per the new curriculum, to the students especially in fields of VLSI, Communication system and Digital electronics.

Our departmental society, SPEC, has taken an innovative step in spreading the electronics culture among those who are unaware of it. It will introduce its readers with the world of tomorrow and encourage them to contribute in its growth.

I congartulate Team SPEC for successful release of the annual magazine **ANVESHAN**.

**Er. Philemon Daniel
OIC,SPEC
E&CE Department**



Society for Promotion of Electronics Culture (**SPEC**) is a society which should be entirely managed by students. It should flourish like a culture and do a lot of projects. There can be two sets of projects: one, trying out things that students learn in their classroom and the other should be to catch up with the latest technology and trying out something like robotics, computing etc.

For that very purpose, SPEC launching its own e-book is a good innovative step. It will be a source of inspiration for many and would also be a platform to share and to show our departmental activities and growth to the outside world.

So an advice for its readers: keep reading, keep writing, keep yourself updated, look forward to inspiring stuff and the future because it's just the start. Hopefully this will become a good base for the students to learn electronics and get inspiration to do fruitful things.

Final year

Isha Goyal

Rishabh Kumar Gaur

Sachin Sharma

Sumit Pandey

Tapan Sharma

Third year

Ajay Singh

Akanksha Kalia

Aman Bhardwaj

Kumud Jindal

Manish Vishnoi

Srinath Madhu

Vartika Verma

Vishal Rai

Second Year

Abhinandan Jain

Ashima Jindal

Chirag Tyagi

Gian Singh

Mahim Saxena

Poonam Maurya

Pradeep Jangir

Priya Karmakar

Priyasha Parmar

Rohan Gupta

Sayali Mahadik

Srishti marwaha

First Year

Hima Bindu Pallanti

Kartik Pathak

Nitesh Kumar Singh

Pranati Dwivedi

Rajat Thakur

Rittwik Sood

Samya Raghuvanshi

Shaphali Gupta

Shubham Sharma

Shubham Trivedi

V. Ravi Teja

Vivek Kumar Yadav

ANVESHAN

RISHABH KUMAR GAUR

PRESIDENT, SPEC.



SPEC was established in 2008 with the motive of promotion of electronics culture in NIT Hamirpur. Members are doing their best to learn and share the knowledge which makes SPEC a prominent technical society.

Team is dedicated to organize workshops and events to make students aware of the various technical aspects of electronics. SPEC provides a nice platform to apply technical knowledge by providing the required resources.

We are glad to introduce our annual SPEC magazine “**ANVESHAN**” this year with a strong intension to induce interest for electronics in students by making them aware of the latest technical enhancements.

I would like to invite you to join us and help in promoting the electronics culture.

Wish you a Happy Reading..!!

MEET THE TEAM



RISHABH
KUMAR
GAUR



TAPAN
SHARMA



ISHA
GOYAL



SUMIT
PANDEY



SACHIN
SHARMA

The “Dexter of the Team”; A man of skills and vision. He always surprises everyone by his creative ideas and bears the confidence to bear the into Reality.

He is the epitome of patience and sincerity ; believes in “ Simple living and high thinking ” . The one whose actions speak louder than words.

Jolly by nature. Faces the situation with the cheerful attitude. Always ready to extend the helping hand. She is the “Aura” of the team.

Passionate guy who is dedicated to his work. Always prefer to be practical, with deep theoretical knowledge. The one with mind full of vivid ideas.

A skilled animator. The one with decent blend of smart look and ambitious mind. Always engaged in exploring new things.

“I am a member of a Team,
and I rely on the Team,
I defer to it and sacrifice for it,
because the Team, not the individual,
is the ultimate champion.”

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FANNY

THE WORLD's LARGEST ROBOT



Fanny, also known as **Tradinno**, is 51 ft long with a wingspan of 40 ft. Its mechanisms, fuel tank and outer shell weigh 11 tonnes. Designed by Zollner Elektronik AG, **Fanny** is the world's largest robot. The Tradinno project was created to take part in a German folk play.

Looking like a creature straight out of the “**Game of Thrones**” TV series, **Fanny** is a 30-foot high, fire-breathing mechanical dragon that can flap its 40-foot wings and walk on all fours.

Length	50 ft
Width	12 ft
Weight	11 tonnes
Height	14ft
Wingspan	39 ft
Max. Speed	1.8 km/h
Drives	50
Oil	165 litres

Designed by German electronic firm, Zollner Elektronik AG, the creature is powered by four remote controls, a two-litre turbo diesel engine and a series of hydraulic valves.

The beast was created as part of the Tradinno project - a portmanteau of 'tradition' and 'innovation' - set up to build the dragon that features in German folk play Drachenstich.

A VOYAGE TO THE RED PLANET: INDIA CREATES HISTORY

September 24 will go down in history as a red letter day. India successfully placed its spacecraft in orbit around Mars, becoming the first country in the world to succeed in such an inter-planetary mission in the maiden attempt itself. The Mars Obiter Mission (MOM), also called MANGALYAAN is a spacecraft orbiting Mars since 24 September 2014. It was launched on 5 November 2013 by the Indian Space Research Organisation (ISRO). The mission is a "technology demonstrator" project to develop the technologies for various fields.



LAUNCH VEHICLE
PSLV-XL with six extended strap-on motors

MISSION COST : ₹450 crore

LIFTOFF MASS: 1,350 kg

DRY MASS: 500 kg

NUMBER OF PAYLOADS: Five

POWER SYSTEM: Solar array with three panels

ON-BOARD PROPULSION: Bi-propellant system for Mars orbit insertion

SOME FACTS ABOUT MANGALYAAN

- 1.Two weeks before Mangalyaan was launched, NASA sent off its own Mars mission named Maven. Its cost: Over Rs 4,000 crores. India's mars mission, meanwhile, is worth just a fraction of that Rs 450 crores and was executed in just 15 months after the government approved it in August 2012.
- 2.India's Mars mission represents a technological leap for the South Asian nation, pushing it ahead of space rivals China and Japan in the field of interplanetary exploration.
- 3.India now has the distinction of becoming the only country to reach the orbit of Mars in its first attempt. More than half the missions to Mars have failed, either crashing or going off course. China's Mars mission of 2011 was among the failures.
- 4.Mangalyaan will look for methane on Mars' surface. A sensor attached to the spacecraft will look for the gas on Mars. If found, it will confirm that life existed on Mars in the past. Besides, the spaceship will also carry another instrument called Lyman Alpha Photometer to study the components on the planet's atmosphere. Two more instruments will measure the surface components that make up Mars' land mass while a Mars Colour Camera will take images of the planet too.

OBJECTIVES

A.TECHNOLOGICAL OBJECTIVES-

The primary objective of the Mars Obiter Mission is to showcase India's rocket launch systems, space-craft-building and operations capabilities. Specifically, the primary objective is to develop the technologies required for design, planning, management and operations of an interplanetary mission, comprising the following major tasks:

Design and realisation of a Mars obiter with a capability to perform Earth-bound manoeuvres, cruise phase of 300 days, Mars orbit insertion / capture, and on-or-

B.SCIENTIFIC OBJECTIVE

To explore Mars' surface features, morphology, mineralogy and Martian atmosphere using indigenous scientific instruments.

SPECIFICATIONS

Mass: The lift-off mass was 1,350 kg (2,980 lb), including 852 kg (1,878 lb) of propellant.

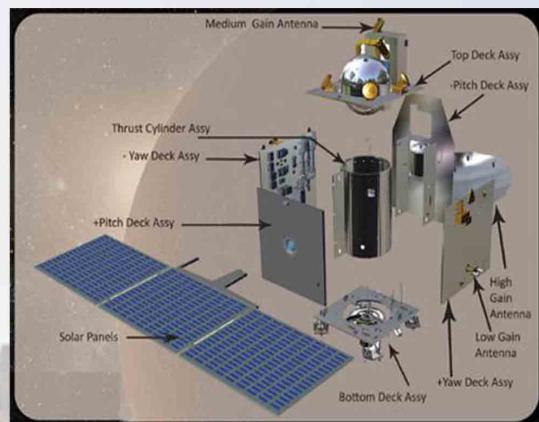
Bus: The spacecraft's bus is a modified I-1 K structure and propulsion hardware configuration, similar to CHANDRAYAAN1, India's lunar obiter that operated from 2008 to 2009, with specific improvements and upgrades needed for a Mars mission.

Power: Electric power is generated by three solar array panels of 1.8 m × 1.4 m (5 ft 11 in × 4 ft 7 in) each (7.56 m² (81.4 sq.ft.) total), for a maximum of 840 watts of power generation in Mars orbit. Electricity is stored in a 36 Ah Li-ion battery.

Communications: Communications are handled by two 230-watt TWTAs and two coherent transponders. The antenna array consists of a low-gain antenna, a medium-gain antenna and a high-gain antenna. The high-gain antenna system is based on a single 2.2-metre (7 ft. 3 in.) reflector illuminated by a feed at S-band. It is used to transmit and receive the telemetry, tracking, commanding and data to and from the Indian Deep Space Network.

Launch:

ISRO's PSLV-XL placed the satellite into Earth orbit at 09:50 UTC on 5 November 2013, with a perigee of 264.1 km (164.1 mi), an apogee of 23,903.6 km (14,853.0 mi), and inclination of 19.20 degrees, with both the antenna and all three sections of the solar panel arrays deployed. During the first three orbit raising operations, ISRO progressively tested the spacecraft systems.



Payload: The 15 kg (33 lb) scientific payload consists of five instruments, viz.,

Lyman-Alpha Photometer (LAP) - A photometer that measures the relative abundance of Deuterium and Hydrogen from Lyman-Alpha emission in the upper atmosphere. Measuring the deuterium/hydrogen ratio will allow an estimation of the amount of water loss to

outer space.

Methane Sensor for Mars (MSM) - will measure Methane in the atmosphere of Mars, if any, and map its sources

Composition Analyser (MENCA) - is a quadrupole mass analyser capable of analysing the neutral composition of particles in the exosphere.

Thermal Infrared Imaging Spectrometer (TIS) -

will measure the temperature and emissivity of the Martian surface, allowing for the mapping of surface composition and mineralogy of Mars.

Mars Colour Camera (MCC) - will provide images in the visual spectrum, providing context for the other instruments.

