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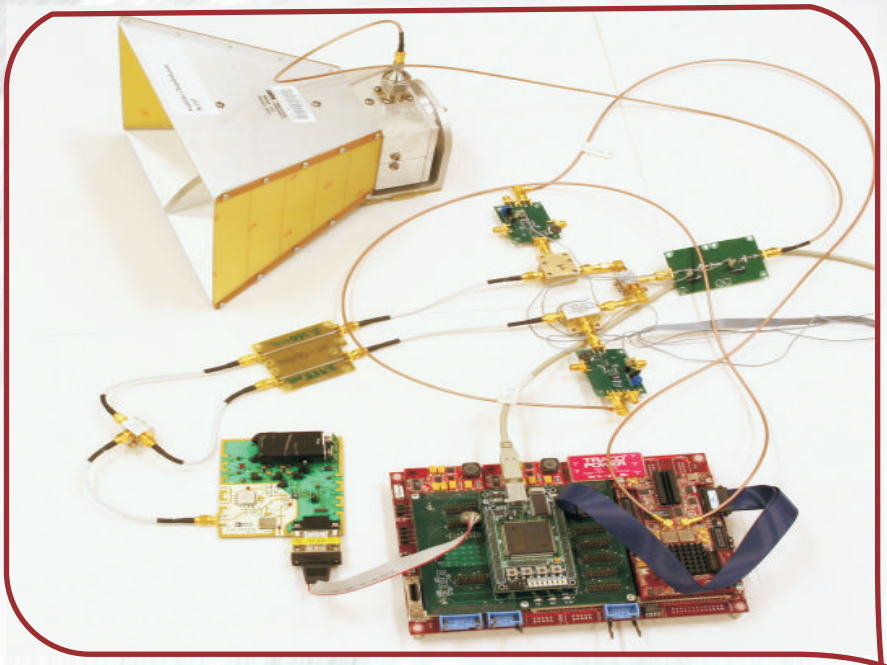

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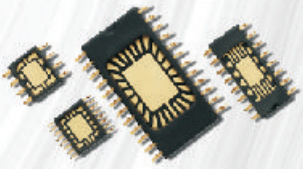

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In Phase, September, 2008

From the editor...

In Phase has successfully completed its first year and I would like to congratulate everyone who has been involved with this endeavor. With this issue, we bid adieu to our founding editor in chief Mr. Akash Baid. The new editorial board promises to keep up the good work, to keep bringing to you the latest happenings in the world of electronics and communication. We at IIT Guwahati constantly strive for excellence in every field and In Phase is a small step in this direction. With In Phase our aim is to keep the readers up-to-date with the progress in the academic as well as the corporate sphere of electronics. We have tried to keep a good balance between technical and non technical matters because we believe that "In phase" is for everyone.

Starting this issue, we have added two new columns "Consumer Electronics"- bringing to you the latest in the field of gadgets, and "Open Source"- an effort to promote open source softwares. The issue features an invited article on "Computer Vision for Car Industry" by Prof. Reinhard Klette, University of Auckland. The cover article features Ultra Wide Band Communication -The next generation wireless communication. We have also included a fun column titled "What not to do in an interview" and "ECEgiri by Merath" in keeping with our tradition.

The first year has been remarkable both in terms of the success and the appreciation of In Phase. To ensure that we keep moving in the right direction, I urge you to write back to us with your articles, comments, and let us know how we are doing.

I hope you enjoy this issue.

Talla Vamsi
Editor-in-chief
(Final Year B.Tech)

Call for Articles

We are looking for technical as well as non technical and experience sharing articles from students, alumni, faculty members and industry professionals. Articles pertaining to completed/ongoing projects, views, discussions, topic introductions, applications and professional or educational experiences are most welcome. Articles must be 1500 - 3000 words in length and should be written keeping in mind the diverse range of targeted audience including people with little as well as extensive knowledge of electronics. Please email us at inphase@iitg.ernet.in for any clarifications or suggestions.

Open Source: What, Why and How?

Dr. Amit Kumar Mishra

The readers from the institute might already have read a few mails from me insisting upon something called Open Sources. May be..... a very distant "may be", some of you would have genuinely wandered what exactly this guy is trying to say. Or may be this guy is some agent of some organizational propaganda machine! However, I am truly delighted that some indeed tried to see the point behind this entire hullabaloo regarding open source. And here is the first essay of a series of essays that will come in InPhase on open sources. In this particular essay I will touch upon what after all is an open source code. Secondly, why anyone should go for it and if anyone wants to use open source codes, where to find them. I shall end with a futuristic remark on the possibilities open for us.

I hope all of you must have heard of Linux. One of my old professors used to comment that Linux is like an Indian metro! On the first sight you will by all chance hate it. But once you put up with it for a few weeks, you can't do without it! Linux is one of the most important open wares used these days (though let me state that not all cousins of Linux are open and the degree of openness also varies). Open source codes or open wares, the way I define them are softwares where the copy right gives you the right to copy! Started in 1983, by late 90's the term open source software or OSS as they are sometime called, was a fairly accepted term. There are many different licensing standards available at present. Most of these licenses allow you to see and modify the source codes. This is a subtle way OSS is different from free software. Free software may not give you the source codes, and sometimes they may restrict you to use the tool only for non-commercial purposes. OSS has no such limitation. You can look at the open source initiatives as a mass movement of the netizens against the IT tycoons! Slightly melodramatically I may say that if you are part of the movement, you have nothing to lose but your chains!

Why should anyone use OSS? One of the greatest inhibitions for the OSS skeptics is that open wares are mostly unsupported. Which means a program or a tool is not guaranteed to work. And even if it works it's not guaranteed to give the right output! Sounds a bit scary, especially if you are doing something new and you don't know beforehand about what should be the output. Secondly, if you get a doubt or an issue with the tool, then there mostly is no one-point help-zone. These are the main drawbacks of open-wares that mostly intimidate weak-hearted people!! But of course for the mature strong guys there is no stopping! We have to stop being spoon-fed at some point or other. We are engineers and scientists, and hence we should be developing our own tools. Hence there is no escaping saying that you can not get consolidated help-files. Now coming to the plus points of OSS, they are many. First of all they are FREE. And I am sure there is nothing

cheaper than free! Secondly, you get the source codes with the tool, which means you can always use them to have a better understanding of the tool and by all chance contribute a bit yourself. Many times while using Matlab I felt if only I could slightly modify a certain function, things will be much more favorable.

Now I have all the independence. So who is in charge? YOU are in charge! Lastly, there is a sort of fellow feeling in using open wares. Let me give you a crude comparison!

In many companies you get some company shares, which makes you feel as if you own a part of the company. Similarly I feel there is a feeling of ownership in using OSS. It is your own tool, may be in a very limited sense…

Now coming to where to find them; again the sources are many. Well established OSS sites may offer it from their own website, e.g. SciLAB. But mostly the tools are released in http://sourceforge.net/ . In fact if you think there might be a tool related to certain area, you just go to sourceforge and run a search. I personally have found loads of tools on virtually everything related to the broad area of electrical engineering (which includes the present day CSE, ECE and all such cousin areas).

From the next issue of InPhase, you will get an overview of one OSS per issue written by the users. I take this opportunity to invite any reader who has used any OSS, to write a small article on his/her experience with the tool and submit it to the editors.

Lastly one plea to all the readers: I am making the presumption that most of you are students (past or present) in India. One field we are lacking in our nation is innovation and creativeness. OSS is a great area to show your creativeness and harness your innovative aptitude. I am pretty confident that with InPhase in for the cause, we will soon have a fruitful drive in the Indian institutes and in IITG in particular, towards contributing something to the world called free-wares. And mind you, contributions don't come out of the blue! Even though Kekule may claim the should not miss the point that a person can dream of a certain thing only when he/she is deep into it. Hence, contribution comes from involvement, and involvement comes from working with openware. As the prize is almost nothing in most cases, one needs true *junoon* to make a contribution in OSS. OSS is not a practice or a hobby, at he saw the benzene structure in dream, wit's a cult! Lets start that cult in the campus!

(Dr. Amit Kumar Mishra is Assistant Professor of ECE Department, Indian Institute of Technology Guwahati)

GUEST ARTICLE

COMPUTER VISION FOR THE CAR INDUSTRY

Reinhard Klette and Zhifeng Liu

Reinhard Klette is professor of information technology in the Department of Computer Science at The University of Auckland, New Zealand, and director of CITR Tamaki (Centre for Image Technology and Robotics). His research interests are directed on theoretical and applied subjects in digital geometry and topology, shape recovery, panoramic imaging, medical imaging, and videobased applications. He has coauthored books on digital geometry (with A. Rosenfeld), computer vision (with K. Schlüns and A. Koschan), image processing operators (with P. Zamperoni) and Panoramic Imaging (with Huang and Scheibe). He is also the associate Editor of IEEE PAMI (rank 3 of all computer science journals worldwide, Dec. 2004); given keynotes at international conferences and chaired/co-chaired more than 20 international conferences or workshops in computer vision and robotics (since 1981). For more details, see http://www.citr.auckland.ac.nz/~rklette/.

This report provides a brief and informal introduction into stereo and motion analysis for driver assistance. Stereo and motion analysis play a central role in computer vision [10]. Many algorithms in this field have been proposed and carefully studied; see, for example, [2, 14] and the website vision.middlebury.edu for stereo and optic flow algorithms.

1 *Stereo Pairs and Distance Maps*

In short, a stereo pair of images allows to identify pairs of corresponding points, and those allow to calculate the distance between the projected point in the three-dimensional world and the recording cameras.

The vehicle which is used to host the stereo camera platform for capturing stereo image sequences is called the ego-vehicle. Figure 1 illustrates an example of a stereo video sequence, recorded and processed at Daimler AG, Germany.

Fig. 1. A stereo pair captured by two cameras, installed on the windscreen of an ego-vehicle.

After years of research on ego-motion estimation [1], the automobile industry has all the tools for producing rectified (i.e., geometrically corrected) stereo image sequences.

