MADRAS INSTITUTE OF TECHNOLOGY

DEPARTMENT OF ELECTRONICS ENGINEERING

iMPETUS

EEA ELECTRONICS ENGINEERS ASSOCIATION

FOREWORD

MADRAS INSTITUTE OF TECHNOLOGY

DEPARTMENT OF ELECTRONICS

www.electrofocus.org.in

Impetus: \ˈim-pə-təs\ noun

1. Something that incites.

Synonyms: Impulse, momentum, incentive

It would seem a daunting task to put together a magazine year after year, which lives up to the promise of stimulation that the title suggests. Yet, given the explosive development of electronics technology today, the real task has been to pick and choose a few subjects, which together present a well-rounded picture of the advances in various aspects of electronics. The selection has been an arduous but pleasant process due to the sheer number of articles worthy of being published. In the following pages, you will find the latest word on advances in the industry, articles of interest to the environmentally inclined among you regarding E-waste and Green Electronics and a few words of advice to our fellow engineers. You will also find some interesting tidbits at the bottom of each page, quotes, facts and some humor thrown in for good measure. We hope we have included a little something for everyone. Happy Reading!

TEAM IMPETUS

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Impetus '13

FEATURES

DEPARTMENT OF ELECTRONICS ENGINEERING

ENGINEERING EXPECTATIONS

- Team Impetus

Be sound in basics

A thorough understaning of basics is vital to familiarise with subjects in the latter years of engineering study and in Industry .

An electronics engineer is expected to have an excellent knowledge of electronic devices, RF design, analog, digital and especially CMOS design. This includes electrical fundamentals like signal integrity and power integrity. Specifically, expertise in VLSI, VHDL, FPGA and ASIC design, signal processing, control systems, industrial manufacturing systems, power transmission, simulation and verification techniques are required. In terms of languages, one must be familiar with HDL (Verilog or VHDL), C and C++.

Other skills that an electronics engineer must weild are domain knowledge of microprocessors, embedded systems, and circuit and device testing.

Broaden your horizons

Grow your interest to build technical and interpersonal skills. Industry anticipates each student to shine atleast in one discipline of electronics. For example, to train in VLSI, the student shoul know about MOS transistor operation, CMOS circuits, operational amplifiers, feedback amplifiers, logic gates and flip-flops, poles and zeroes plot of the same.Owing to advancements in the Industrial front, an engineer with meticulous insight in design , simulation tool and product is an eternal asset.

Learning redefined:

Practical learning is an unparalled experience. Firstly implementing mini-projects can aid to easily grasp concepts. Secondly Industrial Visit , In-plant training and Internships helps to gain industial exposure.

> “Simplicity is the ultimate sophistication -Leonardo da Vinci

Participating in various events gives you the chance to compete with the best and grow your prowess. Being a part in seminars and Workshops creates awreness on recent trends of technology

An engineer is always proactive and holistic to face challenges that may arise in near future. Break complexities and finds feasible solutions. An engineer with a blend of problem solving and decision makking skill can transform the world and evolve into a Visionary.

Becoming a member of a professional society and taking active part in seminars and workshops will also help in understanding where the electronics industry is headed. Subscribing to important and insightful trade media journals and newsletters will also help keep track of trends and latest developments in electronics engineering.

Students should have the ability to assess the situation, identify key issues that need to be addressed, break down complex problems into simpler, more manageable problems and to develop workable solutions for those problems. Companies are looking for people who can fix problems with minimal direction.

Besides technical skills, students must possess excellent problem-solving and decision-making abilities, communication skills and organization and management skills for an all-round perspective. Once you figure out your interests, work towards developing skills required for that vertical. Your future is in your hands.

> “A good engineer thinks in reverse and asks himself about the stylistic consequences of the components and systems he proposes. -Helmut Jahn

WITH A WAVE OF MY HAND

- GOKUL RAJ,2010504018

Touch-screen interfaces are *old*. If you really want to impress your friends, what you really want is a gesture-based interface. Gesture is like touch, but cooler. You never actually touch the screen. Instead, you wave your hands in front of it and the system just *knows* what you want.

Microchip, the company with the world's popular name, has released GestIC, gesture-controller chips (MGC3130) the tiny little 28-pin device.

It's worth pointing out here that GestIC doesn't use cameras. It's based entirely on e-field detection, the physical effect of waving your hand through a magnetic field. Field is generated by the GestIC chip itself and "broadcast" to a small bubble of space directly. The chip then senses a disturbance in the force, so to speak. It can tell you not only that your hand is inside the bubble, but also which way you're moving, how fast, and so on. GestIC can easily detect this motion from a range of about 15cm (about 6 inches) from the surface of the circuit board.

The device also recognizes swipes up and down, flicks, circles, pointing, and various other gestures. The only drawback to GestIC: It's not super accurate, at least not compared to a pen or touch-screen. It's fine for commands and even for typing in space.