Propulsion: A liquid fuel engine with a thrust of 440-N is used for orbit raising and insertion into Mars orbit. The orbiter also has eight 22-N thrusters for attitude control. Its propellant mass is 852 kg.

FUTURE MISSIONS OF ISRO

1. The maiden launch of GSLV-MARK III, a recently developed geo-synchronous satellite launch vehicle with indigenous cryogenic engine to launch heavier satellites weighing more than two tonnes and three tonnes into the geo-orbit at 36,000 km above Earth. (Probable Launch - in December 2014)

2. Chandrayaan-2: the second mission to moon in 2016

3. Mars-2 mission: the second mission to Mars with Indigenous Lander and Rover

ONCE UPON A TIME IN ELECTRONICS LAB..

**SHUBHAM SHARMA
FIRST YEAR**

Similar to human beings, electronic components also have feelings of competition and jealousy among themselves. Here are few of them fighting to prove themselves superior than other..



P-N DIODE: I am the base of semiconductor devices. I am made of n and p type semiconductors. I allow current only if you forward bias me. But don't mess with me because I won't conduct if you reverse bias me.

ZENER DIODE: You seem to be very proudy. Huh! That's why you are doped heavily so that I can take birth and let others make use of reverse biasing. I am used as voltage regulator in breakdown region



TRANSISTOR: The only one smart among you all is me. I am used in all most every electronic circuit. People call me common emitter transistor in love. But I can change getups. I can be used in common collector configuration for microphones and amplifiers or you can use me in common base getup for switching circuitary or bilateral operation because I allow current in either direction in this getup.

RESISTOR: Hahaha! You fools! You are of no use without me. I am present in each one of you. Even current needs permission to pass through me. But I am very generous. I allow it to pass but tell it to drop some food for me. My food is voltage.



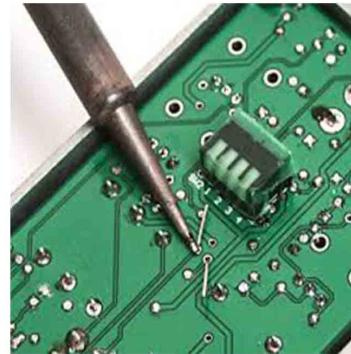
CAPACITOR: It seems you all are flying in sky. Let me tell you that I and only I have been blessed to store charge and release it when required. I have many forms. Few of my types are mica capacitor, electrolytic capacitor, paper capacitor and ceramic capacitor. You can not predict my head(+) and my tail(-). I can invert my head and tail according to the way I am fed with charge.

AND THE STORY CONTINUES..



LED: Hey you all ! Please come out of your dreams. I am the most loved component of electronics. In forward biased diode due to electron and hole recombination, radiations emitted when fall in visible range then I show my magic with colours. I may be red, green, blue or yellow. Shining and glowing in colours I look very beautiful

SOLDERING KIT AND PCB: Shutup you all! Stop fighting among yourself. Each one of you are just waste if we don't assemble you up all together in proper manner on us. Instead of fighting you should work for the purpose you are made. Learn to remain united. Real power lies not in fighting and showing others you weakness but it lies in unity. No circuit would run if any one of you is not properly joint to the other. In that case you would be dumped in dustbin.



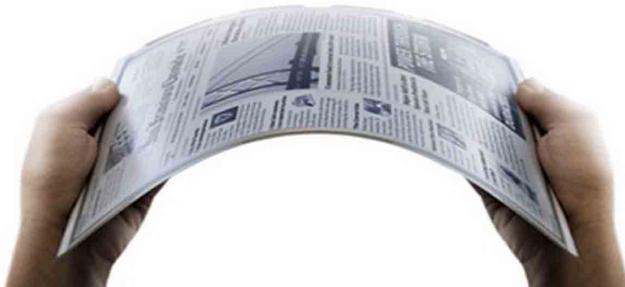
"I hope my message has reached you well and deep. Not only between electronic components but UNITY is strength everywhere."

"FOR THE STRENGTH OF THE PACK IS THE WOLF, AND THE STRENGTH OF THE WOLF IS THE PACK"

**NITESH SINGH
FIRST YEAR**

E-PAPER

The development of the e-paper or the electronic paper started at the end of the '80s. The motivation to create the e-paper was to replace conventional paper printing, but it was also important to maintain the sense of comfort of the printed material. Flexibility and readability were important criteria: the surface of the e-paper need to be readable in strong exterior light without background lighting as well. In addition, the e-paper is



very energy efficient: it only consumes energy, if new texts are uploaded onto it and it doesn't need any additional power supply to keep the already displayed text. The solution of LG could be the first one, which will be commercially available; the series production of the world's first e-paper will start in April, 2012. Although the e-paper cannot be folded as traditional papers, but the new display is so flexible that it

An interaction with Prof. Rajeevan Chandel

Q1. Mam, you have been the HOD of E&CCE for the past few years, and have monitored the work of SPEC too. What are your views about SPEC and how do you find SPEC as a society?

Ans. 1 As head of the department of E&CCE from 2006 to 2009 and again from 2009 to 2014, I have closely monitored SPEC activities. SPEC has always been very active on technical front. I have seen regularly that workshops, quiz and design contests have been a part of its activities. SPEC has its website which is maintained by the students. SPEC encourages E&CCE students to actively participate in all technical activities. It also keeps its doors open for the students of other departments of NIT-H making it a society in true sense.



Q2. Nowadays with a horde of engineers in the country, what do you think makes the students of NIT-H stand out in the crowd?

Ans2. Students of NIT-H always stand out in the crowd of engineers produced by a huge number engineering institutes in the country. It is their hard work; dedication and sincerity which makes them excel in their work. Their zeal to work on various design contests also helps them provide a platform to showcase their talent. Above all, the standing of JEE has been remarkable to get admission in E&CCE branch of NIT-H and speaks about the high ranking of our students. Every year, all the students of E&CCE get placed in the best organizations.

Q3. How do you find student-teacher relationship in our department?

Ans3. Student-teacher relationship in E&CCE department is very friendly and respectful. Students are free to interact with any faculty anytime in the department. They are also free to meet the head of the department with any new academic proposals or their academic issues. In case any student has any problem, instant action is initiated to tackle the same. Students are also encouraged to do extra projects in their courses. These pay students in the long run especially, in the pursuit of higher studies.

Q4. What is your expectation from SPEC in regards of spread of electronics culture?

Ans4. I expect that SPEC to be more focused on their activities. An effort should be made to include expert talks, declamation contests, paper presentations, student seminars and design contests in E&LCE. Today electronics play a sound role in every sphere of engineering. Hence, efforts have to be made to involve students of other departments in the activities of SPEC. Interdisciplinary activities shall make things very meaningful and interesting. The events need to be staggered than make a concentrated effort during the SPEC- FEST.

Q5. What are your views regarding making SPEC entirely a student's society?

Ans.5 SPEC is an entirely a student's society. However, the role of faculty coordinator, head of department, is important to guide, monitor and judge the quality of events. Funding of the events under SPEC is done officially for which the involvement of the department is essential.

Q6. SPEC is launching its own e-book. How do you feel about it?

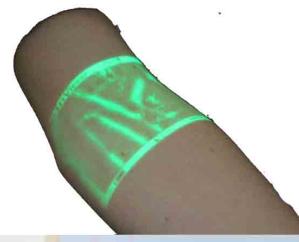
Ans. The initiative of the SPEC to launch an e-book is highly commendable. It should be an annual feature. It shall be an excellent platform for the students of E&LCE to put forth and pen down innovative ideas in the e-book.

Q7. A few words for the readers of our e-book.

Ans.7 I wish all the best to the editorial team of SPEC e-book, It takes lots of efforts to bring out a good and valuable piece of work, I am sure it will be a wonderful experience to see this first issue of SPEC e-book and enjoyable to read it. I wish all the best to all the readers of the SPEC e-book.,

FINDING THE VEINS

KARTIK PATHAK,
FIRST YEAR



If you've ever given blood, you've likely experienced the discomfort of having a nurse struggle to find your vein. And if you're anything like me, you're probably used to someone jabbing at your arm for five minutes before giving up and moving to the other one because your veins are "difficult to find". But don't worry, this device is about to make the process a whole lot less painful.

The technology works by beaming harmless near-infrared light at your arm. Our veins contain a lot of deoxygenated haemoglobin, and because this is absorbed by infrared light, it creates an image of exactly where your veins are under the skin.



Importantly, the device can be used anywhere. It's already used widely in hospitals and pathology clinics around the world to make it easier for patients to have blood taken, but now it's also going to help generous citizens to donate blood.

The Australian Red Cross is the first blood bank service in the world to trial this technology, and has already started using it in its Sydney clinics.

On behalf of everyone out there with hard to find veins: thank you, science.

Find out more about how the technology works in the video below
(scan the QR code for the video) :



Q. Tell us about yourself, your time after college.

I majored in Electronics and Communication Engineering in year 2012 and was associated with SPEC for 3 years during my stint at NIT, Hamirpur. Currently I work for Nagarro Software Pvt. Ltd. as a software developer.

Q. What are the challenges that you face after you left college, challenges that you think industry put on a graduate students?

After college I chose to go in IT domain, so it was a bit challenging as I lacked the basic computer science knowledge. All IT companies will expect you to be at par with another students from Computer Science Engineering background; if you enter this domain. So catching up with them has been one of the challenges that I faced.

Q. How did your experience at college help you find your position after graduation? Was it the coursework, projects or perhaps an internship that made the difference?

Involvement with SPEC was one of the major assets that helped me shape my career and over-all personality. Active participation in college level coding competitions helped me maintain my programming proficiency. Being the secretary of web-development team also helped me to keep up with the technological advancements in IT domain.

Q. What do you think of career services that were available to you and are now to us?

Our college has a remarkable infra-structure which is a great asset when it comes to organizing recruitment drives for various companies. Interviewers visiting our campus love the scenic beauty and nearby tourist places. I think, active involvement of teachers in the organization of recruitment drives can really help to improve the placement scenario of our college. Teachers are well connected with the college Alumni and they can help arrange on-campus and off-campus recruitment drives for college students. At our time, there was very little or no involvement from teacher's side in organizing recruitment drives, I am not sure if it is the same scenario now.