Calculated distance values can then be visualized in a distance map, where gray values represent various distance levels. Figure 2 illustrates two depth maps as calculated in 2007 by a 4th year student (Darren Troy) at The University of Auckland. The used stereo video sequence is the same as illustrated in Figure 1.

Typically, we are interested in dense (approximate) distance maps rather than in sparse depth data. Difficulties in finding corresponding points in pairs of stereo images do have many reasons (see, for example, [10], also for some of the earlier algorithms which have been designed for stereo analysis.

We illustrate two examples of stereo analysis approaches. [4] proposed a special dynamic programming approach, basically for a pair of stereo images, in which the disparity matrix of a line is used as additional input for the calculation of the disparity map of the subsequent image line. This can now be generalized when having sequences of stereo pairs: additionally, the disparity matrix of the same line, but for the previous stereo pair, is also used. See Figure 2 for a result. Using this approach of propagating results within the same pair of images, and also along the time scale. This allowed for a substantial improvement. Figure 3 illustrates another extension of a well known approach due to the specific properties of the given image sequences. Here, belief-propagation was not performed on the given image pairs but on Sobel edge images of those. See [6] for details. See [15] for another example of a technique for calculating distance maps.

"Fusing stereo and motion analysis results together (i.e., 3D plus 3D, called 6D vision), into one consistent interpretation of the scene, may allow to extract objects and their movement."

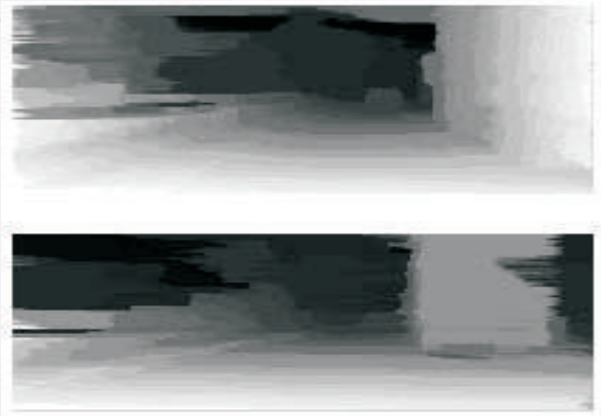

Fig2 Two distance maps calculated by applying a dynamic programming stereo algorithm

2 ***Downloadable Stereo Sequences***

Daimler AG Germany [5] provided in 2007 seven stereo sequences for research purposes. They are captured with a calibrated pair of night-vision cameras near Stuttgart. Each sequence contains 250 or 300 frames, and features different driving environments, including highway, urban road and rural area. The ego-motion of the stereo platform has been correctly estimated and compensated [1], so that the view angle is always (about) parallel to the horizon. Furthermore, camera calibration is used for geometric rectification, such that image pairs are characterized by "standard epipolar geometry" [10]. A few "black strips" around borders of images are caused by this compensation or rectification. Figure 1 showed an example of one stereo pair in such a sequence.

The resolution of images in these sequences is 640×481. They are saved in PGM grayscale format, and available in both big endian and little endian, for convenient usage in different software, on www.citr.auckland.ac.nz/6D/.

3 ***Motion Analysis***

Motion estimation for these sequences should provide information about move-ments of objects (speed, trajectory) as relevant for each sequence, often for identifying possible courses of conflict. Motion analysis starts in computer vi-sion typically with optic flow calculation [7,8, 11], assuming that this leads to approximate calculations of the local displacement (of corresponding points be-tween two continuous image frames). However, a few experiments with those sequences will reveal immediately the difficulty in applying optic flow algorithms successfully to those sequences, which are often blurry or fine textured (e.g., in trees).

Fig 4.Left: Canary edge Image (Inverted) Right: On those edge pixels where the optic flow magnitude exceeds threshold. Direction of optic flow is shown by hue, and length of vector by intensity(image also inverted)

Two typical basic assumptions behind optic flow algorithms are as follows: the brightness of the scene should be about constant, and local displacements must be small. However, both are not satisfied in those sequences. For example, the illumination changes often in one sequences, due to shading patterns of trees, or there is even different lighting for left and right camera. Object segments also move often very fast within images.

Fig 3.Edge Detection followed by belief-propagation allows to calculate this dense depth map

Again, sequences allow stabilization of results along the time scale (see, for example, [9]), and larger motion vectors can also be analyzed by using hierarchical approaches (see, for example, [12]). It is also recommended to apply relatively "advanced" edge detection first (such as a Canny edge detector, and not just. the Sobel operator), and then analyze motion vectors only along those edges. See Figure 4 for an illustration (results by Xuan Guo, 4th year student in 2007 at The University of Auckland).

4 ***6D Analysis***

Fusing stereo and motion analysis results together (i.e., 3D plus 3D, called 6D vision in [5]), into one consistent interpretation of the scene, may allow to extract objects and their movement. An intersection approach for fusion is to take all those pixels where motion information is evaluated as being reliable, and use the depth values at those pixels for combining motion and depth (or, vice-versa). However, this only allows to label very sparse pixel.

Another idea is to segment depth maps, and to assign uniform motion vectors to those segments. The use of Kalman filtering (see the book [7] or the online-tutorial [16]) is recommended to "smooth" and stabilize the movement of extracted features, and to generate more precise estimates. For example, [3] proposed this for the tracking of detected feature points, and [5] generalized this for an intersection approach.

Figure 5 illustrates a simple background removal strategy which uses camera calibration data which are provided for the seven test sequences (with respect to the camera's coordinate system, which is registered with respect to the car's coordinate system):

The camera's coordinate system is left handed: looking into driving direction along the z-axis, the x-axis points to the right, and the y-axis to the sky. The car coordinate system to camera coordinate system transform is the translation defined by "latpos", height, distance, followed by a rotation defined by tilt, yaw, and roll. A positive tilt means looking downward, a positive yaw means looking to the right, and a positive roll means clockwise.

Static background is anything what moves just (about) opposite to the move-ment of the host car. For calculated motion vectors, only those remain where the frame-to frame motion and the related depth information does not indicate a background situation. These are shown as dark dots in Figure 5, which resulted from a 2007 project of Xuan Guo, Zhongxia Ma, and Hao Xue, Auckland.

Fig 5. 6D Vision result, showing only moving object point which are not classified as being static background Clustering of shown dots allows identification of those three cars and of the bicyclist.

5 Outlook

Research on stereo sequences as described is a current hot subjects at many research centers of car companies worldwide, and also at academic institutions. See the .enpeda.. project, www.citr.auckland.ac.nz/projects/research/, for example. Driver assistance based on computer vision is starting to impact safety and performance features of modern cars. Research tasks are manyfold, and will define a vivid area of research for the next couple of years.

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ULTRA WIDE BAND

The future belongs to the Un-Wired

Shyam Agarwal,Harpreet Singh
& Vishal Bhola

Imagine a world, if you would, without wires. No more telling hard to figure out the uncoiling technique about your earphones, no more clumsiness about the wires hanging from your device to the other one. It is a pretty picture, we know, and this has been made possible by the technology that will decide the course of our coming times. The name of that magic is UWB, short for Ultra Wide Band.

Ultra-Wide Band technology is a rapidly emerging wireless technology that gives data rates that crosses all the barriers with current technologies such as 802.11a, b, g, WiMax and the like.As such this new wireless standard is likely to gain a significant market share in the years to come. It is gaining considerable acceptance and being proposed for use in a number of consumer areas. At one side where Bluetooth, Wireless USB and other developing solutions are in progress state, there in other areas where use of Ultra Wide Band Technology alone would be colossal.

Taking a brief look at this amazing technology, we can say that UWB is a form of extremely wide spread spectrum where RF energy is spread over gigahertz of spectrum. This technique is using pulse coded information at a bunch of center frequencies in logical connex , we come to know that UWB is nothing but typically modulated pulse trains of very short duration, sometimes even less than 1ns.

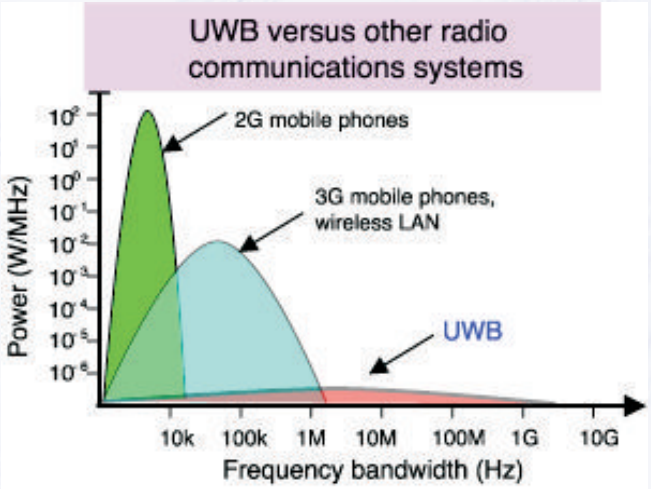
- UWB is a modulated transmission with more than 20% fractional bandwidth or at least 500 MHz of bandwidth.
- The UWB spectrum is between 3.1 and 10.6 GHz.
- Energy spectral density is limited to –41.3 dBm/MHz Bandwidth.

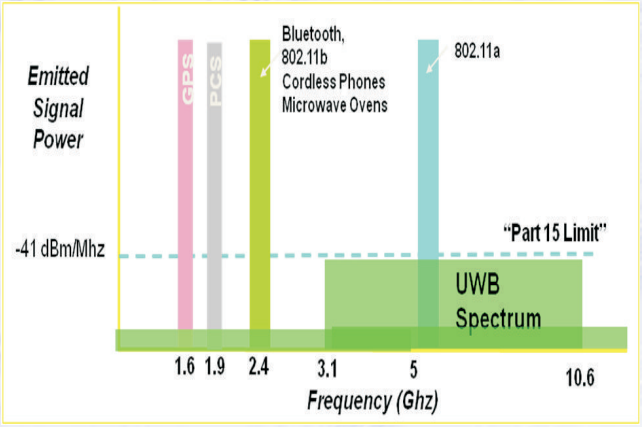
in the figure on the right we see a comparison of the UWB and other communication systems. Being true to its name, the UWB, as we can see, is occupying a large bandwidth (~10^9 Hz).