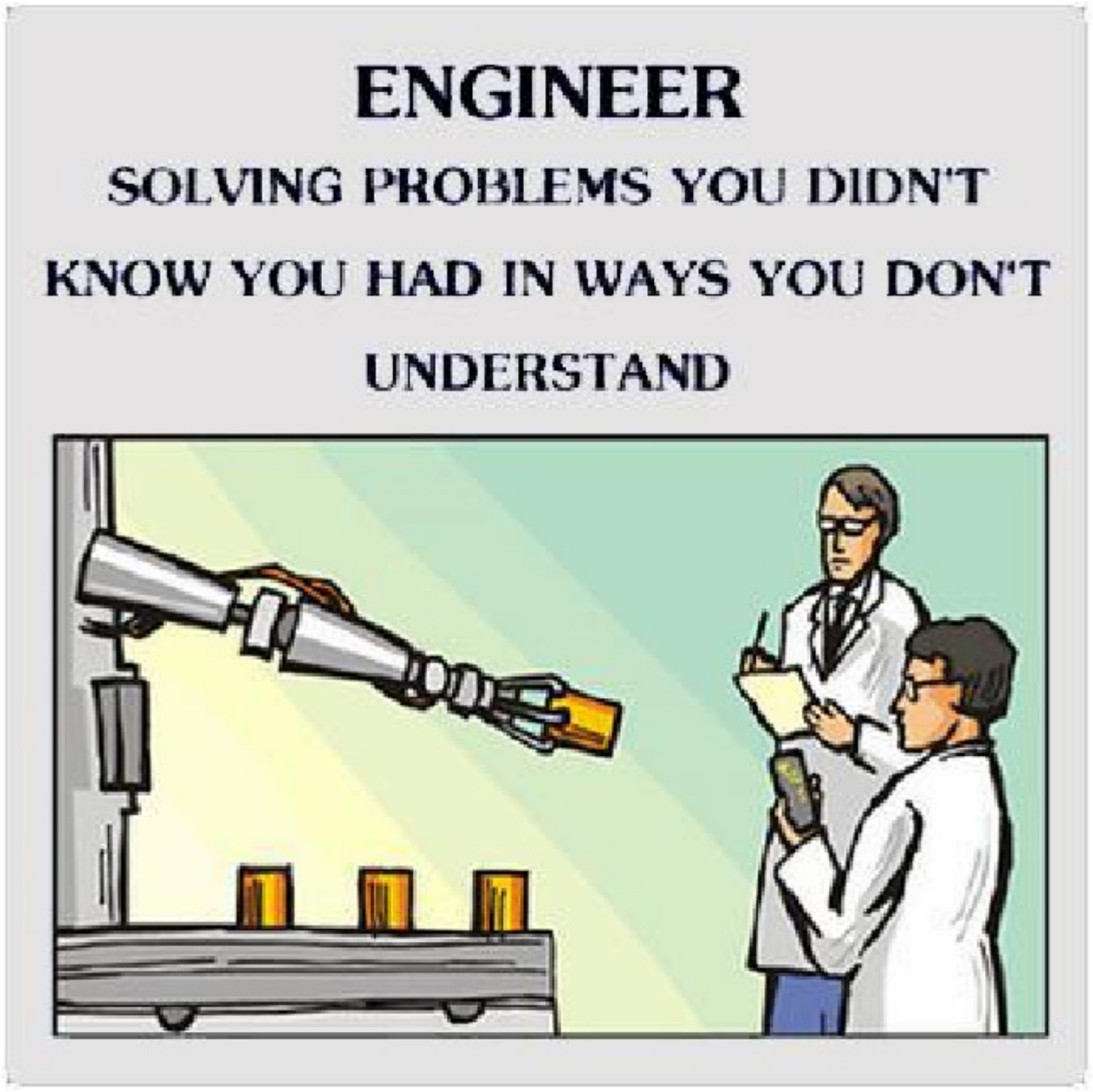
About all you need to add is a set of copper strips on your printed-circuit board to act as antennas. GestIC does the rest, converting RF interference patterns into a bit stream. No other equipment required. Since GestIC doesn't use cameras (cameras take more power). Get too close and the camera doesn't work. GestIC has the opposite characteristic: It works up close but loses sensitivity at about six inches' distance. Thus, GestIC uses very little power. It draws only 90 mW and its sleep current is in microwatts too.

And unlike pen- or accelerometer-based interfaces, GestIC doesn't require the user to hold anything. GestIC can't detect plastic pens (actually it confuses GestIC), only fleshy fingers.

Q: Why did the humble engineer have a mental breakdown after a good design review?
A: Too much positive feedback.

Anytime the user reaches for the device, GestIC can detect and wake up the system a few microseconds before anyone touches it. At worst, it's a cool feature, and at best it gives a system time to energize displays, disk drives, or other peripherals a few seconds before they're needed.

The WIMP (windows, icons, mouse, and pointer) interface is in steady decline; computers can read our minds, Microchip's GestIC may just do the trick.



WHITE COLLAR CRIME

K.KAMALAM, 2011504590

Importing E-waste from Developed Countries to Developing Countries:

E-WASTE is defined as electronic or electrical equipment that has become obsolete because of advancement in technology or changes in fashion. E-waste should be recycled in a proper manner and not dumped into landfills or via incineration. This may lead to adverse effect on environment and human life. But, developed countries like the USA dump their countries' e-waste in developing countries like China, India and South Africa. India has long been a destination for the dumping of e-waste from developed countries but also has a rapidly growing domestic electronics industry. Mountains of hazardous waste from electronic products are growing exponentially in developing countries.

How this trade evolves:

Unlike people in developed nations, developing nations were deprived of resources and jobs . Then the latter realized that they could extract a few components out of the e-waste, which may prove to be useful. So, now we can say that the e-waste is waste no longer, but is a source of income and employment for these people. These countries lack the capacity to safely handle and dispose e-waste. Common Asian destinations for e-waste include China, India, Pakistan, Malaysia, the Philippines, Singapore, Sri Lanka, Thailand and Vietnam. The illegal trade fetches multimillion-dollar turnover. The globalization of the illegal e-waste trade has intensified corporate or white collar, crime.


There are only 10 types of people in the word-- those who understand binary and those who don't.

How much waste is in our mobile phones?

Cadmium- Long time exposure may cause damage to bones and cause lung cancer.

Phthalates- Used to soften PVC plastic. One of the man made pollutants.

Brominated Flame Retardants- Long time exposure may cause damage of nervous, reproductive and endocrine systems.

Lead- Used in keypads and laptop batteries. Banned from landfills.

PVC- Used to insulate wires and cables. It is burnt to extract valuable copper metal.

Mercury- Used in flat screen displays. It accumulates in the food chain.

Beryllium- Used in older motherboards. It causes cancer.

Hexavalent Chromium- Used to protect metal parts from corrosion.

In 2001, the Basel Action Network (BAN) led several groups in an investigation of e-waste processing in China, India, and Pakistan. Interpol set up a global e-waste crime group in 2009 to develop a multinational enforcement strategy to control the illegal trade and investigate links to organized crime.