Q. What do you think is preferable after graduation, job or higher studies?

The only thing that matters is that you should know what you are doing and what you want to do in future.

If you are not sure about it, then there is no point in going for higher studies and it will be better if you spend some more time to further explore your interests..try out jobs in different fields and when you find the field of your choice then go for higher studies.

Q. What else should we do apart from studies? What else should we learn?

I feel until and unless you burn your first electronic component – be it a LED or a microcontroller – you won't start learning electronics. So, if you ask me what to do apart from studies, I would suggest go blow some fuses and burn some circuits daily ;)

College provides you the necessary platform to explore your interests and develop your individual personality. So apart from studies you should also try to enthusiastically take part in various extracurricular activities in college. College clubs are a great place to find like-minded people and it is often a great learning experience to work with them.

Q. Any suggestions for juniors?

Whatever you do, do it with passion and enthusiasm. It's better to ace just 10 subjects of your interest during under-graduation rather than having average performance at all 40-50 of them. Studies are more fun if you can incorporate practical/project work with theory. Simulations are the easiest way to play with and test theories but don't limit yourself to simulations, a live hardware if even more fun :D



ALUMNI TALK ASHISH JINDAL [2008-2012]

CMOS DIGITAL LIGHT SENSOR

SAHIL RAMOLA, FIRST YEAR

A CMOS SENSOR is a type of image sensor inside a digital camera consisting of an integrated circuit that records an image. CMOS uses a slightly different technology from CCD, another type of image sensor found in digital cameras. CMOS is becoming the more popular type of technology because of its low power consumption and speed.

The complementary metal-oxide semiconductor (CMOS) sensor consists of millions of pixel sensors, each of which includes a photodetector. As light enters the camera through the lens, it strikes the CMOS sensor, which causes each photodetector to accumulate an electric charge based on the amount of light that strikes it. The digital camera then converts the charge to pixels that make up the photo.

ADVANTAGES:

1. CMOS sensor reduces the BLOOMING EFFECT

CMOS Sensor reduces the blooming effect as it means that the illuminated Bright Spot are Clearly visible as in CMOS it allows the overflowing charge to flow away without affecting surrounding pixels.

2. CMOS sensors provide better light inhibition

A CMOS sensor's light inhibition function will make objects more visible, and eliminate much of the smear and blooming effects inherent with CCD sensors.

3. CMOS Sensor Reduces Exposure time

CMOS sensor reduces exposure time making outstanding visual effects of the final image beyond its luminosity. Slower shutter speed makes a movement in a still photograph of a moving subject

4. CMOS reduces Power Consumption

CMOS (Complementary Metal Oxide Semiconductor) chips use a Field Effect Transistor (FET) to control the flow of current.

In the FET chip, the VOLTAGE on the Control pin determines how much current flows through the transistor, but the control pin itself takes almost NO current to operate. Therefore, CMOS chips DO NOT need biasing.

DISADVANTAGES :

The drawback to CMOS sensors when used in cameras is that they tend to create photographs with a lot of image noise when used in lower light situations. Due to poor fill factor of CMOS, photosensitivity of CMOS sensors is poor in low light conditions.

3 D PRINTING

VIVEK YADAV.
FIRST YEAR

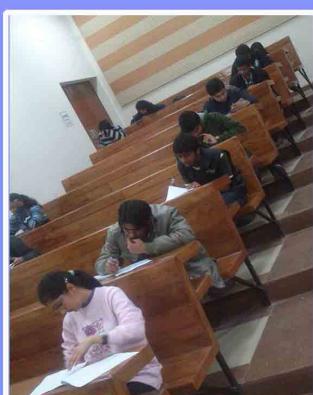
3D printing is a form of additive manufacturing technology where a three dimensional object is created by laying down successive layers of material. It is also known as rapid prototyping, is a mechanized method whereby 3D objects are quickly made on a reasonably sized machine connected to a computer containing blueprints for the object. The 3D printing concept of custom manufacturing is exciting to nearly everyone. This revolutionary method for creating 3D models with the use of inkjet technology saves time and cost by eliminating the need to design; print and glue together separate model parts. Now, you can create a complete model in a single process using 3D printing. The basic principles include materials cartridges, flexibility of output, and translation of code into a visible pattern.

APPLICATIONS AND POTENTIALS OF 3D PRINTING :

1. Product formation is currently the main use of 3D printing technology. These machines allow designers and engineers to test out ideas for dimensional products cheaply before committing to expensive tooling and manufacturing processes.
2. In Medical Field, Surgeons are using 3d printing machines to print body parts for reference before complex surgeries. Other machines are used to construct bone grafts for patients who have suffered traumatic injuries. Looking further in the future, research is underway as scientists are working on creating replacement organs.
3. Architects need to create mockups of their designs. 3D printing allows them to come up with these mockups in a short period of time and with a higher degree of accuracy.



SPEC GALLERY



FEEDBACK

The pre-nimbus workshop organised by SPEC on Arduino and Processing helped me in developing a processing based game named “Double Trouble” & won second prize in a game development competition during Nimbus.

Overall the workshop was a wonderful, interactive learning experience.

Vijay Kumar

Third year

I attended the two days workshop by Atech & organised by Team SPEC. It was a detailed and a nice workshop which covered all the basics of embedded systems coding & interfacing.

Parul Thakur

Third year

One of my best workshops ever at NIT-H. The way SPECians taught us about ‘Processing’ is a matter of applause. The deep knowledge and strong concepts were crystal clear from their confidence, and influenced me like I am practising it yet.

Avneesh Kumar Gupta

Second year

The consistency of the sessions and simplicity in teaching were the features of the MATLAB workshop that made it a successful activity by team SPEC.

The understanding of basics is helpful for further exploration of MATLAB. Waiting for more workshops.

Gunika

Second year

Team SPEC conducted the PROTEUS workshop in a systematic and well-mannered way. It was like a platform to enrich our knowledge. The presentation was quite good and expressive. It was a perfect combo of 2 orators.

Avani Barmecha

First year

Team SPEC conducted the PROTEUS workshop in an organised way. A lot of interaction in between seniors and juniors; which was a great opportunity to express ourselves. Overall, it was an awesome experience & I am eagerly waiting for the next workshop.

Rohit Panjla

First Year

My 1st workshop at NIT-H was well executed. By following the commands, I became comfortable with ‘Proteus’. The way of presenting the software to the beginners couldn’t have been much better.

Vishal Sadwal

First Year

5G:THE FUTURE COMMUNICATION TECHNOLOGY

RITTIWIK SOOD
FIRST YEAR



The global race is on to develop 5G, the fifth generation of mobile network. While 5G will follow in the footsteps of 4G and 3G, this time scientists are more excited. They say 5G will be different - very different.

If you're thinking, "Great, that's the end of my apps stalling, video faltering, and that everlasting load sign," then you are right - but that's only part of the story. "5G will be a dramatic overhaul and harmonisation of the radio spectrum,"

That means the opportunity for properly connected smart cities, remote surgery, driverless cars and the "internet of things".



TRANSMISSION OF DATA: Data is transmitted via radio waves. Radio waves are split up into bands - or ranges - of different frequencies. Each band is reserved for a different type of communication - such as aeronautical and maritime navigation signals, television broadcasts and mobile data. The use of these frequency bands is regulated by the International Telecommunications Union (ITU).

Currently, the radio frequency spectrum is a bit of a mess. As new technologies have been developed, frequencies for them to use have been squeezed into its gaps.

This has caused problems with connection speeds and reliability.

So, to pave the way for 5G the ITU is comprehensively restructuring the parts of the radio network used to transmit data, while allowing pre-existing communications, including 4G and 3G, to continue functioning.

When Samsung announced in 2013 it was testing 5G at 1Gbps, journalists excitedly reported that a high-definition movie could be downloaded in less than half a minute.

Mobile communications: from 1G to 5G



APPLICATION AND FUTURE OF 5G

100 Times faster-scientists believes that it is possible to run a wireless data connection at an astounding 800Gbps - that's 100 times faster than current 5G testing.

Internet of things-The huge rise in connected devices will be due to a boom in inanimate objects using the 5G network - known as the internet of things. It won't be just products like remotely controlling your heating or that mythical fridge ordering you more milk, trains could tell you which seats are free while they are in the station. **By 2020**-The aim is for the first of the frequency bands to come into use around the year 2020, with the other two to follow soon after.

COMMUNICATION IN COMMERCIAL AIRPLANES

V. RAVI TEJA
FIRST YEAR

Efficient communication between the pilot and ground staff is the key factor towards safe flying of aircraft. How is commercial flight communication done and what systems are used?



Every piece of information plays a crucial role in aviation industry. Identified as the aircraft radio communication system, the airplane communication scheme links the pilots in the planes to the control tower on the ground for the smooth flow of flights. The system utilizes a communication network known as air-band or Very High Frequency (VHF) supporting radio navigation.

Entire aviation radio communication is carried out on the aircraft-band of frequencies that ranges from 118.000 MHz to 135.975 MHz (megahertz). The radio operates on simplex system which allows only one person to talk each time. After this, the user releases the button and the listener waits till the transmitting is done and then replies in the same way. If in case, both speak at the same time, the signal gets blocked and no information is transferred. During emergency, international distress frequency of 121.5 or 243 MHz is utilized to transmit information for immediate attention. Some radio conversations are also recorded for future reference for pilots. Towered airports provide Automated Terminal Information Service (ATIS) with up-to-date information. Weather reports by computer can be received at most of the towered as well as un-towered airports through radio or telephone. This is how commercial flight communication is done.

CYBORG INSECTS HOME IN ON SOUNDS OF DISTRESS

RAJAT THAKUR
FIRST YEAR

Cyborg Cockroaches may be the search-and-rescue teams of the future. The enhanced roaches can pinpoint the source of a noise using electric pulses delivered to their antennae, and then crawl towards it.

The insects are the work of Alper Bozkurt and his team at North Carolina State University in Raleigh. They have built two types of audio-sensing “backpacks” that can be strapped on to Madagascar hissing cockroaches.

One has a single high-resolution microphone that can identify sound sources fairly accurately. The other has a three-microphone array that gets a precise fix on the source using the amplitude information from each microphone.