Owing to such a high bandwidth, UWB is able to perform data transfers at a lightning speed and at a much lower cost than any of the current communication systems incur.

Working of the UWB

UWB is the extension of existing technology that is known as spread spectrum. “Spread spectrum” are techniques by means of which the energy of a signal is intentionally spread in the frequency domain, which gives us a signal having a much wider bandwidth. The spread spectrum techniques are used for various reasons. Jamming the communication systems is the main motive that this technique serves. Finding its use mainly in the army, Spread spectrum is quite useful in transmitting signals and messages safely. They are also used for detecting the enemy signals. Because the signals at any particular frequency are not complete, the enemy is not able to decode the entire message. Technically speaking UWB is an extension of spread-spectrum concept as it varies radio pulses amplitude, polarity, timing and other characteristics to form a data stream that can be carefully controlled using packets and error-correction methods. A UWB data transmission may involve billions of pulses spread over several gigahertz. The corresponding receiver then translates the pulses into data by listening for a familiar pulse sequence sent by the transmitter.





The Ultra Wide Band wireless communication technology does not use a single frequency, which enables it to have several potential advantages over single-frequency transmissions. For one, it can transmit data in large bursts because data is moving on several channels at once. Another advantage is that it can share frequencies that are used by other applications because it transmits only for extremely short periods, which do not last long enough to cause interference with other signals. UWB uses very low-powered, short-pulse radio signals many times in the picoseconds duration range to transfer data over a very wide range of frequencies. A UWB transmission involves billions of pulses spread over several gigahertz. The corresponding receiver then translates the pulses into data by listening for a familiar pulse sequence sent by the transmitter.

UWB - the FCC face of it

To date the FCC in the USA has approved UWB for indoor and short range outdoor communication, but with restrictions on the frequencies over which the transmission can spread as well as the power limits. This will enable the UWB transmissions to communicate successfully, but without affecting existing 'narrowband' transmissions

According to FCC, UWB transmissions can legally operate in the range 3.1 GHz up to 10.6 GHz, but with the constraints of power that is -41dBm/MHz. Additionally, the transmissions must occupy a bandwidth of at least 500 MHz, as well as having a bandwidth of at least 20% of the centre frequency. To achieve this last requirement, a transmission with a centre frequency of 10 GHz, for example, must have a bandwidth of at least 2 GHz. Consequently, this feature of UWB provides channel capacity at short range that minimizes the possibilities of interference. Very low power density transmission means that the interference to other services will be negligible that are not noticeable to existing transmissions. Additionally the lowest frequencies for UWB have been set above 3 GHz to ensure they do not cut across bands currently used for GPS, cellular and many other services.

The FCC's current rules (issued on February 14, 2002) allow only the following:

- Vehicular Radar Systems: These devices are able to detect the location and movement of objects near a vehicle, enabling features such as near collision avoidance, improved airbag activation, and suspension systems that better respond to road conditions.
- Medical Systems: These devices must be operated in the frequency band 3.1-10.6 Ghz. A medical imaging system may be used for a variety of health applications to “see” inside the body of a person or animal.
- Through-wall Imaging Systems: These systems must be operated below 960 MHz or in the frequency band 1.99-10.6 Ghz. Through wall imaging systems detect the location or movement of persons or objects that are located on the other side of a structure such as a wall.
- Construction applications, including through-wall imaging systems and ground-penetrating radar.
- Communications devices, such as high-speed home or office networking, provided that the devices are designed for indoor use; outdoor use is restricted to handheld devices engaged only in peer-to-peer operation.

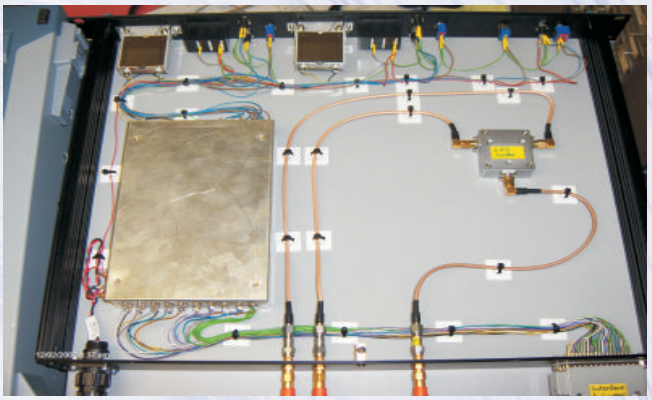
(FCC press release on February 14 2002

http://www.fcc.gov/Bureaus/Engineering_Technology/News_Releases/2002/nret0203.html)

If the FCC relaxes its rules in the future, wireless digital home, offices, institutions, factories, military - everywhere people will be enjoying the wireless connectivity of every consumer electronics device.

Wireless Freedom brought closer: Pros for UWB

As we know we are imposed with certain restrictions on the power of transmission of UWB signals, we can use the UWB signals to connect only short range devices. However we can still complete our dream of digital home. Requirements for the digital environment include high-speed data transfer for multimedia content, short-range connectivity for transfer of data to other peripheral devices, low power consumption in repercussion to limited battery capacity and for saving power, and low complexity and cost due to market pricing pressures and alternative wired connectivity options. We can create enormous scenario with the unwired digital home. Transfer of video from a camcorder to a mobile or PC is one scenario. Another perspective is the ability to view photos or slide show from the user's digital still camera on a larger display. Removing all the wires to the printer, scanner, mass storage devices, and video cameras located in the home office and use them by keeping them according to your space choice is another possible scenario. This all thing is possible with UWB, Because UWB has the ability to penetrate walls and transmit data at rates up to 1 gigabit per second, it is could have the ability to become the center of all communications within a single location, Besides its blazing speed, UWB offers some other benefits worth considering. Because UWB transceivers use low power short burst radio waves, they do not take as much planning to build. This makes them extremely easy and not costly to build compared to typical spread spectrum transceivers.UWB systems also have very less power consumption, around one ten-



thousandth of that of mobile phones. This makes UWB practical for use in smaller devices, such as cell phones, PDAs and MP3s that users carry at all times.

Because UWB operates at such low power, it has very less interference impact on other systems. UWB causes less interference than traditional radio-network solutions. In addition, the relatively wide spectrum that UWB utilizes significantly minimizes the impact of interference from other systems as well.

How will UWB impact the industry?

"Connecting people" will be rejuvenated by UWB to "connected people".

Till now we talked about the UWB technologies and its possibilities of application. But can you say what consequences will this have on current industry? Let us have a look into this. Ultra wide band (UWB) modulation is beginning to take a stronger foothold in the wireless networking industry. UWB technology is allowed to use in very restricted stage, still it has the potential to root out every wireless "area network," from wireless personal area networks (WPANs) to wireless wide area networks (WWANs). UWB will most likely be the preferred technology for wireless personal area networks, replacing Bluetooth's 1-2Mbps bandwidth with 400-500Mbps data rates.

Yet UWB is not in an immediate position to take over the WLANs. This has to cope with the power limitations imposed by the FCC, but even if the limitations are smoothened a bit, it could take at least five years before UWB will become the all-rounder in the wireless LAN market. Whoever has invested the money recently in the existing wireless technologies may face severe downfall in future.

UWB will provide cheap, fast wireless access systems, which would solve the interference issues with the current spread spectrum-based Metropolitan Area Networks (MANs). These UWB systems could be set up in village areas, bringing never seen before high-speed connectivity to those users. **"Connecting people" will be rejuvenated by UWB to "connected people".**

Right now the best application for UWB is home multimedia networking systems, where large bandwidth is necessary. UWB could interface wirelessly with every multimedia consumer electronics device in your home without using any cable. Digital cameras and camcorders could wirelessly stream images and video to your Television or Personal computers, DVD players and TV's could stream videos throughout your home or office providing the freedom to adjust them anywhere according to space and comfort. Flat screen monitors could wirelessly be connected to computers, DVD players, or any other source you desire. UWB will very likely revolutionize the home multimedia scene and eliminate the mounds of tangled wires found behind home entertainment centers.

Technological Challenges: Cons against UWB

"The greatest technological challenges associated with implementing UWB are performance and power consumption," says Dr. Roberto Aiello, Founder, Chief Technology Officer, Fantasma Networks Inc. (Palo Alto, CA).

As UWB is in its birth stage and it also needs proper shaping and sizing for consumer electronics, commercial wireless networks raise the same types of technological challenges of performance and power as all wireless technologies face.

Pointing out the one major problem with UWB technologies is Multi-path interference. Multi-path signal will create additional signal gain for UWB networks and it will act as a hindrance to existing wireless techniques. The main concern about UWB was whether or not they would interfere with existing RF systems that provide essential military, aviation, fire, police, and rescue services. FCC, the regulatory body on UWB researched for two years evaluating the proposed UWB specifications and concluded that there will be no major interference.

But the real problem will be solved when we will be allowed to use higher power systems. Then only we can use UWB's magical power at its extreme. The FCC envisages to research on this issue in the later years and to have a closer look at higher power systems. Until then, you are limited to UWB devises with short range propagation.

Summary

Undoubtedly in the digital home, offices, institutions of the not-too-distant future, people will be enjoying the photos, music, video, data and voice transference among networked consumer electronics devises. PCs and mobile devices throughout the area and even remotely can be accessed together and all with a spellbound transfer speed. Users will be able to stream video content, photo slide show, and live video from indoor/outdoor surveillance system, from a PC or consumer electronics (CE) device -- such as a camcorder, DVD player or personal video recorder -- to a flat screen HDTV (high-definition television) display without the use of any connectors and cables. You will be surrounded by invisible and high speed connectors to all electronics devises that will be accessible on one click. With the enormous applications the UWB technology will be the technology of near future. Researchers and engineers are working for fission in wireless networks speed through UWB. Consumer electronics industries will have the golden opportunity to choose UWB as a physical layer for device manufacturing in the PC, mobile etc. But for this a standard for the common UWB development platform have to be maintained. By doing so, they will be able to take advantage of the low power and high bandwidth these technology provides.Intel researchers are working on a variety of UWB technologies, that includes a platform for next-generation development efforts, and believe it will be a critical step in enhancing advanced communications for a wide range of uses in the future.