We are well versed in establishing rules and regulations. But, we fail to implement them. Apart from the producers and manufacturers of electronic devices, individuals should realize their responsibilities towards e-waste generation. Laws should be strict and no malpractices should be allowed. Dumping of either legal or illegal e-waste in developing countries should be strictly prohibited. We, the electronic engineers should take some measures to overcome this white-collar crime.

> “ If you can't explain it simply, you don't understand it well enough. -Albert Einstein

TUG OF WAR

S.RAJYALAKSHMI, 2010504586

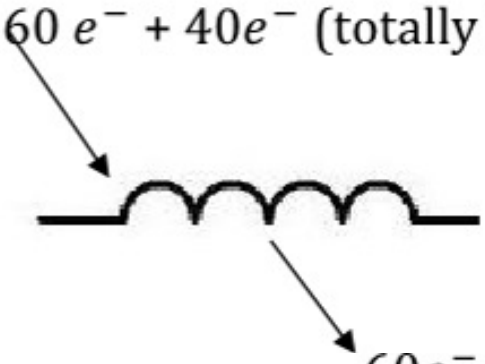
Ages past and we have people talking all around us that it is mathematics that alone stands as the backbone for the justifying technological improvements. But how far is this true???? Are great engineers need to be the masters of mathematics to prove their innovations...? Let us take a small example and justify this doubt that we have for years..

PRINCIPLE OF INDUCTION:-

Whenever asked to explain about the principle of induction an average a student would explain it as "the principle of creating voltage due to a varying magnetic field " but do we definitely need mathematics prove this ???

Let us consider a straight conductor and say it consist of 100 e^- , when the same conductor is twisted the effective number of electrons decreases. This is because upon twisting due to repulsion and collision some electrons are lost. Therefore, the effective number of electrons at various parts of the twisted coil varies. This variation increases largely when a current is applied to the solenoid.

60 e^- + 40e^- (totally 100e^- as per our assumption)



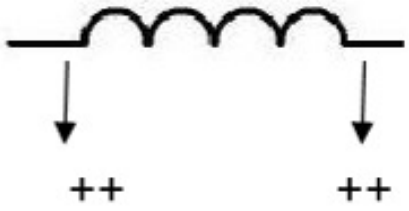
60e^-+0e^-(electrons are lost due to repulsion near the twist)

There exists a strong force of repulsion between the 60e^- whereas the remaining 40e^- contribute an effective force of attraction. This indicates that there exists an electric flux and this flux is proportional to the current supplied to the solenoid.

"Don't worry about people stealing your ideas. If your ideas are any good, you'll have to ram them down people's throats."

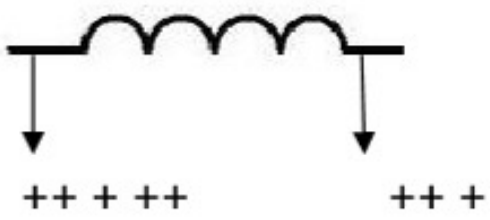
-Howard Aiken quotes (American computer engineer and mathematician 1900-1973)

Whenever energy is given perpendicular to a body, it vibrates. As a result of this vibrations the molecules and hence the atoms vibrate. Due to the continuous vibrations, the atoms lose the outermost electron (valence electron). The atoms as a result become positively charged ions. Whenever direct current is given the energy remains constant. Therefore the ions that are formed are of the same magnitude at both the ends of the conductor. This implies that the surface charge of the inductor remains constant. This implies that the inductor becomes a short circuit.



There exists same number of charged particles at both the ends of the inductor; hence the inductor acts as a short circuit for direct current.

Whenever an alternating cycle is applied to the inductor, the ions hit each other with different energies. Hence, there exists a difference in potential and the inductor acts as a resistance here.



Now we have successfully proved the principle of induction without using even a single mathematical equation. Thus we cannot now say that it is the mathematics which helps in easier analysis of the scientific innovations. So, enjoy the marvelous science that is inherent in the mathematical equations. We must understand that mathematics aids as a tool in giving proofs to scientific concepts.

> “To be a good professional engineer, always start to study late for exams because it teaches you how to manage time and tackle emergencies.
>
> -Bill Gates

PRINTED ELECTRONICS-THE FUTURE

M.PRAVEEN, 2012504528

Imagine a World where newspaper and magazine ads are animated or the headlines keep current. Your clothing changes color or design according to your mood. If you can imagine these things, you have imagined the near future and just a small fraction of what plastic and printed electronics can do.

Printed electronics is the manufacturing of electronics by standard printing processes that opens the door to a future of electronic innovations that are lightweight, flexible, and could be produced on cheap materials such as paper or flexible film. Printed electronics or plastic electronics or organic electronics, is an innovative departure from the conventional manufacture of electrical and electronic components such as silicon chips.

Printed electronics can be divided into two subtopics. First is the material used for printing (both organic and inorganic): 'the inks'. These can either be conductors, dielectrics, resistors or semiconductors. Second is the printing technology used, the most common being inkjet, screen printing, gravure, offset and flexographic printing. Layers with different functions are printed - by building up layers using additive printing processes, combined with coating and patterning processes, an electronic device is generated.

Some of the currently available applications are:

Smart windows- Allow users to control the amount of light and heat passing through.

E-Paper- An electrically rewritable thin display that can be used as paper. It looks and feels just like regular paper and ink but stores and displays more information than initially meets the eye.

RFID (Radio-Frequency Identification)- Smart Card Inks in RFID antennas. RFID is the use of a wireless non-contact system that uses radio-frequency electromagnetic fields to transfer data from a tag attached to an object, for the purposes of automatic identification and tracking.

Q: How do you ensure that a singing group that never strays far from their lead singer's monotone stays out of a contest?
A: Use a band reject filter!

OLED (organic light-emitting diode)- An LED in which the emissive electroluminescent layer is a film of organic compound, which emits light in response to an electric current. OLEDs are used to create digital displays in devices such as televisions, computer monitors, mobile phones, game displays.

Some of the possible applications are:

Smart skin patches- It can electrically deliver cosmetics. They use laminar batteries, often partially printed, plus printed electrode patterns to deliver drugs, cosmetics, tattoos and potentially performance boosting chemicals.

Signage- "Wallpaper" electronics will increasingly merge signage and promotion by switching messages.