Using a computer to integrate the data from a network of 10 to 15 insects, the cockroaches are then guided towards the sound source via automated electric pulses to their antennae. The nerve stimulation causes the insects to turn left or right, essentially by simulating contact with obstacles in front of them. Bozkurt presented the work at a conference in Spain last week.

Hacking cockroaches like this is nothing new. Bozkurt and his group have been working with them for the past five years, and last year a Kickstarter project made “RoboRoaches” commercially available for the very first time. But Bozkurt’s newest project moves the field into more practical applications. His team hopes the cyborg cockroaches may be used to find disaster victims, for example people buried under rubble in the aftermath of an earthquake.



Alper Bozkurt holding his cyborg insect

“Cockroaches as a platform are certainly better in terms of performance than anything we are currently able to build, and that will remain true for many years,” says Shai Revzen at the University of Michigan in Ann Arbor. “But one of the problems with these approaches is that they work well in the lab, where there are no distractions, but are much more tricky to apply reliably in real-world environments.”

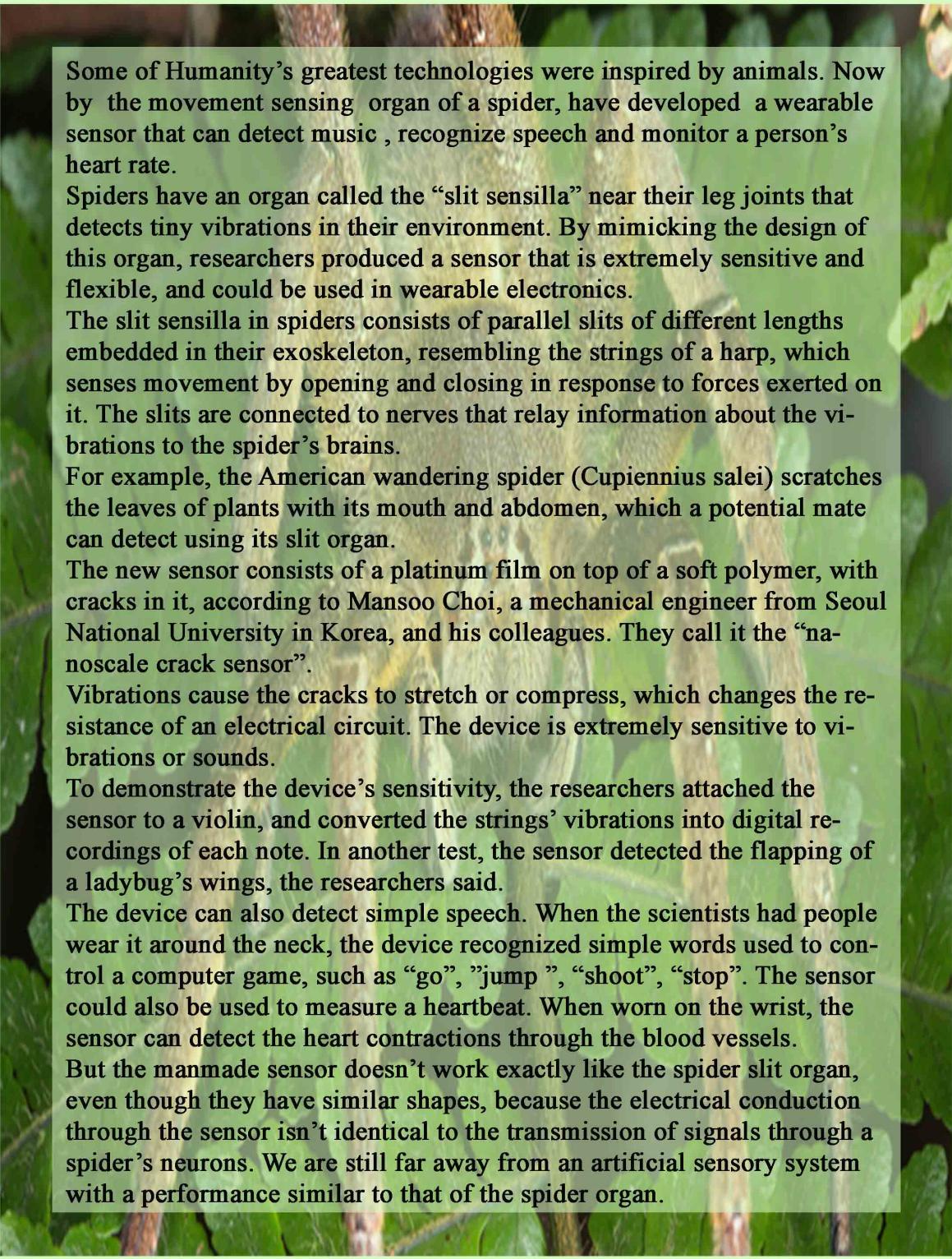
That’s why the next stage of Bozkurt’s research is to take the insects out of the lab – though not to a terrain as complex as a dense pile of rubble, as yet. Once the lab phase is complete, his team plans to use cyborg roaches equipped with geiger counters to search for leaks in nuclear power plants.

“There are a number of applications where we can get insect-bot sensors out into the field to collect useful information,” says Bozkurt. “But in the next five or six years, we think this project will be ready to be fully deployed under the rubble.”

'SPIDER'

AN INSPIRED SENSOR DETECTS VIBRATIONS AND SPEECH

HIMABINDU PALLANTI, FIRST YEAR



Some of Humanity's greatest technologies were inspired by animals. Now by the movement sensing organ of a spider, have developed a wearable sensor that can detect music , recognize speech and monitor a person's heart rate.

Spiders have an organ called the "slit sensilla" near their leg joints that detects tiny vibrations in their environment. By mimicking the design of this organ, researchers produced a sensor that is extremely sensitive and flexible, and could be used in wearable electronics.

The slit sensilla in spiders consists of parallel slits of different lengths embedded in their exoskeleton, resembling the strings of a harp, which senses movement by opening and closing in response to forces exerted on it. The slits are connected to nerves that relay information about the vibrations to the spider's brains.

For example, the American wandering spider (*Cupiennius salei*) scratches the leaves of plants with its mouth and abdomen, which a potential mate can detect using its slit organ.

The new sensor consists of a platinum film on top of a soft polymer, with cracks in it, according to Mansoo Choi, a mechanical engineer from Seoul National University in Korea, and his colleagues. They call it the "nanoscale crack sensor".

Vibrations cause the cracks to stretch or compress, which changes the resistance of an electrical circuit. The device is extremely sensitive to vibrations or sounds.

To demonstrate the device's sensitivity, the researchers attached the sensor to a violin, and converted the strings' vibrations into digital recordings of each note. In another test, the sensor detected the flapping of a ladybug's wings, the researchers said.

The device can also detect simple speech. When the scientists had people wear it around the neck, the device recognized simple words used to control a computer game, such as "go", "jump", "shoot", "stop". The sensor could also be used to measure a heartbeat. When worn on the wrist, the sensor can detect the heart contractions through the blood vessels.

But the manmade sensor doesn't work exactly like the spider slit organ, even though they have similar shapes, because the electrical conduction through the sensor isn't identical to the transmission of signals through a spider's neurons. We are still far away from an artificial sensory system with a performance similar to that of the spider organ.

Q. Tell us about your GSOC internship.

A. ‘Google summer of codes’ is a competition organized by GOOGLE in summer so that student utilize their valuable time in some valuable work. I came to know about it in 2nd year but was late in submitting application. So I tried again in third year. This time I started preparing one month before the date of submitting applications. I wanted to do something related to “image viewing”. Initially I participated with KDE, which is an open source organization but then I moved to with GNOM. Then I chose a developer and started working hard for it. Developers are very helpful. We were three in the same group, one-an NIT Durgapur student and other- a student from Romania. It took around a week for me to submit the application for my project.

Q. Do you think an awareness program about internship should be conducted in the college?

A. Yes, I think so. That is because it keeps you informed about the competitions going on across the globe. Our college is lagging much behind in this sector unlike IITs.

Q. What are the sources available that would help students in their preparations for GSOC?

A. Sites like codechef.com, topcoder.com, codeforces.com, usaco.org-a learning site that conducts quizzes and problems from simpler to a higher level.

Q. What was the project you worked on?

A. My project was to develop an educational game “MARVEL”. It is a virtual globe like GOOGLE EARTH. I rendered a political map on the virtual globe by placing the coordinates of every country with their latitude and longitude in degrees and setting their boundaries. It was a sort of a quiz where the flag of any country would be displayed and the user had to guess its name or he had to click on a country’s map whose flag was displayed there.



“Working on ‘Real World’ projects employs designing ; its performance measure ; memory space and extension by adding new features which are not taken care of on small projects.”

ABHINAV GANGWAR

Q. What are your future plans?

A. I am interested in research work, so I am planning to join R&D department in some MNCs. I will go for further studies after doing job for some time. There is a company named BUILTROOT which work on microcontrollers. I am Interested in going there.

Q. Any feedback for team SPEC?

A. The team should run an awareness program on internship. Other than that you are doing a good job. I wish you all the best.



"The IRDE lab only prefers students from IITs/NITs for internship programs."

SHILPA RANA

Q. What are your future plans?

A. I would like to go for higher studies. I have a few ideas in my mind which I would like to explore more.

Q. Tell us something about the lab.

A. Well, the lab was quite good actually. It was a recognized lab with tight security. And the most amazing thing was that the scientists working there were friendly so that I didn't feel hesitant while working with them. The lab also had libraries which was a major advantage as well.

Q. What was your project?

A. My project was coding of Organic-LED screen of thermal imaging camera. I worked under the guidance of Dr.Neela Kanpal. It was based on detection of an object by the heat produced by it. Organic material is used for the screen on which thermal image is seen. This all can be accomplished through proper coding. For the coding, we used 8051 micro-controller with I2C interface. We used it to adjust the brightness, contrast and size of the image.

Q. What were the challenges you faced in your project?

A. I had studied (I)²C interfacing at theoretical level but when it came to application part, I struggled with it. Thus it was difficult to actually work with it during the implementation part.

Q. What made you chose DRDO as a potential internship?

A. I had heard of Defence Research & Development Organisation (DRDO) and many of its branches all over India. One of them is Instruments Research and Development Establishment (IRDE) Lab, Dehradun. I applied for it and got selected.
The IRDE lab only prefers students from IITs/NITs for internship programs.