(Shyam Agarwal, Harpreet Singh & Vishal Bhola are 3rd year B.Tech students of ECE Department)

INTERNSHIP

Final Year student Rahul Sangwan shares his internship experience @ Cosmic Circuits, Bangalore

My intern at the end of the third year was in a company called Cosmic Circuits, located in Bangalore. By describing my intern there, I want to tell you WHY I chose to do an industrial intern and whether you would want to do one.

By the beginning of the sixth semester, I was pretty sure that I wanted to work in a hardware related job. I liked dealing with circuits and was not a great fan of DSP. I was pretty sure that I did not want to go in for higher studies, the reason being that frankly I was tired of giving exams and going to labs and preparing reports. So that meant either getting a job or pursuing a management degree. Finally I decided that I wanted to do a job in the core sector in analog circuit design. Just one catch with that. Only ONE analog company had visited our campus for placements the previous year, and the year before. Two companies having come the year before that. Also we had only one basic analog course, in the third semester, in our entire B.Tech course. If I wanted do work in my chosen field then I had to do something on my own, and quickly.

Internships are not compulsory in our dept.. Hence the placement cell is not obligated to help us get interns. That meant that I must either apply myself directly, or find contacts in some company. I tried the latter route, and although I was able to locate many contacts a problem came up which I had not anticipated. Companies were not interested in calling me not because of any lack of qualifications on my part, but because I could only come for 3 months. Shocked by this revelation, I learnt my first valuable lesson – there are a LOT of other engineering colleges and students in India besides the IIT's. And these colleges sent their students for 6 month interns. So these people could be trained longer than me and hence were more useful to the company. Anyway, after some time I was interviewed by Cosmic Circuits and was fortunately offered a 2 month intern.

Cosmic is a 3 year old company which designs analog chips. These include ADC's, DAC's, PLL's, power management chips such as buck-boost converters and a lot of other blocks. My stay there was an excellent experience and an eye opener. I learnt that analog was not a dying art. Infact the demand for analog chips was growing BECAUSE of the growth in digital. I learnt that working in a company is not about sitting in a cubicle all day long and waiting for the hour's hand to point to 5. There are people there just like people here in college, and life is never boring. And because of the fact that you are being paid, you are more dedicated towards your work and you have more freedom. There were frequent sporting events and outings. Overall people in a company display far more passion for their work than what you see in a college. I realized that you don't HAVE to have higher qualifications to move up the ladder, and that Phd's can earn a lot of money in India also. It was very comforting to see that Indian companies are doing very high quality work these days, and it is not necessary to settle abroad to find challenging work. Another very important fact rubbed into me was that there are other engineering colleges besides us. And though we might have forgotten about them, they have not forgotten about us. In light of that fact our education sometimes seems very deficient.

Although we frequently read in the newspapers that India is developing rapidly, it is only an intellectual appreciation. It is only when you go to a city such as Bangalore as a working professional that you get to see and appreciate the wealth created by the industry. In parting there is one thing that I want to tell you. Don't be in a hurry to go for higher studies or pursue management degrees. Try and experience the industry that you have always dreamed of joining. Things there are often different from the image you might have constructed by sitting in classrooms here.

DISPOSABLE CELL PHONES !

Ramnik Singh Malhi

How many of you have thought of dumping your cell phone when you have a fight with your friends or throwing your mobile in despair after not getting any darn connection. Well you needn't think twice before doing the same with disposable mobiles in your hands. In the past, people have come up with many disposable products such as razors, diapers, cameras, etc. Cell phones can now be added to this list.

"We have printed a phone"--These were the words of none other than a woman named Randi Altschul who with engineer Lee Volte, patented a disposable cell phone and the Super Thin Technology (STTTM) used in it and many other intended products. You may be astonished to hear some "woman" inventing an electronic technology which is proving to be a milestone in electronic innovation.

> "The Circuit itself becomes the body of the unit and it becomes its own built-in tamper proof system because as soon as you cut it open,you break the circuits and the phone goes dead."

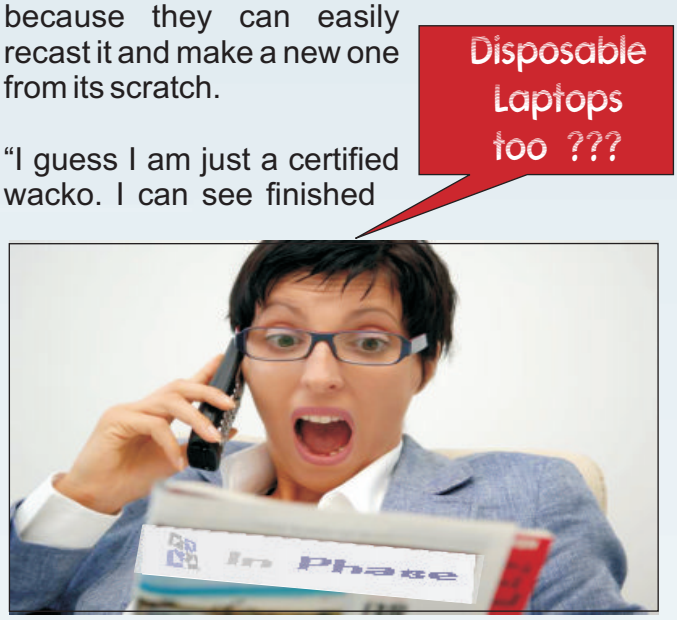
It was in 1996 that idea about the world's first disposable cell phone struck Altschul. While she was driving down the highway and talking on her mobile phone one day, she became frustrated as her connection became weak and the conversation cut out. She wanted to throw her cell phone out the window. Suddenly, this creative idea like a lightning struck her brain. Why not create a disposable cell phone that people could buy and use until an allotted amount of time was used up, and then throw it away? She was already inclined towards making toys and this mentality helped her to think this way as children tend to use an item for a fairly short period of time before they move on to other toys and throw their old ones out.

Paper Substrates have been used to make the entire phone body, touch pad and even the circuit board. The cell phone is of the size of a mere credit card(2 by 3 inches).It is made by printing the cell phone circuitry onto a paper substrate that is sealed and laminated. It uses an elongated flexible circuit which will be one piece with the body of the phone, part of the patented STTTM technology. The ultra-thin circuitry is made by applying the metallic conductive inks to paper. Conductive inks are typically made of metallic particles such as silver or copper flakes in a retaining matrix, or carbon flakes/particles in a retaining matrix. Traditionally, the matrix was a ceramic such as glass frit, but now increasingly it is a polymer (known as Polymer Thick Film, PTF).The retaining matrix is not conductive or weakly conductive - once printed the matrix needs to be reduced so that conductance through the material occurs by conductive particles in contact with each other, which is done by curing.

"The Circuit itself becomes the body of the unit" and it "becomes its own built-in tamper proof system because as soon as you cut it open, you break the circuits and the phone goes dead.

This phone will be able to make outgoing calls only. The buyers will be able to add phone minutes with their credit or debit card until unless non- replaceable battery doesn't die.

Altschul and Volte have also created a paper laptop computer which will be available to the people at just twenty dollars and will serve as an internet access device. The STTTM technology has opened up the potential for creating countless new electronic products and countless cheaper versions of pre-existing products. If STTTM is all that it seems to be, this technology should be considered a milestone in electronic innovation. Most part of the cell phone will be made of paper products and hence different beautiful images can be printed on it. So don't be astonished to see a pizza hut advertisement on it. The paper products can be recycled and one can get some rebate after returning it back to the company when its working life has finished because they can easily recast it and make a new one from its scratch.



"I guess I am just a certified wacko. I can see finished products in my head as if my mind is a catalog and I just make them happen. My greatest asset is that I don't know anything, so I have no boundaries. Then I surround myself with people who are a lot smarter than me and we make it happen," Altschul, founder of a company called Dieceland, said. Randice-Lisa Altschul is a proof that one should not back away from his/her dreams even when one doesn't have any darn idea about that field. If you have the right motivation to achieve your goal, you will definitely succeed in it. With little education and training, the New Jersey toy inventor began creating games and toys for children and adults in 1985.By the time she reached 26, she was a millionaire. She aims to become the next Bill gates with her phones which will be priced as less as $10.

Eventually competing companies like Hop latched on to Altschul's idea and began making

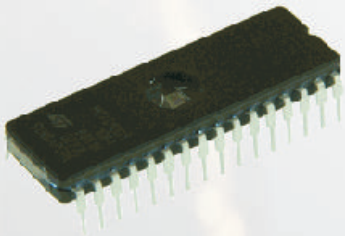
disposable cell phones of their own. Thus, Altschul's phone is yet to be distributed. But she is known as the first person to put forward this novel idea. In 2002, the Phone-Card-Phone was named Product of the Year by Frost and Sullivan.

(Ramnik Singh Malhi is a 3rd yr student of B.tech, ECE, IIT Guwahati)

(For more information, please visit: http://inventors.about.com/library/weekly/aa022801a.htm)

Nomenclature of Ic's

Vishal Bhola



Every person who has ever been associated to Electronics would have come across "IC's". Each IC has a unique designation, like 54S00, 74LS32 and so on. Have you ever wondered what exactly the numbers on an IC convey rather than just the logic operation that it performs?? If yes, then the following article will clarifiy all your doubts regarding nomenclature of an IC.

Upon simple observation, you will find that designation of an IC could be one of the many designations and these can be explained as follows: -

The first two digits, i.e., 74 or 54, indicate whether the part is a commercial version or a military version. The digits 74 imply a commercial version of the IC while the digits 54 imply a military version (The military version of the ICs provides the same functionality but has more stringent specifications and is guaranteed to work over a wider temperature range and can handle a larger voltage range, etc).