Posters- With an NFC tag positioned on each poster, the URL can be tailored to suit individual campaigns or information displays. Posters are easily changed on-site without the need for special tools and a unique locking device provides security if required.

Interactive Toys and Games- Powered by Thin film Memory.

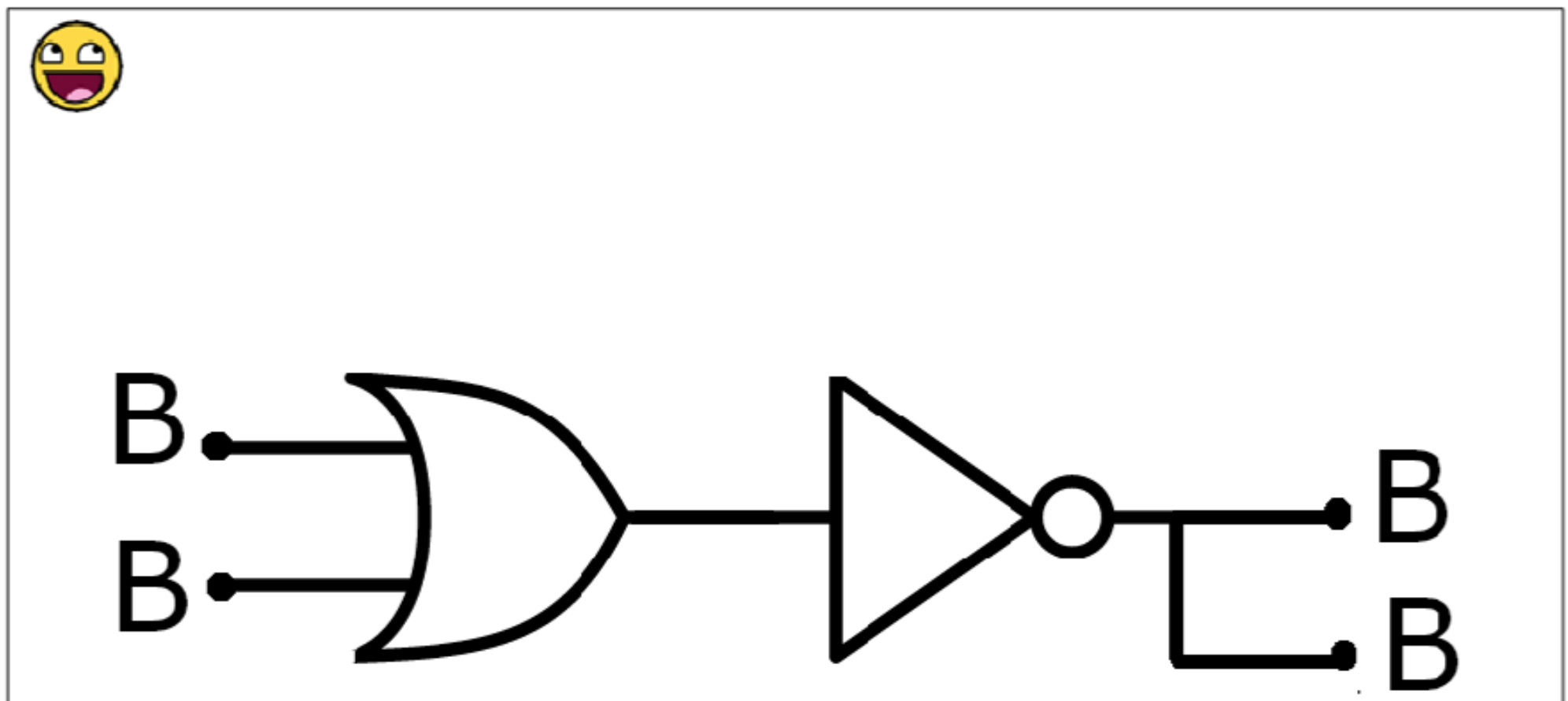
Smart Tapes- T-INK enabled spackling tape allows unprecedented flexibility and multi functionality to bring power / data from walls, to ceiling to floor to create the template as the future standard for concealed technology.

Keyless entry into cars- Smart in Mold technology creates an interactive b column and/or printed windshield element that creates a unique and invulnerable interface that will light up when the driver is within a specific distance and allow the entry of a personal code to gain entry to a vehicle.

Paper Batteries, ISO thickness powered cards, Transit tickets, Customer loyalty cards, Interactive display gift cards, Retail Merchandising, New product form factors involving LED displays, miniature speakers and other electronic features.

Q: Why did the binary number blush? A: Probably because of two's complement.

Thus, we can see that this topic is very vast and also, a lot of development and research is currently being undertaken. In India, universities across the whole region are already doing excellent basic research in a variety of printed and potentially printed electronic and electric devices but major initiatives to industrialize these technologies are, as yet, largely absent. The government is aware of this and it is now beginning to encourage product programs.



2B OR NOT 2B

ROBOTIC NANO-SPIDERS

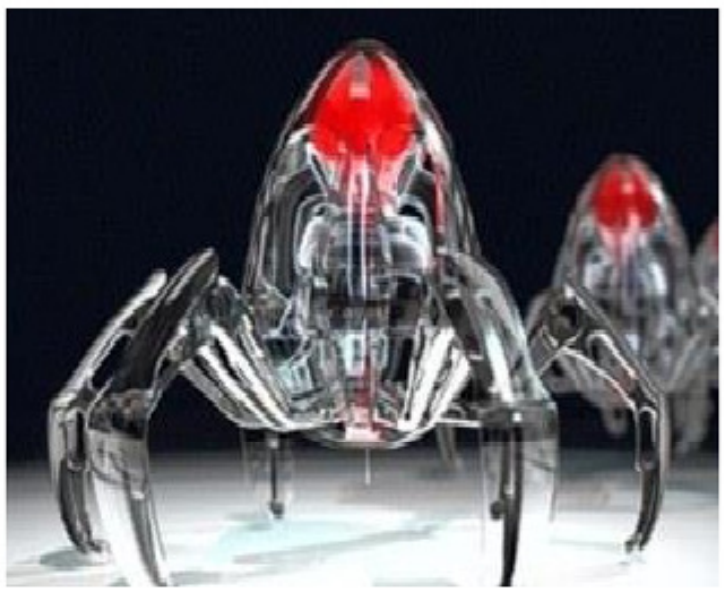
S.JAYANTHI, 2011504013

A group of scientists from Columbia University managed to invent extremely small spider robots measuring about 4nm across. These nano robots are about 100,000 times smaller than the diameter of a human hair.