Q. Any feedback for team SPEC you have?

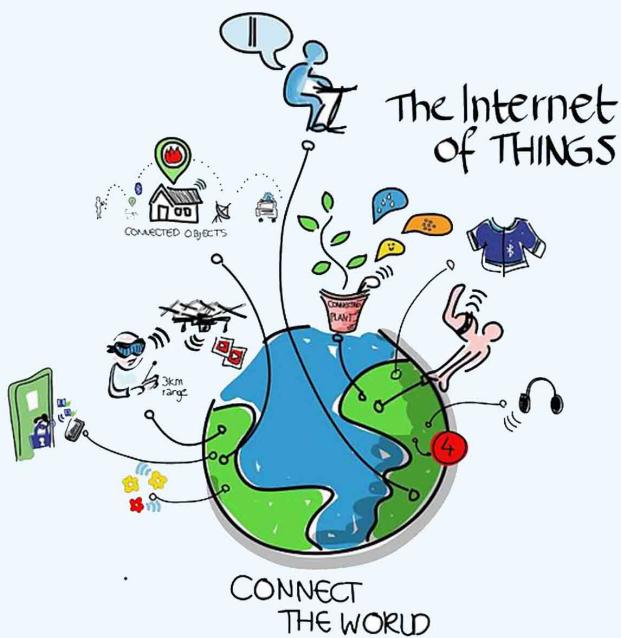
A. Well SPEC is doing good job. It interacts with the freshers and makes them aware about the various happenings of the college. I would like them to encourage the freshers to apply their theoretical knowledge to practical applications.

Q. How was your daily life during the internship?

A. It was busy. It was an almost two month training program. I got a room as a paying guest in the market place nearby the lab. I had to go to an NGO mess for taking my meals. It was a new experience and I enjoyed it.

INTERNET OF THINGS

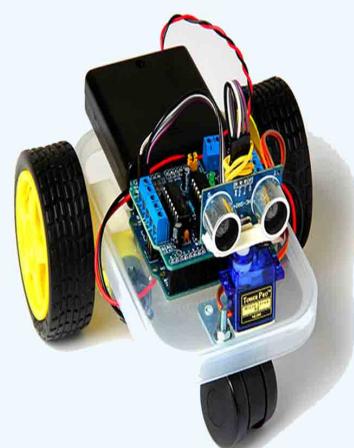
The Internet of Things (IoT) is a term first coined by Keven Ashton back in 2009, referring to a future world where all types of electronic devices link to each other via the Internet. This includes everything from cell phones, coffee makers, washing machines, headphones, lamps, wearable devices and almost anything else you can think of. According to Gartner, there will be nearly 26 billion devices on the Internet of Things by 2020. As of 2014 the vision of the Internet of Things has evolved due to a convergence of multiple technologies, ranging from wireless communication to the Internet and from embedded systems to micro-electromechanical systems (MEMS). This means that traditional fields of embedded systems, wireless sensor networks, control systems, automation (including home and building automation), and others, all have contributions to enable the Internet of Things (IoT).



The aim of this technology is to develop a highly interconnected world, where every object in our surrounding will be connected to each other. The object can be anything, it can be your toothbrush, books, switchboard, cloths, refrigerator, tube light, music system or your car. Integration with the Internet implies that devices will utilize an IP address as a unique identifier. However, due to the limited address space of IPv4 (which allows for 4.3 billion unique addresses), objects in the IoT will have to use IPv6 to accommodate the extremely large address space required. Objects in the IoT will not only be devices with sensory capabilities, but also provide actuation capabilities (e.g., bulbs or locks controlled over the Internet). To a large extent, the future of the Internet of Things will not be possible without the support of IPv6; and consequently the global adoption of IPv6 in the coming years will be critical for the successful development.



The basic idea behind this technology is that every machine must be able to communicate to other machine or device connected to the network. Diverse applications call for different deployment scenarios and requirement, which have usually been handled in a proprietary implementation. However, since the IoT is connected to the Internet, most of the devices comprising IoT services will need to operate utilizing standard-



Smart houses : We will be able to control every device present in our house by our smartphone even from faraway places. Suppose you left your house for office leaving washing machine, tube light or any other gadget switched on and on your way you came to know that you have left your gadget switched on instead of coming back to home we can switch it off using our smartphone.

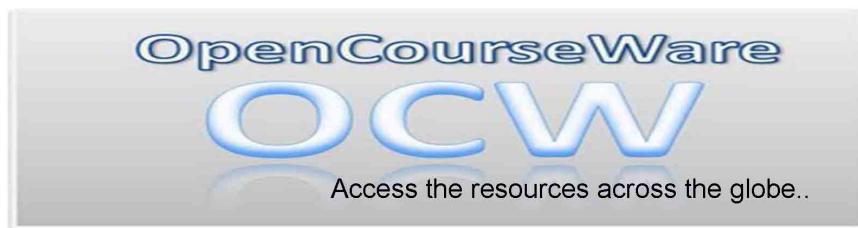
Health and these gadgets will be able to guide us that what precautions must be taken and whether we need to visit a doctor or not. For example if our Smart toothbrush would be able to detect the germs present in our mouth then we will be able to track the level of germs from the data generated and we could take necessary precau-



Searching location of any object-
If an object goes missing in the room then it is very time consuming and frustrating job to search it everywhere in the room. Here internet of things can help us, if every object present in our room is connected to a network then we can easily locate them on our smartphone. This will save a lot of time.

The demand is growing to make industries accountable for their products. In future using internet of things we will easily come to know who is the manufacturer of the product and from which shop it has been bought, so that it become easy to track the path of the product and it will also be easy to find out whether the product is original or not.

If every vehicle present on the road is connected to each other, then the vehicles can automatically apply breaks when approaching to any other vehicle on a turn, this can save life on sudden turn where the driver is unable to view another vehicle coming on the same turn. If both vehicle can locate each other and decrease the speed or apply breaks then they will avoid the accident .



OPEN EDUCATION compasses resources, tools and practices that employ a framework of open sharing to improve educational access and effectiveness worldwide. Open Education combines the traditions of knowledge sharing and creation with 21st century technology to create a vast pool of openly shared educational resources, while harnessing today's collaborative spirit to develop educational approaches that are more responsive to learner's needs. The idea of free and open sharing in education is not new. In fact, sharing is probably the most basic characteristic of education: education is sharing knowledge, insights and information with others, upon which new knowledge, skills, ideas and understanding can be built. Open Education seeks to scale educational opportunities by taking advantage of the power of the internet, allowing rapid and essentially free dissemination, and enabling people around the world to access knowledge, connect and collaborate.

IMPORTANCE OF OCW

Education is an essential tool for individuals and society to solve the challenges of the present and seize the opportunities of the future. However, the current provision of education is limited by institutions' educational capacity consequently; this resource is available to the few, not the many. By providing free and open access to education and knowledge, people can fulfill this desire. Students can get additional information, viewpoints and materials to help them succeed. Workers can learn something that will help them on the job. Faculty can exchange material and draw on resources from all around the world. Researchers can share data and develop new networks. People can connect with others they wouldn't otherwise meet to share information and ideas. Materials can be translated, mixed together, broken apart and openly shared again, increasing access and allowing new approaches.

This article intents to aware the readers about some online platforms that provide open course wares as mentioned further-

- 1. UDEMY** is a platform for online learning which unlike academic MOOC programs driven by traditional collegiate coursework, provides a platform for experts of any kind to create courses which can be offered to the public, either at no charge or for a tuition fee. Though no Udemy courses are currently credentialled for college credit; its students take courses largely as a means of improving job-related skills.
Website- <http://www.udemy.com>

2. EdX is a massive open online course (MOOC) provider online learning platform. It is a nonprofit and hosts online university-level courses in a wide range of disciplines to a worldwide audience, some at no charge. It also conducts research into learning based on how people use its platform. EdX was founded by the Massachusetts Institute of Technology and Harvard University in 2012.

Website- www.edx.org

3. Coursera was founded by science professors from Stanford University that offers massive open online courses (MOOCs). Coursera works with universities to make some of their courses available online, and offers courses in physics, engineering, humanities, medicine, biology, social sciences, mathematics, business, computer science, and other subjects. Coursera has an official mobile app for iOS and Android.

Website- www.coursera.org

4. Udacity is a for-profit educational organization offering massive open online courses. It now focuses more on vocational courses for professionals. Each course consists of several units comprising video lectures with closed captioning, in conjunction with integrated quizzes to help students understand concepts and reinforce ideas, as well as follow-up homework which promote a "learn by doing" model.

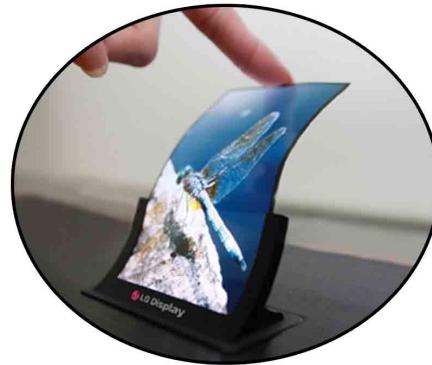
Website- www.udacity.com

5. The National Programme on Technology Enhanced Learning (NPTEL) is a joint initiative by various Indian Institutes of Technology (IITs) and Indian Institute of Science (IISc) funded by HRD ministry of government of India .The mission of NPTEL is to enhance the quality of engineering education in the country by providing free online courseware. It provides E-learning through web and video courses in engineering, science and humanities streams.

Website- www.nptel.ac.in

ORGANIC LIGHT EMITTING DIODES

MAHIM SAXENA
SECOND YEAR



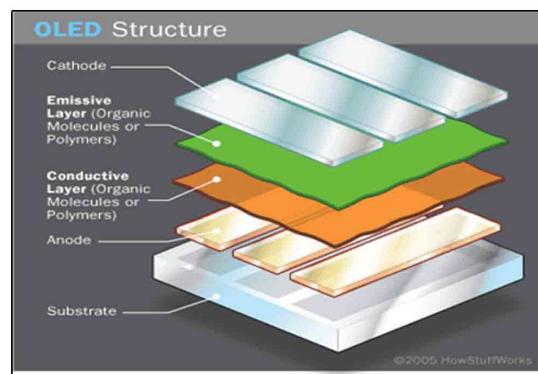
An organic light-emitting diode (OLED) is a light-emitting diode (LED) in which the emissive electroluminescent layer is a film of organic compound which emits light in response to an electric current. This layer of organic semiconductor is situated between two electrodes; typically, at least one of these electrodes is transparent layers; with a total thickness of about 1000 Å. The organic layers consist of a hole transporting layer, an emissive layer containing a dopant and a host material, and an electron transporting layer. When a potential is applied, the injected positive and negative charges recombine in the emissive layer to produce light.