The middle letters, e.g., LS, S, etc., in the IC designation specify the technology and type of logic used in the manufacture of the IC. The widely used logic types are TTL (transistor-transistor logic) or CMOS (complementary metal-oxide-semiconductor), which specify the type of transistors used inside the chip. Following table lists most of the common types of digital IC's.

Nomenclature	Characteristics
74	Original TTL technology
74S	TTL employing Schottkey transistors
74LS	TTL employing Schottkey transistors. Less power consumption
74AS	Advanced Schottkey TTL. Twice as fast as the "S" series
74ALS	Advanced Schottkey TTL. Less power consumption
74F	Fast TTL (between 74AS and 74ALS)
74HC	Employs high-speed CMOS transistors. For use with CMOS-only circuits
74HCT	High-speed CMOS with TTL -compatible logic levels
74VHC	Very high-speed CMOS
74VHCT	Very high -speed CMOS with TTL compatibility

The ending of a 7400 series IC consists of two or three digits which indicate the number and functionality of the gates. The ending "00" indicates that there are four 2-input NAND gates in the IC. The ending "20" indicates that there are two 4-input NAND gates in the IC.

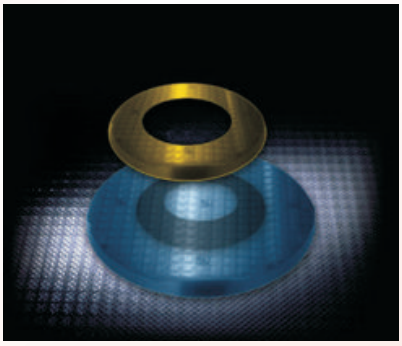
Thus, the IC number 74LS00 signifies that it is a commercial version of 2-input NAND gate IC, which employs low-power Schottkey technology.

(Vishal Bhola is a 3rd year student of B.Tech ECE, IIT Guwahati)

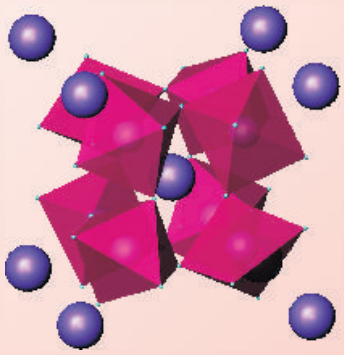
Holy Grail of the modern era: Superconductivity @ Room Temperature

Harpreet Singh

Ever wondered how would it feel to have the power of the invincible in your hands? How would it feel to hold the “Holy Grail” in your hands and control the world with it? Thanks to some ground breaking work done by some of the great scientists, this wondering has been turned into a reality. YES! I am talking about the property of superconductivity, now attainable at room temperature.



Let us have a look at a brief history of Superconductors, the principles underlying this phenomenal discovery and some possible theories that helped to make this project a success. Superconductivity is a phenomenon occurring in certain materials at extremely low temperatures, characterized by exactly zero electrical resistance and the exclusion of the interior magnetic field. The electrical resistivity of a metallic conductor decreases gradually as the temperature is lowered. However, in ordinary conductors such as copper and silver, impurities and other defects impose a lower limit. Even near absolute zero a real sample of copper shows a non-zero resistance. The resistance of a superconductor, on the other hand, drops abruptly to zero when the material is cooled below its "critical temperature". An electric current flowing in a loop of superconducting wire can persist indefinitely with no power source. It occurs in various kinds of materials like Tin, Aluminium, some alloys and even in some heavily doped semiconductors. It does not, rather, occur in noble metals like Gold, Silver etc. neither does it occurs in most ferromagnetic metals.



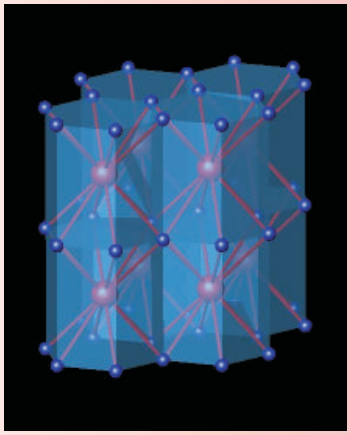
The history of superconductivity dates back to the early 20th century when it was first discovered in 1911 by Heike Kamerlingh Onnes who stumbled upon this while working on the resistance of solid Mercury at cryogenic temperatures using recently discovered liquid Helium as refrigerant. At 4.2K he observed that the resistance abruptly disappeared. In subsequent decades, superconductivity was found in several materials. For instance, in 1913, Lead was found to be behaving as a superconductor at 7K, and in 1941 niobium nitride was found to superconduct at 16 K. The next important step in understanding superconductivity occurred in 1933, when Meissner and Ochsenfeld discovered that superconductors expelled applied magnetic fields, a phenomenon which has come to be known as the Meissner effect. In 1935, F. and H. London showed that the Meissner effect was a consequence of the minimization of the electromagnetic free energy carried by superconducting current.

In 1950, the phenomenological Ginzburg-Landau theory of superconductivity was devised by Landau and Ginzburg. This theory, which combined Landau's theory of second-order phase transitions with a Schrödinger-like wave equation, had great success in explaining the macroscopic properties of superconductors. In particular, Abrikosov showed that Ginzburg-Landau theory predicts the division of superconductors into the two categories now referred to as Type I and Type II.

In the same year Maxwell and Reynolds found that the critical temperature of a superconductor depends on the isotopic mass of the constituent element. Critical temperature is the temperature when a material loses its magnetic field and becomes a superconductor. This important discovery pointed to the electron-photon interaction as the microscopic mechanism responsible for superconductivity.

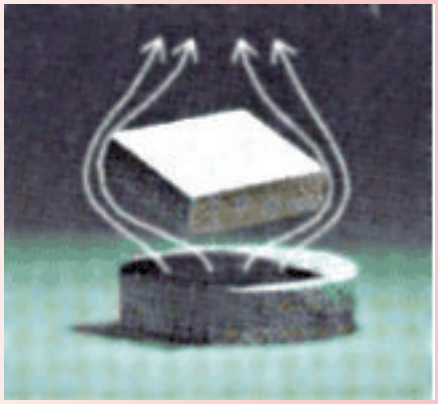
Earlier, as we can see, superconductivity was observed at extremely low temperatures. No one had ever ventured into the post-zero zone of superconductivity. However important developments took place ever since it came to be known as “High Temperature Superconductivity (high Tc)” after its discoverers Johannes Georg Bednorz and Karl Alexander Müller were awarded the Nobel Prize in 1986 for discovering a superconductor LaBaCuO. High temperature superconductors were discovered recently recording a critical temperature of 138 K by cuperate-pervoskite. But no superconductor worked above about 130 Kelvin (-143 ¡C). Superconductivity at such low temperature was neither useful for the academician nor for the industrialists. Then came the concept of Superconductivity at Room temperature. A direct implication of this concept was that if a material could carry current with no resistance at room temperature, no energy would be lost as heat, meaning faster and lower-power electronics. And electricity could be carried longer distances with 100 per cent efficiency.

Neither 1 nor 2, but 3 instances have been reported where the superconductivity at room temperature barrier has been breached. The first instance came in to picture when Guo-meng Zhao and Yong Sheng Wang of the University of Houston in Texas found subtle signs of superconductivity in tiny tubes of carbon at temperatures stretching up past the boiling point of water. The tubes were the first superconductors to work at room temperature. These tiny Carbon tubes proved to be what maybe called as the path breaking success. These tubes called “multiwall carbon nanotubes” are typically a millionth of a metre long, several billionths of a metre in diameter and with wall a few atoms thick. These nanotubes cling together in oblong bundles about a millimeter in length.



The second of such a discovery comes from The University of Brookhaven. Scientists there uncovered the truth during studies of directional dependence in the material's electron-transport and magnetic properties. In the 2D plane, the material acts as a superconductor - conducts electricity with no resistance - at a significantly higher temperature than in the 3D state. It was made possible by using a particular arrangement of electrons known as “stripes”.

The third one comes from a group of scientists working in Croatia claim to have found a material with no electrical resistance at room temperature. The scientists say that current will flow effortlessly through their material, a mixture of lead carbonate, and lead and silver oxides, at up to about 30°C.



The properties of superconductors vary from material to material and are dependent on the substance they are made up of. Some of these properties include Heat Capacity and Critical temperature at which superconductivity is destroyed. This is not all. Some of the properties are independent of the material that the superconductors are made of. For instance, all superconductors have *exactly* zero resistivity to low applied currents when there is no magnetic field present. The existence of these "universal" properties implies that superconductivity is a thermodynamic phase and thus possesses certain distinguishing properties which are largely independent of microscopic details.

Many theories were proposed to explain this effect but the most popular of them was BSC theory, named after 3 scientists Bardeen, Cooper, and Schrieffer. BCS theory views superconductivity as a macroscopic quantum mechanical effect. It proposes that electrons with opposite spin can become paired, forming *Cooper pairs*. Independently and at the same time, this superconductivity phenomenon was explained by Nikolay Bogoliubov by means of the so-called Bogoliubov transformations. An electron moving through a conductor will attract nearby positive charges in the lattice. This deformation of the lattice causes another electron, with opposite "spin", to move into the region of higher positive charge density. The two electrons are then held together with a certain binding energy. If this binding energy is higher than the energy provided by kicks from oscillating atoms in the conductor (which is true at low temperatures), then the electron pair will stick together and resist all kicks, thus not experiencing resistance.

Convolved? What is the big deal in this discovery? Well, the answer is that this discovery can change the way our daily life proceeds. It's going to be faster, accurate and more efficient. This phenomenon finds its implementation in MAGLEV, the magnetically elevated train. Using this technology in transmission cables could reduce the cost of electricity to an extent we can't even imagine. The biggest application right now for superconductivity is in producing the large volume, stable magnetic fields required for MRI and NMR. Then some other application include, production of magnetometers based on SQUID [Superconducting Quantum Interfering Devices], Digital Circuits, Control magnets in particle accelerator, fusion reactors, RF and Microwave filters, and railgun and coilgun magnets. Superconductors are used to build Josephson devices, which are the building blocks of SQUID.