The spider robots are made of DNA molecules. They can walk, turn right and left and create their own products. Developed at the molecular level, the robots represent DNA walkers, featuring legs to walk autonomously, though very slow - about 100nm in 30 meters - 1 hour.

In order to observe the spider robots scientists used atomic force microscopy. The molecular robots are programmed to sense the environment and react accordingly. For example, they can detect disease markers on a cell surface, identify whether it is a cancerous one and then bring a compound to kill it.

Researchers consider that their latest invention is an important step in molecular robotics. Although today this field cannot boast many great inventions, scientists and engineers believe that in the near future it could become one of the most important industries that could create devices for various medical applications.



Molecular robotics is a topic to ponder on!

Why switch off your cell phone on a plane?

Cell phones operate on a different frequency range than airplane navigation signals and the body of the plane is designed to be impervious to foreign sources of interference. The real reason you're asked to turn your phone off is because of the potential network congestion problems that can result from the signals bouncing of multiple cell towers at that altitude!

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NEAR-FIELD COMMUNICATION

K.KAVITHA, 2010504555

It's an upcoming technology that could be used in smartphones and could be configured for many purposes.

Near field communication (**NFC**) is a set of standards for smartphones and similar devices to establish radio communication with each other by touching them together or bringing them into close proximity, usually no more than a few centimetres . NFC works similar to RFID, even though they have a much shorter range(about 4 inches) compared to RFID.

Establishing connection: Devices with NFC hardware establish connections with other NFC equipped devices through 'NFC' tags. NFC tags are unpowered NFC chips. They don't draw power from a source, rather from a nearby smartphone or other powered NFC device.

Just touch the two NFC equipped devices together to establish a connection!

- If we have two NFC equipped smartphones, we can touch them together back-to-back.
- If we have a NFC tag, we can touch the NFC equipped smartphone to NFC tag.

How Can This Technology Be Utilized?

Mobile Payments:

Instead of credit cards, an NFC equipped smartphone could be touched to an NFC enabled payment terminal to pay for something, replacing the credit card. In the future carrying money or credit cards will become obsolete, mobile phones will be sufficient.

Transferring Data Wirelessly:

Data can be transferred wirelessly between two NFC equipped smartphones.

Eg. Anroid phones have Android Beam. This feature allows two smartphones to quickly share a web page, contact, photo, video or any information we wish to transfer.

NFC tags: They are cheap and anybody could purchase them.

We can configure actions to be performed when our smartphone comes in contact with an NFC tag .

Eg: We need to put our mobiles in silent mode when we go to sleep or set an alarm every night. Instead of doing it manually, we can place our smartphone onto the NFC tag configured for that particular function and our smartphone will automatically perform the configured action.

Transit And Boarding Passes:

NFC equipped smartphones can replace the transit pass on transit systems and boarding passes at the airport.

Car manufacturers are even working on NFC-equipped car keys.

A bunch of scientists and engineers were rather drunk, and when one decided to yell out his favorite equation, "E = MC^2," others started to follow suit.
"F = ma", "a^2 + b^2 = c^2" but when one engineer yelled out "F = c*(d/dt)(x1 - x0)" the crowd groaned and the yelling stopped. He later apologized to his friend, "I didn't mean to put a damper on things."

BIO-BATTERY

- Jaya Prakash

One of the worst problems in India, especially in Tamilnadu, is power scarcity. Once upon a time, Tamilnadu had surplus electricity but now it faces acute scarcity. Rural areas suffer nearly about 14-15 hours of powercuts. To overcome this, the TNEB initially tried to generate some power using wind energy, but unfortunately, the state faced severe monsoons so this plan failed to compensate for the power scarcity. Many alternate solutions are available, but the total need of power is about 4000MW, which is quite hard to generate.

A new technology, introduced by a Japanese scientist, termed as "BIO-BATTERY" might be the solution. Using this technology, without the help of a power source or external energy, we can generate power. The bio-battery is an energy storing device that is powered by organic compounds.

Bio-batteries will be made with the help of renewable sources, like glucose. The bio-battery will make use of glucose to generate power. Glucose production is plenty in India but we are not using these kind of technologies to improve the power scarcity. The main producers of glucose are plants, which use of carbon dioxide, water and sunlight, and release carbohydrates (glucose) and oxygen. In the bio-battery, enzymes will act on the glucose and breaks it down to releases hydrogen and electrons.

$Glucose \rightarrow Gluconolactone + 2H^{+} + 2e^{-}$

Bio-battery is like a normal battery. It contains 4 parts namely anode, cathode, separator and electrolyte. The separator is used to separate the anode and the cathode in short circuit. When glucose first enters the battery, it enters through the anode. In the anode the sugar is broken down, producing both electrons and protons. These electrons and protons play an important role in creating energy. They travel through the electrolyte, where the separator redirects electrons to go through the mediator to get to the cathode. On the other hand, protons are redirected to go through the separator to get to the cathode side of the battery.

A redox reaction then takes place at the cathode. This reaction uses the protons and electrons, with the addition of oxygen gas, to produce water.

The optimist says, "The glass is half full". The pessimist says, "The glass is half empty". The engineer says, "The glass is twice as big as it needs to be".

$$O_2 + 4H^+ + 4e^- \rightarrow 2H_2O$$

There is a flow created from the anode to the cathode which is what generates the electricity in the bio-battery. The flow of electrons and protons in the system are what create this generation of electricity.