OLEDs are used to create digital displays in devices such as television screens, computer monitors, portable systems such as mobile phones, handheld game consoles and Personal Digital Assistants.

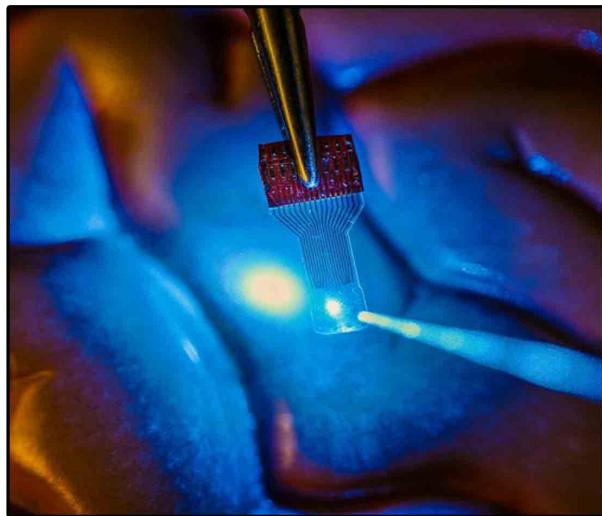
There are two main families of OLED: those based on small molecules and those employing polymers. Adding mobile ions to an OLED cre-

OLEDs over LCDs:-

- OLEDs can be printed onto any suitable substrate by an inkjet printer or even by screen printing, theoretically making them cheaper to produce than LCD or plasma displays.
- OLEDs can enable a greater artificial contrast ratio (both dynamic range and static, measured in purely dark conditions) and a wider viewing angle compared to LCDs because OLED pixels emit light directly.
- LCDs filter the light emitted from a backlight, allowing a small fraction of light through. So, they cannot show true black. However, an inactive OLED element does not produce light or consume power, thus allowing true blacks. Dismissing the backlight also makes OLEDs lighter because some substrates are not needed.
- OLEDs also can have a faster response time than standard LCD screens. Whereas LCD displays are capable of between 1 and 16 ms response time offering a refresh rate of 60 to 480 Hz, an OLED theoretically can have a response time less than 0.01 ms, enabling a refresh rate up to 100,000 Hz.



SEE-THROUGH SENSORS



A blue light shines through a clear implantable medical sensor onto a brain model. See-through sensors, which have been developed by a team of UW-Madison engineers, should help neural researchers better view brain activity.

**ABHINANDAN JAIN
SECOND YEAR**

See-through sensors open new window into the brain

Developing invisible implantable medical sensor arrays, a team of overcome a major technological hurdle in researchers' efforts to understand the brain. The technology has applications in fields ranging from neuroscience to cardiac care and even contact lenses.

Neural researchers study, monitor or stimulate the brain using imaging

techniques in conjunction with implantable sensors that allow them to continuously capture and associate fleeting brain signals with the brain activity they can see.

However, it's difficult to see brain activity when there are sensors blocking the view. An implant device that doesn't interfere with any of the traditional imaging diagnostics was sought after. A traditional implant looks like a square of dots, and we can't see anything under it. The need was to make a transparent electronic device.

The researchers chose graphene, a material gaining wider use in everything from solar cells to electronics, because of its versatility and biocompatibility. Sensors can be made incredibly flexible and transparent because the electronic circuit elements are only 4 atoms thick -- an astounding thinness made possible by graphene's excellent conductive properties.

Applications:-

The transparent sensors could be a boon to neuromodulation therapies, which physicians increasingly are using to control symptoms, restore function, and relieve pain in patients with diseases or disorders such as hypertension, epilepsy, Parkinson's disease, or others.

Currently, researchers are limited in their ability to directly observe how the body generates electrical signals and how it reacts to externally generated electrical signals.

Q. What was the pre-requisite knowledge that helped you in project during internship?

A. The foremost requirement was knowledge of C-language.

I had a decent command on it. Though I soon realised that it was not enough. I had to program codes on Python. The good thing was that the knowledge of C-language provided me a head start with it.

Q. What was the project that you worked on?

A. There were several departments at IIRS out of which I was allotted the Geo Informatics Department. I worked under the guidance of my mentor-Prof. Asfa Siddiqui -who was very kind and helpful. She gave me a list of her ongoing projects and asked me to choose one from which I chose Statistical Modelling of Malaria and Dengue in Dehradun. I was provided with the survey of 2012 and 2013, based on which I had to prepare a forecasting model that would predict the occurrence of these diseases in that area so as to take the required preventive measures.

Q. Which organization did you choose for your internship?

A. I got to know about the summer training at Indian Institute of Remote Sensing-the Dehradun division of ISRO in December during my 3rd year. I applied for it along with 50 of my batch mates. In April I got the confirmation letter of my selection. At first one may think of IIRS to be for civil engineers, but IIRS tends to give preference to ECE students. It was a month and a half summer training program



"I think the students have to be self-aware more than anything else. They should search what's best for them. . But ultimately it is the determination of the students which would lead to their success."

SUMIT PANDEY

Q. What were the challenges you faced during the internship?

A. Firstly, we had to look for accommodation as the institute provided none. As far as the project is concerned, the data provided was highly disorganized as you would expect of any government surveys. Arranging it on the basis of different categories like age and gender of patients, the different regions of survey, and even the atmospheric conditions like rainfall, humidity and temperature which led to the diseases. Presentation of information using various charts and visuals was another big challenge. By that time I started working with Mr. Praveen Kumar of Urban and Regional Studies Department under the guidance of Prof. K. Shiva Reddy. We both worked on Python language for visual representation of the processed information after which we moved to the R-language. There was a regular evaluation of our project work and we both worked together to meet the deadlines.

Q. Tell us about the project you worked on, in IIT Roorkee?

A. My project was Compact Modelling of Nanowire MOS devices using Verilog-A. Verilog-A is a language for defining analog models in which module is created to specify the behaviour by incorporating the mathematical relationship between current and voltage terminals of module. In present scenario, to extend the scalability of devices, we are heading towards Multi-gate devices. These are new devices and their modelling is quite challenging. My project was based on compact modelling approach for surrounding gate MOSFET using Verilog-A. Compact modelling is a powerful tool in engineering which provides guidelines to minimize time and cost in design process. By designing a compact model for a device, we can study its behaviour with accuracy and computational efficiency for a circuit. I worked under the guidance of Dr.Sanjeev Manhas and a Ph.D scholar Mr.Satish Maheshwari.

Q. What were your skills or qualities which helped you get to the training program?

A I kept myself in regular contact with my seniors and remained up to date with the internship training program at various institutes. I managed to keep a decent cgpa and took part in extracurricular activities, which helped me a lot.

Q. Do you think there is a need for an internship awareness program in the college?

A. Yes. It will provide a regular check for the students about the prospects of the training program at various institutes.

Q. Any feedback on team SPEC?

A.SPEC is a hardworking team. It provides exposure to the freshers through various events and workshops. Now that it will have its own e-magazine, the club can reach a wider audience and spread awareness about the various advancements in the field of electronics and communication.

Q. What were the challenges you faced during your internship?

A. Firstly, there was no place to stay. My mentors helped me in getting a place for accommodation. Moving on to the project, with the advancement in technology, there is a need for integrated circuits incorporating MOSFETs of channel lengths in nanometres and thus having the feature size as small as possible. But with miniaturization short channel effects, quantum mechanical effects come into account and make the modelling of physical processes challenging as well. Due to these quantum mechanical effects, we didn't get the desired characteristics. Also, circuit simulation using Verilog-A was time consuming as there were a lot of research papers. The mentors again proved to be helpful and easily handled the situation. There was a continuous evaluation of the project, so I had to keep it up to date.



**"Just, follow your Dreams;
work hard & you will get, all you want."**

SAKSHI DOGRA

RADICAL ATOMS

PRIYA KARMAKAR

SECOND YEAR

Radical Atoms is our vision for human interactions with dynamic physical materials that are computationally transformable and reconfigurable. Radical Atoms is based on a hypothetical, extremely malleable, and dynamic physical material that is bidirectionally coupled with an underlying digital model (bits) so that dynamic changes of the physical form can be reflected in the digital states in real time, and vice-versa. Through Radical Atoms the focus is on the interaction with a hypothetical dynamic material rather than on the technological difficulties in developing such a material. A variety of application scenarios have been explored in which we can interact with Radical Atoms.

PICO

PICO is a tabletop interaction surface that can track and move small objects on top of it. It has been used for complex spatial layout problems, such as cellular telephone tower layout. It is a merging software-based computation with dynamic physical processes that are exposed to and modified by the user in order to accomplish his or her task. Objects on this surface are moved under software control using electromagnets, but also by users standing around the table. With this method, PICO users can physically intervene in the computational optimization process of determining cellphone-tower placement.

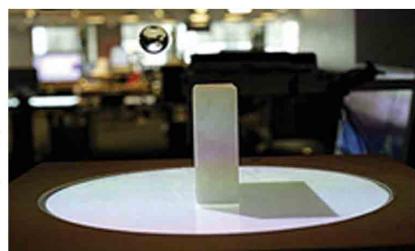


RECOMPOSE

The Recompose project explores how we can interact with a 2.5-D actuated surface through our gestures. The table consists of an array of 120 individually addressable pins, whose height can be actuated and read back simultaneously, thus allowing the user to utilize them as both input and output. Users can interact with the table using their gestures or through direct manipulation. Together, these two input types provide a full range of fidelity, from low to high precision and from hand (direct manipulation) to body-scale(gestures) interaction.