Series of Josephson devices are also used to define the S.I. volt. Depending on their mode of operation, these devices can be used to function as photon detector and also as mixers.The crux of the whole thing is that we are about to witness something that was a dream even a couple of years back and seeing that dream take the shape of reality, believe me, feels like heaven. The very face of our world is about to change and the next big thing, rather the “next trend” is definitely *superconductivity*.

(Harpreet Singh, is a 3rd year student of B.Tech ECE, IIT Guwahati.)

- PHONE

Manisha Shrivastava

Apple is known for its innovative gadget design, and with the release of the iphone , it continues to live up to its hype . Even for those who didn't wait in line to buy one , there is no doubt that by now , the tide of hype associated with apples' iphone has washed on your shores . Apple created the device during a secretive and unprecedented collaboration with AT&T Mobility-Cingular Wireless at the time of the phone's inception .

The question “what is an iphone?” beckons us. It is basically one device with three revolutionary products-the first one is a wide-screen ipod with touch controls, the second is a first of its kind mobile phone and the third is a break-through internet communications device. The iphone can be considered as a pocket-sized Macintosh computer that uses an unique and intuitive touch-screen interface for surfing the web , scrolling through pictures and music , making calls , sending text messages and emails . The ability of the user to literally let their fingers do the talking through the iphone's operating system and even the internet has been described by even the most jaded tech reporters as a 'thrilling' experience. This potent combination of the extreme usability of an Apple-designed touch-screen operating system with the portability and 'cool factor' of an ipod media device makes for a product that raises the bar for a common man's information appliances.

So what exactly makes the Apple's iphone click ? It's expensive. It's revolutionary. But are its features worth the price tag that comes along with it? Let us have a look on it's features

1: iPHONE INTERFACE TECHNOLOGY:

A: multi-touch technology : The most outstanding feature is the iphone's radical multi-touch screen. The 3.5 in liquid crystal display HVGA touch screen topped with optical-quality, scratch-resistant glass is specifically created for use with a finger or multiple fingers for multi-touch sensing. Because the screen is a capacitive touch screen, no stylus is needed, nor can one be used. The MT screen allows any mechanical button to appear on this high tech toy. It simply allows you to use your fingers to operate it. This separates it with any other phone available in the market today, which either have mechanical keyboards or a stylus. By tapping the screen with your finger, you can navigate menus, dial phone numbers, write e-mail messages and likewise use the whole functionality of the popular gadget. The 3.5 inches screen displays a keyboard for inputting text via multi-touch. More so, the iphone addresses the problems of typos commonly known to multi-touch usage by adding self-correction abilities .

The multi-touch screen functionality allows its owner to scroll by dragging a finger in the desired direction. The speed of scrolling is designed to be proportional to the speed at which you drag your finger. The iphone interface enables the user to move the content itself up or down by a touch-drag motion of the finger, much as one would freely slide or flick a playing card across a table with a finger. Similarly, scrolling through a long list in a menu works as if the list is pasted on the outer surface of a wheel: the wheel can be "spun" by sliding a finger over the display from bottom to top(or vice-versa). In either case, the object continues to move based on the flicking motion of the finger, slowly decelerating as if affected by friction. In this way, the interface stimulates the physics of 3D objects, giving it a real world feel.

B: Revolutionary sensors: Our popular gadget of the issue has some very interesting sensors. The gadget's sensors have the ability to detect changes to the iphone's environment. The sensors are minuscule yet absurdly powerful. The three major sensors include an accelerometer, sensor for ambient light and a proximity sensor.

"If there is something good in the world then we copy with pride."

Anssi Vanjoki

Nokia VP & General Manager of Multimedia on his company' s plans to release new phone similar to iPhone in 2008.

A 3 axis accelerometer senses the orientation of the iphone and changes the screen accordingly. The iphone's screen display will actually rotate to portrait or landscape. Because it changes the view according to ratio, images are not distorted among web pages, videos or photos. Photo browsing, web browsing and music playing support both upright and left or right wide-screen orientations, while videos play in only one wide-screen orientation.

The Proximity sensors detect the location of iphone with regard to skin. It shuts off the display and touch screen when the iphone is brought near the face to save power and to prevent inadvertent inputs from user's face and ears. The Ambient light sensor, detects changes in the phone's environment and instantaneously adjust the display's brightness. Your iphone's display will always be well adjusted in regard to lighting.

2: Mac OS operating system: The Mac OS x is the operating system inside the latest Apple computers. On the other hand, this device doesn't have the complete functionality of the operating system. The entire OS is too large to fit within the 4GB or 8GB internal memory. The iphone contains a 500 MB version of the operating system. All the power and sophistication of the world's most advanced operating system -OS x -is now available on a small ,handheld device that give you access to true desktop-class applications such as widgets ,Safari ,calendar ,text messaging ,Notes and address book . Iphone is fully multi-tasking so you can read a web-page while downloading your email in the background .This software completely redefines what you can do with a mobile phone

.

3: i-Tunes: The iphone syncs with both Macs and PCs using the same third pin dock connector that ipods use .This syncing is done through iTunes .So now all you have to do is to place your iphone in the dock ,and it automatically syncs with your PC or Mac through iTunes ,simultaneously charging itself .ITunes will not only sync all the media content with your iphone, it will also sync all the data between the computer and the phone.

4: Multi-purpose cell phones: The iphone itself functions as a multi-purpose cell phone. It allows three way conferencing ,call waiting, caller ID and visual voicemail ,a revolutionary feature ,that allows a user to browse the list of voicemail messages onscreen without dialing into their inbox .They can be listened to in whatever order desire .However this is a feature that requires support from network provider .Therefore Apple has collaborated with Cingular(now acquired by AT&T)in US to provide this service to users

5: Multimedia: The layout of the music library differs from previous iPods, with the sections divided more clearly alphabetically, and with a larger font. Similar to previous iPods, the iphone can sort its media library by songs, albums, videos, playlists, genres, composers, podcasts, audio books and compilations. Cover flow, like that on iTunes, shows the different album covers in a scroll through photo library. Scrolling is achieved by swiping a finger across the screen. Like the 5th generation ipods introduced in 2005, the iphone can play video, allowing user to watch TV shows and films.

6: Hardware:

a: Touchscreen: The 3.5 in liquid crystal display HVGA touch screen topped with optical-quality, scratch-resistant glass is specifically created for use with a finger, or multiple fingers for multi-touch sensing. Because the screen is a capacitive touch screen, no stylus is needed, nor can one be used. Bare skin is a requirement, users wearing gloves would have to remove them to use the touchpad. unless they are wearing electrically neutral gloves.

b:SIM card: The sim card is located in a slot at the top of the device and the device is activated through i-tunes.The iphone is usually sold with a simlock preventing the use of SIM cards from different mobile networks.

c:Storage: The iphone was initially released with two options for internal storage, either a 4GB or 8GB flash drive(manufactured by Samsung)model was available. On September 5,2007, Apple announced they were discontinuing the 4GB models. On February 5,2008, Apple announced the addition of a 16GB model to iphone lineup. The iphone does not contain any external memory card slots for expanded storage.

7: web accessibility/internet connectivity/e-mail:

Internet and e-mail are a central feature to the iphone and safari (which is the most advanced web browser ever to be embedded onto a portable,handheld device) will be the primary browser for the device.it has a built-in WiFi capabilities and will be able to access the internet both through EDGE and WiFi hot spots.The iphone will display web pages as you would browse them from home as opposed to mobile web pages other phones showcase. Apple has partnered with Google to create an interactive version of Google maps that allows you to go from finding a place to calling it within a few taps of the display.

8: 3G network:

The second model of Apple's cellphone, was made available on July 11, 2008.3G technology gives iPhone fast access to the Internet and email over cellular networks around the world. iPhone 3G also makes it possible to do more in more places: Surf the web, download email, get directions, and watch video — even while you're on a call. Incorporating Version 2.0 of the iPhone operating system, it features GPS capability and high-speed 3G cellular data transfer, wherever HSDPA towers are available. iPhone 3G technology protocol HSDPA (High-Speed Downlink Packet Access) downloads data fast over UMTS (Universal Mobile Telecommunications System) networks. Part of the HSPA family of data services, HSDPA provides a speed increase over the sluggish EDGE service. HSDPA 3G downloads are 200-500 Kbps compared to 70-150 Kbps for EDGE.And since iPhone 3G seamlessly switches between EDGE, faster 3G, and even faster Wi-Fi, you always get the best speeds possible. iPhone 3G meets worldwide standards for cellular communications, so you can make calls and surf the web from practically anywhere on the planet. And if you're in an area without a 3G network, iPhone connects you via GSM for calls and EDGE for data. iPhone already gives you mobile multitasking. But 3G technology lets you multitask in more places — without connecting via Wi-Fi. Since 3G networks enable simultaneous data and voice, you can talk on the phone while surfing the web, checking email, or using Maps. All from your 3G cellular network. iPhone 3G delivers UMTS, HSDPA, GSM, Wi-Fi, EDGE, GPS, and Bluetooth 2.0 + EDR in one compact device — using only two antennas. Clever iPhone engineering integrates those antennas into a few unexpected places: the metal ring around the camera, the audio jack, the metal screen bezel, and the iPhone circuitry itself. And intelligent iPhone power management technology gives you up to 5 hours of talk time over 3G networks.

Although some of the features such as higher resolution camera, video recording, expandable memory slot, are still missing ,Apple is able to differentiate the iphone by providing "the smoothest running applications and the most intutive and easiest to use feature" .It has great packaging of several technologies and features in a very reliable and consistent platform .The way in which the iphone is designed makes it easier to use than any "existing smartphone or cell phone ,handle music and video and photo display infinitely better than any such phone ,and be a better internet-connected device for browsing ,and perhaps for emails". Hands down, the iphone is more intelligent than any other phones today and has the untapped potential that can provide a whole slew of new features and functionalities.

(Manisha Shrivastava is a 2nd year student of ECE Department, IIT Guwahati.)