The reason why I suggest bio-battery implementation in India is that plants create both carbohydrates and oxygen by photosynthesis. Animals take up those carbohydrates and oxygen and utilize them as an energy source and release carbon dioxide and water. Then this cycle starts again. Since the carbon dioxide is recycled in this system, the amount of carbon dioxide in the atmosphere does not increase. If electrical energy could be directly acquired from this cycle, we could obtain more environmentally friendly energy than that from fossil fuels. Therefore the process is recycled and we will believe this can make a change in the power scarcity. India is ranked 2nd in the world in the production of sugar, that is in glucose production.

Another advantage of the bio-battery is that it is rechargeable. It can recharge itself without the help of power. In other words, through a constant supply of sugar, or glucose, bio batteries are able to continuously keep themselves charged without an external power supply. This technology was first used by Sony™. Several researches are going on to elaborate this technology.

Engineer Speak

What is said	What it means
A number of different approaches are being tried.	We don't know where we're going, but we're moving
An extensive report is being prepared on a fresh approach to the problem.	We just hired three guys. We'll let them kick it aroun for a while.
Developed after years of intensive research.	It was discovered by accident.
Modifications are underway to correct certain minor difficulties.	We threw the whole thing out and are starting from scratch.
Preliminary operational tests were inconclusive.	The darn thing blew up when we threw the switch.
Test results were extremely gratifying.	It works and, boy, are we surprised!
The design will be finalised in the next reporting period.	We haven't started this job yet, but we've got to say something.
The entire concept is unworkable.	The only guy who understood the thing just quit.
We need close project coordination.	We should have asked someone else.

STABILITY ANALYSIS

- U. S. Surasitha, 20120504606

Our universe has presented us with many enigmatic issues. Everything in the universe is incorporated under different systems and for any system to function well, one of the vital parameters is its stability.

How do we predict whether a system is stable or not? This is decided by the controlling part of the system. Hence if stability of a control system is established, then the main system's stability is established.

So how do we do this? An engineer's answer will be if the poles of the transfer function that defines and characterises the system lie on the left half of s+jw plane, then the system is said to be stable. Though this answer seems to be simple, does this not leave us with one puzzling thought? When the axis itself is imaginary and not real, how can we take it as a reference for deciding the most important factor of any system!!?

Let's find out a convincing solution.

All of us know what noise is. It is an unwanted signal that degrades the performance of any system. Noise's effect over a system can be very evidently felt but we can never exactly determine at what point of time noise will start affecting the system significantly i.e., at what exact timing it has a grave effect.

Consider an inductor and a capacitor. The first mathematical aspect that comes to our mind is $X_L = j\omega L$ and $X_C = 1/(j\omega C)$. Note that there exists a common factor "jω" in both the expressions. Take a radio that works well. Open it and change the inductor and capacitor values and switch it on. We'll find that now we just hear a buzzing or corrupted sound. If we use proper values then we'll be able to tune to any desired channel. Thus inductors and capacitors become best source of noise as well as eliminators of noise depending on value of "jω".

An engineer's task would be to reduce the effect of noise while communicating through a mobile or any other telecommunication device. These devices must obviously consist of inductors and capacitors, which are best

A common mistake that people make when trying to design something completely foolproof is to underestimate the ingenuity of complete fools. - Douglas Adams

creators/eliminators of noise as explained before. But we don't know when noise gets added, so we consider it to be always present but with different intensities at different timings. So, for establishing a good "**stable**" communication link, noise at some level which is omnipresent has to be constantly decreased to suppress its presence.

Thus, this decreasing technique from some positive level to a comparatively low level (Negative) of "imaginary" virtue of noise proves to be a good basis which makes us say that if the poles of transfer function of a system are on the negative side of the imaginary axis, the system becomes stable.

Professor: You have so much potential.
Student: Watt? Watt did you say?
P: Don't resist your destiny! You have the capacity to do well!
S: Currently, I just don't have the power.
P: Look, I know that you are under a lot of pressure right now.
S: It's the stress, professor, I know I'm going to fail!
P: You have to be more elastic.
S: I know, I know, the same old schtick, "You're only Young once."
P: Look, am I going to get an honest response out of you?
S: Not continuously, professor. Only on impulse.
P: That doesn't Bode well for your future. I'm worried about you.
S: Look, I think its just a phase I'm going through.
P: It's just the magnitude of your problem that I'm worried about.
S: Look, I know you think I'm a nut.
P: You've got it nailed.
S: I gotta bolt.

COLOURFUL MISTAKE

Indu S. 2011504545

This article begins with the seemingly simple question: **which is the smallest particle of matter in existence?** Most of us would guess an atom or a proton or a neutron. But the exact answer to this question (at the time of writing) is a **QUARK**.

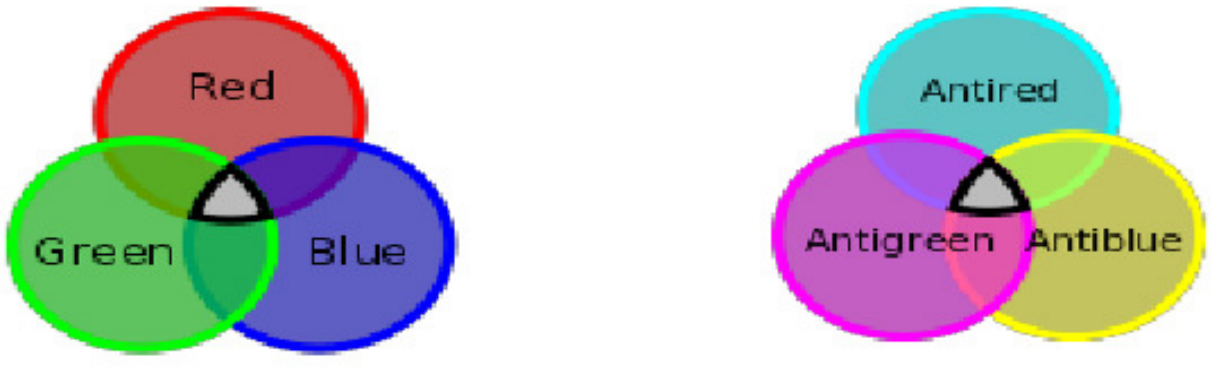
Around the 5th century B.C., the Greek philosopher Democritus proposed that matter was made up of atoms, which he thought were the smallest particles. But it took until the early 20th century for physicists to discover that atoms were made up of even smaller particles called neutrons, protons and electrons. Physicists continue to whittle down the theories about matter, and now the quark is thought to be one of the smallest particles. But wait a few minutes and a new one might be discovered! Until then, here's what we know about the quark.