ZeroN

ZeroN is an anti-gravity interaction element that can be levitated and moved freely by a computer in 3-D space, seemingly unconstrained by gravity. A ZeroN in movement can represent a sun that casts the digital shadow of physical objects or a planet orbiting based on a computer simulation.



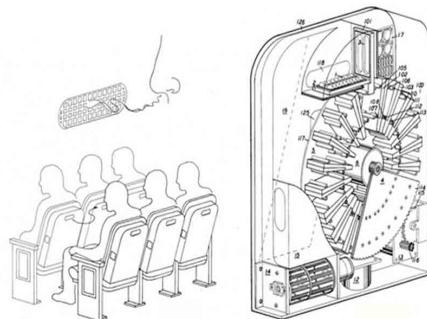


DIGI-SCENT

GIAN SINGH
SECOND YEAR

Imagine how incredible it would be if you could experience the perception of smell during your favorite movie scenes. Almost every aspect of a movie watching experience can be enhanced just by the addition of smell. It would not only intensify our emotions but give the drama a heightened sense of reality. As such, it can be explained as the numerous and varying attempts of movie theaters and producers to provide an enriched experience of watching movies—by releasing scents/aromas related to what they are viewing on the screen.

Smell-O-vision was a system designed to release odor so that the viewers could smell what they were visually experiencing on the screen. The appropriate smell was released, in a timely and controlled manner, by pipes connected to individual seats in theaters. Unfortunately the system did not work as anticipated.



The audience complained that the release of odour was accompanied by a distracting hissing noise. Also there was significant time mismatch between the scene on the screen and the aroma being experienced. In some parts of the theater the smell was too faint to be recognized.



A lot of companies are working on the **Digital Scent Technology**. This will allow us to digitally sense, transmit and reproduce smell. A notable example is “The Scent Dome” which is being tested by a UK-based internet service provider called Telewest Broadband. The device is about the size of a teapot and can reproduce around sixty distinct smells by releasing particles from its twenty liquid-filled odour capsules. Computers using this device will be equipped by software to recognize odour identifying codes embedded in a digital file which can be transmitted via the internet. Digital smell technology can immensely influence the future of a plethora of industries including but not limited to movies, marketing, education, games and music – if only we build it right. Once researchers are able to provide instant, uniform transfer and fast dissipation of smell, the digital scent technology might work better. That, in turn may mean some reconstruction in theaters as well.

HOW CLOSE ARE WE TO A REAL IRON MAN SUIT?

SAMYA RAGHUVANSHI
FIRST YEAR

We can almost exactly copy the original Mark I prototype armor from the comics right now today or in the next few years. The stuff we can do is:-

- Power

The most limiting factor is battery technology, but it is getting better. We would have trouble with finding a power source and would need to recharge frequently. This is actually okay, because the Mark I had the exact same issue! The Mark I used "transistors" (capacitors they meant possibly?) to power the suit and allow it to be charged rapidly from any wall outlet. Unfortunately, it ran out of juice very often.

- Flight

The military designed a series of "jump jets" or "rocket belts" that used a highly concentrated mix of hydrogen peroxide and a catalyzing agent to create jets of high intensity steam that can allow a person to fly mostly vertically, which is just what the Mark I did! Some other models used liquid nitrogen instead. Either one can be deadly if the fuel tank ruptures. Dissolved by 90% pure hydrogen peroxide or frozen by liquid nitrogen is no way to go.

In conclusion...

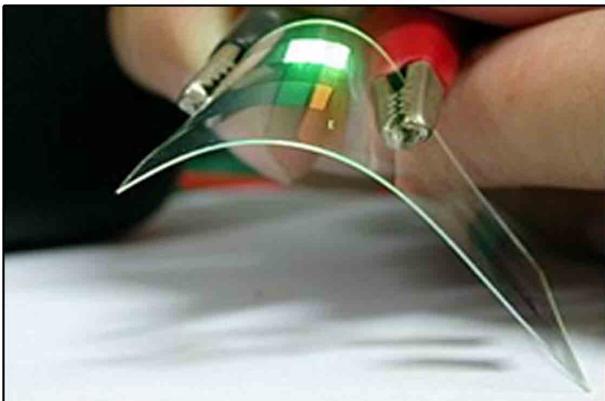
The number of ways in which such a device could change the battlefield or dangerous police and emergency rescue operations is almost too many to list. We could also have versions of these suits in use at factories and manufacturing plants around the world. The benefits to workers on assembly lines would also be enormous as workers would get fatigued much less often and injuries from strains would be very uncommon. Eventually technology will allow these suits to work without the human at all but that is still a long ways off....

F@CT



US Army is building a real Iron Man!

While the Army's Iron Man suit—officially called Tactical Assault Light Operator Suit (TALOS)—will not have flying capability, little missiles, or repulsors, the feature list is still extremely impressive. The suit will have integrated communications, body and external sensors, and a head-up display that will give battle information graphics in real time along with night vision. It will be more Google Glass than Jarvis in this generation. Another feature for the suit is an optional attachable exoskeleton that will provide with hydraulic mechanisms to improve both strength and speed.



FLEXIBLE ELECTRONICS

**SHUBHAM TRIVEDI
FIRST YEAR**

Flexible electronics also known as flex circuit ,is a technology for assembling electronics circuits by mounting electronic devices on flexible plastic substrate such as polyimide, transparent conductive polyester film ,additionally flex circuit can be screen printed silver circuits on polyester. a common application of flex circuit is a computer keyboards. Organic light emitting diodes (OLED'S) are normally used instead of a back light, for flexible displays. FOLED (flexible organic light emitting diode) is a type of OLED incorporating a flexible plastic substrate on which the electroluminescent organic semiconductor is deposited.

Based on flexible electronics nokia gave a concept of mobile phone known as nokia-morph which will launch later .nokia morph is a concept mobile phone created by Finnish company nokia. It was a product of a joint study into the future of mobile phones by the nokia research center and the university of Cambridge's nanoscience center .the device was presented as a part of the museum as “ Design and the elastic mind ” exhibit. The device which is non functional is intended to provide a conceptual showcase for future applications of nanotechnology in the realm of consumer electronics .the phone's theoretical feature list would include the ability to bend into numerous shapes. so it can be see through yet functional; self cleaning surfaces that can absorb solar energy to recharge the phone's battery and a wide range of fully integrated sensors .the manufacturers are believing that some of devices imagined features would appear by 2016....



ROHAN GUPTA

SECOND YEAR

GOOGLE GLASS

Google Glass is a type of wearable technology with an optical head-mounted display (OHMD). It was developed by Google with the mission of producing a mass-market ubiquitous computer. Google Glass displays information in a smartphone-like hands-free format. Wearers communicate with the Internet via natural language voice commands.

Features

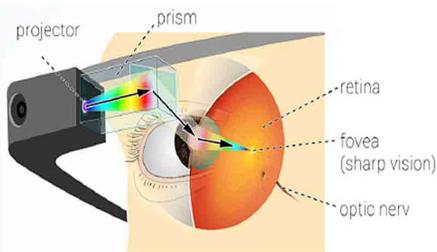
- **TOUCHPAD:** A touchpad is located on the side of Google Glass, allowing users to control the device by swiping through a timeline-like interface displayed on the screen. Sliding backward shows current events, such as weather, and sliding forward shows past events, such as phone calls, photos, circle updates, etc.
- **CAMERA:** Google Glass has the ability to take photos and record 720p HD video.
- **DISPLAY:** The Explorer version of Google Glass uses a Liquid Crystal on Silicon (LCoS), LED illuminated display. The display's LED illumination is first P-polarized and then shines through the in-coupling polarizing beam splitter (PBS) to the LCoS panel. The panel reflects the light and alters it to S-polarization at active pixel sites. The in-coupling PBS then reflects the S-polarized areas of light at 45° through the out-coupling beam splitter to a collimating reflector at the other end. Finally, the out-coupling beam splitter reflects the collimated light another 45° and into the wearer's eye.



How it works

Google Glass contains the fundamental bits of any computer, including a CPU, sensors such as GPS, speakers, microphone and battery, to which are added a tiny projector and a prism that redirects the light onto your retina. Each component is neatly embedded in the frame. To keep the device as light as possible, most of the processing will actually take place in the cloud so a good mobile broadband signal is essential.

In this image below, you can see the projector and prism in the Google Glass working together. In essence, Google Glass is just a tiny projector embedded into a pair of glasses frames with some tiny computing components to drive the package.



Do You Know



Arvind Sanjeev from Kochi, India has successfully developed replica of Google Glass for barely Rs 4,500. He claims that he has used open source hardware to develop the product. Sanjeev has made the project totally open source. He has posted a report that explains how to build this product. He has named it as "Smart Cap". He used Android software, Raspberry Pi computer and Arduino board to develop this Smart Cap

NANOTECHNOLOGY

SAYALI MAHADIK
SECOND YEAR

In the advent of new technologies, Nanotechnology is an emerging field which is poised to bring in revolutionary changes across all spheres of life. The concepts that seeded Nanotechnology were discussed in 1959 by renowned physicist Richard Feynman in his talk: ‘There’s plenty of room at the bottom’. He suggested the possibility to make nanoscale machines that “arrange the atoms the way we want”. After more than 20 years of basic nanoscience research and more than a decade of focused research and development, applications of Nanotechnology are delivering in both expected and unexpected ways. Some of its applications are:

ELECTRONICS

The exponential increase in the performance of computing devices is due to continuing to shrink the dimensions of electronic devices which increases processor speed, reduce device switching energy, increase system functionality, and reduced manufacturing cost per bit. Nanoscale transistors that are faster, more powerful, and increasingly energy-efficient; soon your computer’s entire memory may be stored on a single tiny chip. Magnetic random access memory (MRAM) enabled by nanometer-scale magnetic tunnel junctions that can quickly and effectively save even encrypted data during a system shutdown or crash, enable resume-play features, and gather vehicle accident data.

SUSTAINABLE ENERGY

The difficulty of meeting the world’s energy demand is compounded by the growing need to protect our environment. Many scientists

are looking into ways to develop clean, affordable, and renewable energy sources, along with means to reduce energy consumption and lessen toxicity burdens on the environment. Nanotechnology is already being used in numerous new kinds of batteries



that are less flammable, quicker-charging, more efficient, lighter weight, and have a higher power density and hold electrical charge longer. One new lithium-ion battery type uses a common, nontoxic virus in an environmentally benign production process.