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e WASTE

Harsh Kumar

Over the last 50 years there has been a lot of improvement in the field of science and technology. There has been rapid growth of new technology and high tech equipments. The growth of the technology has been so fast that the rate at which devices of daily use become obsolete has increased exponentially. One sector of industry which has witnessed this trend in the most profound sense is the electronics sector. The pace of development has been tremendous. In the history of mankind, the pace of development has never been so great. The best example of this growth that we have all witnessed in our day to day life is the way we used to store data. It may be recalled that magnetic tapes were used to store data not very long ago. Then came floppy discs. They didn't lasted long and were replaced by CD's which are being phased out by DVD's. DVD's are also expected to die out soon with the introduction of newer storage devices like BluRay disc.

This is just a tiny part of the big picture. The rate at which things are changing has seen the everyday electronic item become obsolete at a great pace. The problem with this is not just waste of resources while buying new hardware but is related to the disposal of these old unwanted devices. Disposing this stuff is not as simple as disposing off our kitchen waste. Electronic waste or “Waste Electrical and Electronic Equipment (WEEE)” is of concern largely due to the toxicity and carcinogenicity of the substances which are part of it. Toxic substances in electronic waste may include lead, mercury, cadmium and a vast range of chemical substances which are dangerous for all living forms. Up to thirty-eight separate chemical elements are incorporated into electronic waste items.Landfilling e-waste, one of the most widely used methods of disposal, is prone to hazards because this releases toxins into the soil, air and groundwater. Older landfill sites and uncontrolled dumps pose a much greater danger of releasing hazardous emissions. Some electronic items contain hazardous compounds such as halogenated chlorides and bromides used as flame-retardants in plastics, which form persistent dioxins and furans on combustion at low temperatures (600-800°C). Copper, which is present in printed circuit boards and cables, acts a catalyst for dioxin formation when flame-retardants are incinerated. The PVC sheathing of wires is highly corrosive when burnt and also

induces the formation of dioxins. A study on burning printed wiring boards in India showed alarming concentrations of dioxins in the surroundings of open burning places reaching 30 times the Swiss guidance level.

The impact of these toxins on human body is dangerous. At high levels, the lead can have an adverse effect on various nerves, such as the motor nerves. This damage can result in the inability to maintain the hand or foot in a normal position due to weakness of muscle tone because of nerve damage ("wrist drop" or "foot drop"). The Center for Disease Control estimates that nearly two million American children under the age of six have at least low-level lead poisoning. The CDC also estimates that 10% of all children suffer from lead poisoning.

The first comprehensive study to estimate the annual generation of e-waste in India and answer the questions above is being undertaken up by the National WEEE taskforce. So far the preliminary estimates suggest that total WEEE generation in India is approximately 1,46,000 tonnes per year. The top states in order of highest contribution to WEEE include Maharastra, Andhra Pradesh, Tamil Nadu, Uttar Pradesh,West Bengal, Delhi, Karnataka, Gujarat, Madhya Pradesh and Punjab. The city wise ranking of largest WEEE generators is Mumbai, Delhi, Bangalore, Chennai, Kolkatta, Ahmedabad, Hyderabad, Pune, Surat and Nagpur.

An estimated 30,000 computers become obsolete every year from the IT industry in Bangalore alone.

"An estimated 30,000 computers become obsolete every year from the IT industry in Bangalore alone. The reason – an extremely high obsolescence rate of 30% per year."

The reason – an extremely high obsolescence rate of 30% per year.

The amount of old electronics, or e-waste, such as computers, phones and TVs being discarded every year is growing rapidly. In many countries it's the fastest growing type of waste as cheap prices mean replacing electronics is cheaper than fixing them, while low price often means low quality and very short life spans. The products are made cheap by companies by using low quality components which have low life. This is their way of increasing sales. Shorter life of product means that customers have to buy new products after very less time. The sales are also boosted by bringing out newer products and discontinuing support for old products, thus forcing obsolescence. The best example is whenever a newer version of the Windows operating system is released it requires a newer and faster hardware. This was seen with the recent release of Windows Vista. This ensures continuous revenue for both the software developers and hardware manufacturers.

As electronics increasingly become part of the throw away culture in many developed countries and some developing countries, amounts of e-waste have dramatically increased while solutions have often lagged far behind. Even in the European Union (EU) that has tighter regulation 75 percent of e-waste is unaccounted for. Of the estimated 8.7 million tonnes of e-waste created annually in the EU a massive 6.6 million tonnes of e-wastes do not get recycled.

In the US there is very little regulation of e-waste. Less than 20 percent of US e-waste is recovered for recycling. Worrying the recycling percentages for PCs (10 percent) and TVs (14 percent) are even lower. The imminent switch to digital TVs in the US and elsewhere will lead to a massive increase in the amount of redundant analogue TVs.

Another major concern for is the import of e-waste from developed countries into developing countries. A large quantity of e-waste is shipped into developing countries mainly India, China, Pakistan and a few African countries where laws and environmental standards are not strict. The scrap yards in the developing countries extract the

valuable and required materials from the junk and leave the rest. These workers have little or no expertise in recycling of e-waste and do their job in unprotected environment without proper equipments. Exporting e-waste from Europe is illegal but exporting old electronics for 'reuse' allows unscrupulous traders to profit from dumping old electronics in these countries. USA which is among the greatest producer of e-waste has no legislation that restricts the export of e-waste. Now the amount of domestic e-waste generated by these countries is growing fast. In India only one percent of e-waste is collected for authorized recycling.

The Basel Convention is an international treaty intended to restrict this sort of practice, but it has proven difficult to enforce and the United States has not yet ratified the agreement. Because the US has no domestic laws forbidding the export of toxic waste, the Basel Action Network estimates that about 80% of the e-waste directed to recycling in the US does not get recycled there at all but is put on container ships and sent to countries such as China.

The Solution

One clear solution for the problem is for the major electronics companies to eliminate the worst toxic chemicals from their products and improve their recycling programs. Having generated demand for the latest new mobile phone or sleek laptop and made vast profits from sales of electronics it should not be a problem the companies are allowed to ignore. In 2006 more than one billion mobile phones were shipped worldwide.

"In 2006 more than one billion mobile phones were shipped worldwide. However, Nokia (the market leader) recycles just 2 percent of the phones it sells."

However, Nokia (the market leader) recycles just 2 percent of the phones it sells. The major computer makers do little better, with currently an average recycling rate of just 9 percent. That means the major companies don't recycle over 90 percent of their old products. To address the rising tide of e-waste all manufactures must offer free and convenient recycling of their products to all their customers. While most companies accept responsibility for recycling their own products, and are improving their recycling programs for consumers, several TV companies are dragging their feet on recycling with the majority offering no recycling for old TVs in many countries. Of the TV companies, Philips stands out by publicly stating that recycling is the responsibility for the customer and government and consumers should pay for recycling, not the product makers.

Where companies are unwilling to do this tough legislation is need to ensure electronics are safely recycled. Japan has effective recycling legislation and Sony reports that it collects 53 percent of it's old products in Japan. That's five times better than the global average for major PC makers and shows that solutions are already available. There are several other legislations all over the world that encourage the recycling of e-waste and reducing the amount of hazardous chemicals in electronic products. The most notable of these legislations is the The **Directive on the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment** commonly referred to as the Restriction of Hazardous Substances Directive or RoHS. The directive was adopted in February 2003 by the European Union. The RoHS directive took effect on 1 July 2006, and is required to be enforced and become law in each member state. This directive restricts the use of six hazardous materials in the manufacture of various types of electronic and electrical equipment. RoHS is often referred to as the lead-free directive, but it restricts the use of the following six substances:

1. Lead
2. Mercury
3. Cadmium
4. Hexavalent chromium (Cr6+)
5. Polybrominated biphenyls (PBB)
6. Polybrominated diphenyl ether (PBDE)

The maximum permitted concentrations are 0.1% or 1000 ppm (except for cadmium, which is limited to 0.01% or 100 ppm) by weight of homogeneous material. Another notable legislation in this context is the The Electronic Waste Recycling Act of 2003 is a California law to reduce the use of certain hazardous substances in certain electronic products sold in the state. The act was signed into law September 2003. This also puts restriction on the maximum amount of hazardous chemicals in electronic devices. The Act also requires retailers to collect an Electronic Waste Recycling Fee (effective January 1, 2005) from consumers who purchase covered devices. Recycling fees are paid to the State of California.

In order to individually help make a difference, consumers can follow a number of steps to help with the recycling of electronics:

- Send your old computing equipment back to the electronic company from which you bought it.
- Dell, HP, and Apple are all willing to take back your old products when you buy a new one.
- When researching computer companies before your computer purchase, find out if they offer such recycling services.
- Don't throw your electronics away in the trash.
- Educate yourself! Read, research, and gain some knowledge about the harmful effects of recycling as well as the recycling laws.
- Don't burn any of the electronic items to get rid of them. It is best to send them to a recycling plant.
- Take initiative and join any of the NGO's which are concerned about this problem.
- Spread the word about the danger of e-waste.

Although the problem of e-waste pose a great amount of danger to our planet, several initiatives have been taken to bring this problem under control. A number of government and non-governmental agencies have been working to educate people and control this menace. As the public awareness increases, government and companies will be forced to take action and do their part of recycling the waste. Till then it is up to us, the residents of planet to save our mother earth.

(Harsh Kumar is a 2nd year student of ECE Department, IIT Guwahati.)

Math Blues !

Robert W. Lucky

(The following article has appeared in the reflections column of IEEE Spectrum, September 2007.)

I was browsing through some of the features of a popular computer program for doing Mathematics. Wow, I thought! What I would have given for this years ago!

But suddenly I was overcome with sadness. I don't need this anymore, I realized. In fact, it has been many years since I worked with "real" mathematics. I just never really thought about that loss before. It was as if my profession had slipped away when I wasn't looking.

I commiserated with several engineering friends. Two of them weren't concerned at all. That's what happens when you move along in your career, they said, and it doesn't make you ant less of an engineer. The other, a researcher like me, shared my nostalgia and pain. It made him think of what he had been- and was no more.