A **quark** is an elementary particle and a fundamental constituent of matter. Quarks combine to form particles called hadrons, the most stable of which are protons and neutrons the components of atomic nuclei. Due to a phenomenon known as colour confinement, quarks are never directly observed or found in isolation; they can be found only within hadrons, such as baryons(of which protons and neutrons are examples), and mesons. For this reason, much of what is known about quarks has been drawn from observations of the hadrons themselves. There are six types of quarks, known as flavours: up, down, strange, charm, bottom, and top.

Quarks are the only elementary particles in the Standard model of particle physics to experience all four fundamental interactions (also known as fundamental forces), (electromagnetism, gravitation, strong and weak interactions), as well as the only known particles whose electric charges are not integral multiples of elementary charge.

Q: Which James Bond characer is FIFO?
A: Queue

For every quark flavor there is a corresponding type of antiparticle known as an **antiquark,** that differs from the quark only in that some of its properties have equal magnitude and opposite charge.



- The quark colours (red r, green g, blue b) combine to be colourless
- The quark anti colours (anti red r anti green g, anti blue b) also combine to be colourless

In particle physics, **colour charge** is a property of quarks and gluons that is related to the particles' strong interactions in the theory of quantum chromo dynamics (QCD). The "colour" of quarks and gluons is completely unrelated to visual perception of colour. QCD has three different kinds of charge, labeled by “colour.” The term ’colour’ was chosen because the abstract property to which it refers has three kinds of values, which are analogized to the three primary colours of red, green, and blue. In QCD, a quark's colour can take one of three values (or charges), red, green, and blue. An antiquark can take one of three anti colours, called anti red, anti green, and anti blue (represented as cyan, magenta and yellow, respectively). Gluons are mixtures of two colours, such as red and anti green, which constitutes their colour charge.

The study of quarks and QCD is central to nuclear physics and helps understand the strong interaction between protons and neutrons, which are the basic constituents of all objects. Further study and research regarding quarks might lead us to new discoveries in future. It is thus the need of the hour know about quarks.

Q: Why did the communications company go out of business?

A: They overspent their link budget!

ROBEI – SIMULATION SOFTWARE

J.YOGESH KUMAR, 2009504632

FPGA is a technology-intensive field full of opportunity for innovations. Due to its low cost, versatility and marketing advantages, plenty of companies and individual engineers choose it to develop prototype products. However, there are some obstacles that prevent FPGA from growing fast, like background knowledge requirement and huge, complex design tools.

First of all, FPGA design requires knowledge of digital design and logic synthesis. However, most such knowledge is offered in universities and graduate schools, which limits the market growth

Second, FPGA tools are different from each other. In order to implement a project on certain FPGA chips, the designer must use the particular FPGA vendor's software and intellectual properties. Design engineers need to spend a lot of time to get familiar with these tools for the first time.

Third, FPGA tools are huge in size and complex in contents.

On the other hand, there are the success stories of Apple's iOS and Google's Android, which offer their products from personal computers to mobile platforms. However, FPGA design on mobile platform is still a challenge due to the aforementioned complexity and size of FPGA design tools.

One method to overcome to this is Robei:

Robei is a tiny cross-platform FPGA design tool that aims to simplify design procedure, make intellectual properties transparent and reduce complexity.

How do you keep a programmer in the shower all day?
Give him a bottle of shampoo which says "lather, rinse, repeat."

Robei, the world's smallest EDA tool also runs on embedded platforms like Android, which makes it distinctive from other EDA design software It supports 4 platforms: Windows, Linux, Mac OS and Android. Therefore, developers can realize their design anywhere on mobile phones or tablets. .

In conclusion, the goal of this design tool is to make FPGA design accessible to anyone and hence increasing the innovations from new sources other than hardware engineers. Robei is not only a great educational tool for students and professors, but also a great development tool for entry to medium level engineers.

A man is flying in a hot air balloon and realizes he is lost. He reduces height and spots a man down below. He lowers the balloon further and shouts, "Excuse me. Can you help me? I promised my friend I would meet him half an hour ago, but I don't know where I am."

The man below says, "Yes. You are in a hot air balloon, hovering approximately 30 feet above this field. You are between 40 and 42 degrees N. latitude, and between 58 and 60 degrees W. longitude."

"You must be an engineer," says the balloonist. "I am," replies the man. "How did you know?" "Well," says the balloonist, "everything you have told me is technically correct, but I have no idea what to make of your information, and the fact is I am still lost."

The man below says, "You must be a manager." "I am," replies the balloonist, "but how did you know?" "Well," says the man below, "you don't know where you are, or where you are going. You have made a promise which you have no idea how to keep, and you expect me to solve your problem. The fact is you are in exactly the same position you were in before we met, but now it is somehow my fault.

FLOWCODE AVR – THE PLACE TO START

Prashanth Chandran, 2009504564

Any programming course begins with flowcharts. Apart from facilitating the projection of our program idea onto paper, flowcharts are also excellent representations of how our program will execute by giving us a solid perspective of our algorithm. Programming microcontrollers of any class is no different. Given the fact that anyone and everyone can put together a concrete flowchart, Flowcode AVR is the perfect place to start for beginners.

Flowcode AVR has enough resources to power almost any project on an AVR microcontroller. This is one of its greatest strengths. Widespread modules neatly organized into categories, presented in an easy-to-access GUI can engender a feeling of ease to any beginner. Categories include 'inputs', 'outputs', 'comms', 'Wireless', 'Peripheral', 'Mechatronics', 'miscellaneous' and a 'common' category. The programmer can select input devices ranging from a simple switch to switch banks, keypads and ADCs'. The Outputs section consists of LED variants, a graphical LCD module, a LCD display module and even a seven segment display module. The Communications and Wireless categories house an impressive array of communication protocols and interfaces extending from RS232, CAN, Bluetooth and ZIGBEE, among others. Flowcode AVR even has a module for a GPS system. This highly useful assortment of eclectic modules can sway even an experienced programmer to start using Flowcode AVR.