TRANSPORTATION

In addition to contributing to building and maintaining lighter



smarter, more efficient, and “greener” vehicles, aircraft, and ships, nanotechnology offers various means to improve the transportation infrastructure with nanoscale sensors and devices may provide cost-effective continuous structural monitoring of the condition and performance of bridges, tunnels, rails, parking structures and pavements over time. Nanoscale sensors and devices may also support an enhanced transportation infrastructure.



SPEC ENTOURAGE



AJAY SINGH

"Strong is thy hand and high is thy right hand"- this truly defines Ajay. Sweet , simple, kind, a dedicated and hardworking soul, truly a worthy mentor.

AKANKSHA KALIA

Hardworking and consistent.

With ever-bright smile on her face, she is always engaged in learning new things and loves internet surfing.



AMAN BHARDWAJ

The “GADGET GEEK” & philanthropist with the expertise in team work, enjoys photography & exploring new places, lives with the motto-“Stay hungry stay foolish”.

KUMUD JINDAL

"A bubble of enthusiasm", confident , versatile, an 'ever ready' attitude to shoulder responsibilities, actively involved in many co-curricular activities.



MANISH VISHNOI

"The man of codes " .

A perennial source of new ideas and suggestions and always motivating others to do more and better .

SRINATH MADHU

Though looks quiet at sight ,his brain is always busy in the effort to yield something creative; does not only think 'hatke' but also has all the craziness it takes to make it happen.

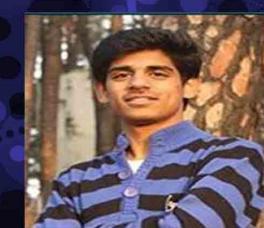


VARTIKA VERMA

Blessed with the ability to create beauty out of thin air, an amazing artist with an optimistic outlook towards life . Adorable *Nati* dancer.

VISHAL RAI

The one who believes in "Learn and implement"; with his innovative ideas and sincere efforts ,he always attempts in direction to use the technology for betterment of society.



SPEC ENTOURAGE



**Abhinandan
Jain**



**Ashima
Jindal**



**Chirag
Tyagi**



**Gian
Singh**



**Mahim
Saxena**



**Poonam
Maurya**



**Pradeep
Jangir**



**Priya
Karmarkar**



**Priyasha
Parmar**



**Rohan
Gupta**



**Sayali
Mahadik**



**Srishti
Marwaha**



**Hima Bindu
Pallanti**



**Kartik
Pathak**



**Nitesh
Kumar
Singh**



**Pranati
Dwivedi**



**Rajat
Thakur**



**Rittwik
Sood**



**Samya
Raghuvanshi**



**Shaphali
Gupta**



**Shubham
Sharma**



**Shubham
Trivedi**



**V.Ravi
Teja**



**Vivek
Kumar
Yadav**

WORK IN PROGRESS



Water level detector and dark sensor: Automatic water level controller will automatically START the pump set as soon as water falls below a predefined level.
Dark Sensor will enable switching on of street lights when it gets dark



Bank Security System
An alarm will buzz when someone tries to intrude the Bank's security system.



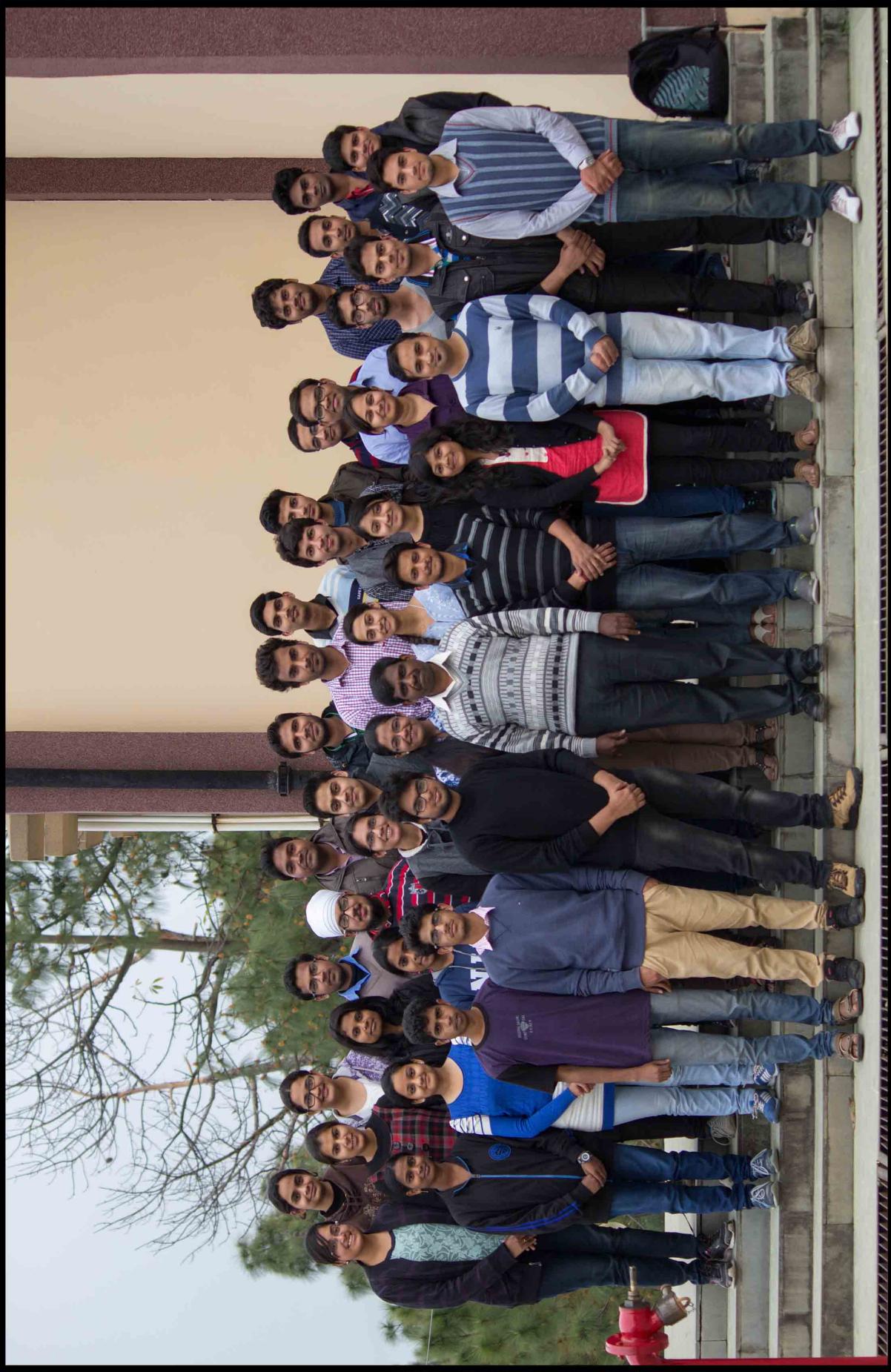
Metal Detector

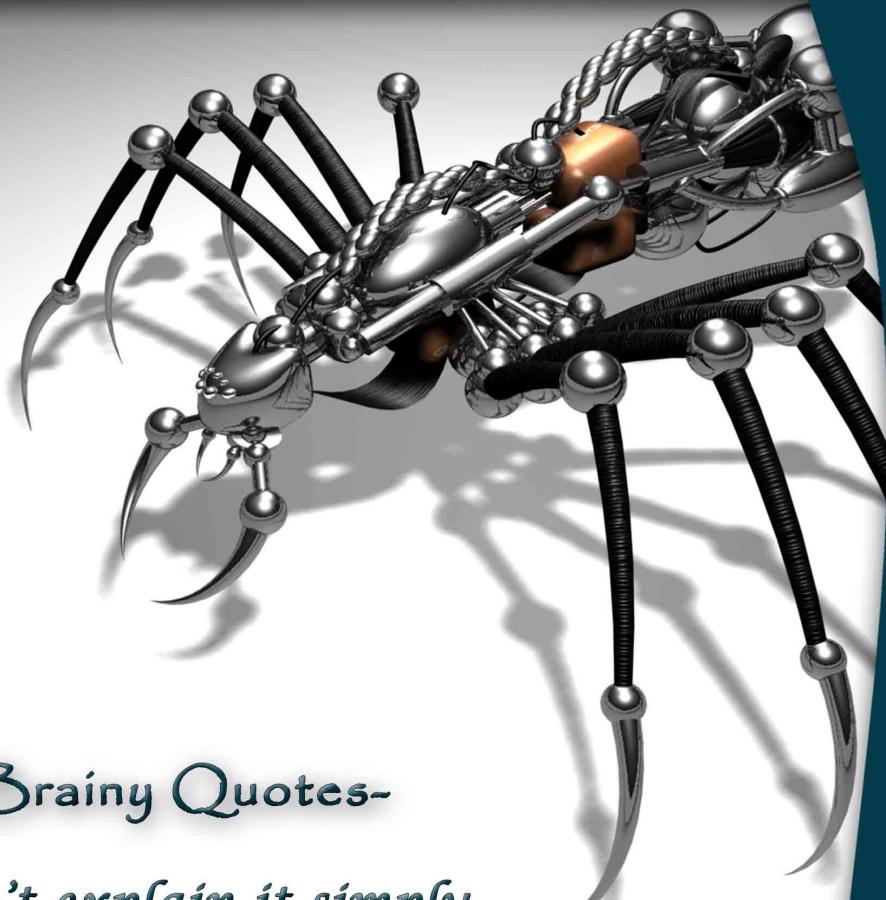
Security: Screening people before allowing access to a particular building like office, sporting event, concert.

Item Recovery: Help someone search for a lost item, such as a piece of jewelry.



TEAM SPEC





Some Brainy Quotes-

> If you can't explain it simply,
you don't understand it well enough.

>Everyone is genius. But if you judge a
fish by its ability to climb a tree, it will
live its whole life believing that it is stupid.

>Tell me and I forget, reach me and I
Remember, Involve me and I learn.

>A man is never too old until regrets
takes the place of dreams.

>Things turn out to be the best for the
people who make the best out of the way
things turn out.

>Don't be a carbon copy of god's great
originals.