Having rich resources is one thing, but putting those resources to proper use is another thing entirely. Configuring peripheral devices is a big hassle, particularly when dealing with peripherals of higher complexity.

Capslock – Preventing login since 1980

Flowcode AVR's biggest strength lies in its ability to enable the configuration of all its modules with appreciable ease and understanding. One can configure the properties associated with any peripheral by right-clicking the device and choosing device properties. This opens a new dialog box that makes available a number of properties pertaining to the device that the programmer can alter to get the job done, in a straightforward manner. For instance, programming an LCD display is time consuming and tiring mainly because of the number of properties one has to consider, for even initializing the LCD display. Flowcode AVR makes programming LCD devices as easy as programming an LED. Flowcode AVR even has an option to write a custom program module in C and insert them into our flowchart. It even stretches itself to provide a simulation option that will actually show us how the input and output peripherals look during run time.

Having all that one could wish functionally, Flowcode AVR lacks in flexibility. This useful software works only for AVR microcontrollers. But it works for a sufficient number of AVR microcontrollers that can cover almost any project. Additionally, trial versions of the software restrict the number of modules one can use in the program and that gets a little irritating as we try to build more complex systems.

Young electronics enthusiasts looking for place to kick-start their mini projects will find Flowcode AVR extremely useful and easy. The programming experience they gain by using this software will no doubt improve their understanding of how the world of microcontrollers goes around. This software is truly a blessing for all beginners and I can think of no better place to get going. Flowcode AVR is the perfect place to start your journey of microcontroller programming.

In order to keep electricity inexpensive to the public, Tesla sold George Westinghouse his own royalties, which were worth $12 million, for just $216,000. If Tesla had kept his royalties, he may have been the first billionaire, sharing financial history with the likes of John D. Rockefeller the worlds first in 1916, Howard Hughes, and Bill Gates who became the first man to reach $100 billion in 1999.

GO GREEN ELECTRONICS

- R.SOUMYA, 2010504598

Electronic devices are becoming a bigger and bigger part of our lives, especially as they get smaller and smaller. We use them as tools and toys to communicate, work, enjoy media, and be expressive. Being green with electronics doesn't mean living in a teepee listening to truckers squawk on the old short wave. Greening your electronics is a matter of knowing what tech to get, how to use it best, and what to do with it when its useful life is done.

Top Home Electronics Tips

1. **Go rechargeable:** Of the 15 billion batteries produced and sold each year, most of them are disposable alkaline batteries, and only a fraction of those are recycled. Look for electronics that are rechargeable. For removable batteries, lithium-ion (Li-Ion) and nickel metal hydride (NiMH) are cost-effective, green alternative.
2. **Kill Vampire Power:** Just because your cell phone is unplugged from the charger or your TV is off, doesn't mean these devices aren't drawing a current and running up your electricity bill. Many AC adapters (or "wall warts") if left plugged in will continue to pull a current from the wall socket (you may notice they are warm to the touch). Many devices that have a standby mode do the same thing. To make sure you aren't wasting energy, pull the plug on devices when not in use or put all of your electronics and chargers on a power strip. There are also a number of "smart" power strips on the market that sense when electronics are turned off, or that turn off the strip when one main unit (like your PC) is powered down.
3. **Look for EPEAT:** EPEAT (electronic product environmental assessment tool) is an attempt at environmental certification for computers (CPUs, monitors, and notebooks). Released in early 2006, a growing number of products have been registered with EPEAT.

Q: How do electrical engineers meditate? A: They contemplate V = IR

V = IR is called "Ohm's Law." Get it? "Ohmmmmmmmmm..."

4) **Treat those batteries right:** While battery-recycling programs are increasingly common and easy to use, the process of recycling anything still takes energy and resources and should not be overused. Knowing how to best use and maintain rechargeable batteries will boost their longevity and performance.
5) **Make it a short circuit:** So, you just bought the newest, sleekest cell phone. It takes video, filters out calls from exes, and charts barometric pressure. What should you do with the old one?. There are plenty of organizations and charities that recycle and reuse old electronics. A growing number of computer manufacturers are adopting take-back programs as well, under which they will accept and recycle their units when you're done with them.
6) **Buy used:** Don't want to spend a fortune on technology? You can find top quality, totally functional used electronics at sites like Ebay and Craigslist, and even at yard sales and flea markets. This not only cuts down on the amount of new resources being used for the production of more stuff, it also creates a market for sellers to safely recirculate electronics they're no longer using. Ebay's Easytradein.com is a good resource for the electronics you are ready to part with. You might even be surprised what comes up on Freecycle.
7) **Bright idea:** The solar charger: There are an increasing number of options for on-the-go solar power. From handheld to backpack power, solar chargers now come in a spectrum of types for juicing up phones, PDAs, Bluetooth headsets, iPods, and laptops. Many have an onboard battery pack that can charge while the solar cells are in the sun, and then transfer the power to your device when you need it.
8) **Extend use:** There's definitely a cult around replacing our electronic toys and tools every 15 minutes or so when a new model comes out. In some cases, the newest technologies are cleaner and more efficient, but often, the older ones will faithfully do their assigned task for a lot longer than the marketplace would have us believe. In some cases, the older models are even superior. Step back a few paces from the whole technophelia thing and take stock of what your real needs are.
9) **Buy a less toxic system:** Europe is making huge inroads on reducing the presence of toxic chemicals in electronics such as lead, cadmium, and mercury with a directive called RoHS (Restriction on Hazardous Substances). Even if you don't live in Europe this has a big impact, as any company looking to sell there has to follow the directive. Look for companies that are adhering to--and even going beyond--the RoHS compliance in Europe and around the globe.

Have you heard of Base 2 Ball? One... Ten... Eleven strikes; you're out!