I wonder how many engineers use advanced math in their jobs and whether fewer do so, now that computers have consumed so much of our work. Has mathematics disappeared behind the screens of our monitors, as have so many other subjects since engineering began to centre increasingly on writing software?

Yet mathematics is a way of thought that binds us to our profession. Maxwell's equations are inscribed in the entrance foyer of the National Academy of Engineering as the very symbol of what we do. I look at them as the scripture of engineering-a concise and elegant description of the laws that govern electromagnetism. But I also wonder: How many engineers have actually used Maxwell's equation in their work? Alas, I've never had the pleasure myself.

The author is a retired IEEE fellow. He was Vice President for applied research at Telcordia University.

Our journals are still full of mathematics. If you want to publish and have your work inscribed in stone for eternity, you must code your work in mathematical symbolism. If you want to parade among the elite of the profession, you must cloak yourself in mathematics. This is the way it has always been. Now, if math is disappearing from our practice, this would make me sad.

I remember the day well in high school algebra class when I was first introduced to imaginary numbers. The teacher said that since the square root of a negative number didn't exist, it was called, imaginary. That bothered me a lot. I asked, if it didn't exist, why give it a name and study it? Unfortunately the teacher had no answers to these questions.

As with much of the math we've all studied, understanding comes only much later. We've all had the experience of learning mathematical principles before we had any idea what they were good for. If I could go back to that day in high school, how would I have explained matters?

I can think of two approaches, although somehow I doubt that my younger self would have been happy with either. The first is to say that mathematics is beautiful in itself, a study of consistent rules of logic that can be appreciated as an art form, quite apart from any application it may have to everyday problems. The second is to note that the square root of minus one is actually useful (in problems that my younger self didn't know about yet). It opens the door to two dimensional thinking-a dimension that gets you off the line of real numbers. So whether or not this imaginary number exists in your world of arithmetic training, it's useful. In real world of problems, it works.

I'm reminded of a famous saying in physics, variously attributed to Paul Dirac and Richard Feynman: “Shut up and calculate”. It was a response to a class of problems in quantum mechanics in which Schrödinger wave equation often contradicts common perception, yet it always provides the right answers. So don't worry about it: quit complaining and just calculate. Like using the square root of minus one, it works.

Since that first introduction to imaginary numbers, I've just about come full circle. I learned to appreciate math, and I found imaginary numbers useful. But now I'm thinking that, though the appreciation remains, the usefulness to me has faded.

The more I think about this as I write, the sadder I get. I'm going to go back and look at the features of this mathematics program again.

(This article is being published with consent from the author.)

Fractal Feature Based ECG Arrhythmia Classification

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(This is the summarized version and the paper has been accepted in the TENCON 2008 conference)

I. Introduction

Electrocardiogram (ECG) is a graphical way of representing the electrical activity of heart. The classification of electrocardiogram (ECG) into different disease categories is a complex pattern recognition task. Cardiac Arrhythmia is a term for any abnormal electrical activity in heart beats. Due to the higher risk involved in some of the arrhythmia, the detection and classification of ECG arrhythmia along with real-time monitoring of cardiac activities are essential. Many research programs have been conducted in this regard which generally have two functional units: feature extraction and pattern classification. We proposed a algorithm, using local fractal dimensions of ECG signals as the features to classify the arrhythmic beats. Fractal geometry based methods have been major success in cardiac signal analysis recently [1]. In the current work fractal modeling has been applied for neighboring samples of ECG signal segments to find the local fractal features. This in turn has been used in a template matching classifier to classify the ECG arrhythmia.

II. ECG database and signal preprocessing

The database used in the present work, is the ECG signals form the MIT-BIH Arrhythmia Database [2]. The proposed algorithm uses small segments of the waveform, each segment consisting of 200 samples. A fixed length window starting 50 samples before the R-peak point and ending 150 samples after the same point, was applied to extract the heartbeat waveform. After this preprocessing, the database consisted of 2316 segments of normal sinus beats (N), 240 segments of right bundle branch block beats (R), 171 segments of ventricular ectopic beats (V), 219 segments of left bundle branch block beats (L) and 45 segments of atrial premature beats (A). Out of these, one third of the ECG beats are selected for training and remaining for testing of classifier.

III. Fractal and Fractal Dimension

Fractal is a mathematical model that defies the conventional measures, such as length and area. Fractals are most often characterized by their fractional dimension [3]. They are used to describe scale invariant random functions. To estimate the fractal dimension of ECG signals we have used the power spectrum density (PSD) based algorithm [4]. The power spectrum of fractal process is given by the power law relationship of

$$S(f_n) \sim p f_n^{-\beta} \tag{1}$$

which yields

$$\log(S(f_n)) \sim \log(p) - \beta \log(f_n) \tag{2}$$

Here beta is the spectral index. The slope of the line fitting the $\log - \log$ plot of the power spectrum by a least square method in the linear frequency range gives the estimate of β. Fractal dimension D is related to the spectral index β by the following equation.

$$D = \frac{5 - \beta}{2} \tag{3}$$

To find the fractal dimension of a curve, first an estimate of β is obtained from the PSD curve. Then the fractal dimension D is found using the above expression.

IV. Fractal feature based template matching classifier (FTMC)

After the database preprocessing, a window of size W is taken around each sample point, after which its fractional dimension is calculated using equations (1), (2) and (3). Thus, an ECG signal waveform of 200 samples gets converted into a sample series of fractional dimensions of size 200-W. Experimentally it is observed that the classifier gives best results at the $W = 15$. For matching, the obtained fractional dimension series from test dataset to those from the training dataset, two methods are used. The first method is consists of calculating the Euclidean distance between the templates and the class giving the minimum Euclidean distance is declared as the class of the test ECG signal.

$$\text{Euclidean distance}(X_d) = \sqrt{\sum_{i=1}^{W} (x_i - y_i)^2} \tag{4}$$

The second method based on calculation of correlation coefficient, the maximum correlation coefficient gives the arrhythmia class of the test ECG signal.

$$r_{xy} = \frac{n \sum x_i y_i - \sum x_i \sum y_i}{\sqrt{n \sum x_i^2 - (\sum x_i)^2} \sqrt{n \sum y_i^2 - (\sum y_i)^2}} \tag{5}$$

V. Results and discussions

Results from the current work will be presented in the terms of three figures of merit, viz. error-bar results, absolute performance in terms of confusion matrix and performance with reduced training data.

A. Error-bar calculation

An efficient classifier's performance is expected not only to be high but also to change as little as possible with a change in the training and test datasets. For this the classification exercise is run repeatedly with different choices of training and test datasets. Error-bar study gives information about how reliable is the classifier's performance. The error-bar plots of FTMC based on Euclidean distance and correlation coefficient are presented in figure 1 where the mean value of the absolute performance of classifier is plotted along with an error bar of width thrice the standard deviation. Both in terms of absolute performance and in terms of error-bar analysis the Euclidean distance based FTMC proved to be the better choice.

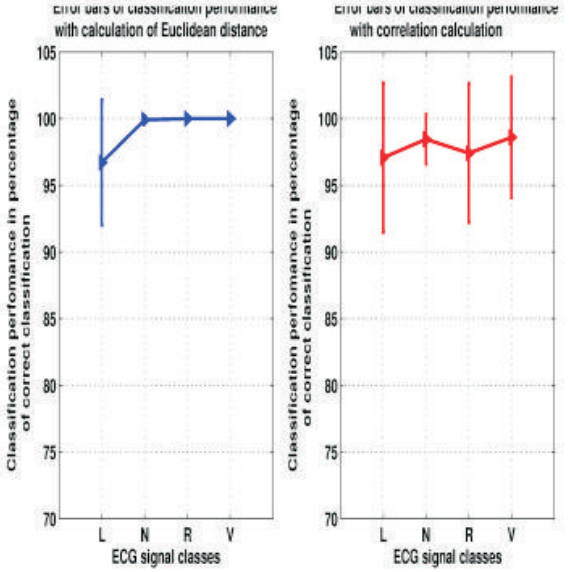

Fig. 1. Classification performance for Euclidean distance and correlation coefficient based FTMC, along with the corresponding error bars

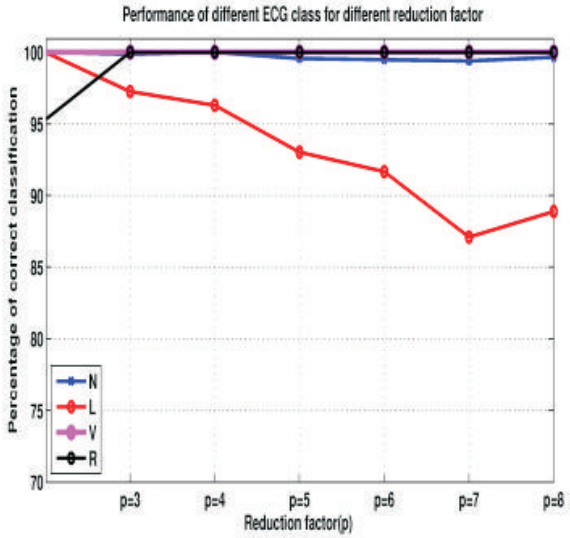

Fig. 2. Classification performance for different reduction factor

B. Absolute performance and confusion matrix

A confusion matrix for a classification task gives the number of times a signal has been correctly classified and also the number of times it has been misclassified as some other type of arrhythmia. Table I gives the confusion matrix for the Euclidean distance based FTMC and last coloumn of the tables gives the performance of classifier for that particular arrhythmia.

The total performance calculated from the confusion matrix,

TABLE I
CONFUSION MATRIX FOR EUCLIDEAN DISTANCE BASED FTMC ($W = 15$)

Train / Test	A	L	N	R	V	Performance (in percentage)
A	27	1	2	0	0	90.00
L	0	144	2	0	0	98.61
N	0	0	1544	0	0	100
R	0	0	0	160	0	100
V	0	0	0	5	109	95.41

is found to be 99.498%.

C. Performance with reduced training set

A practical ECG signal classifier will be expected to perform with limited amount of training dataset. Figure 2 describes the trend of how FTMC behaves with reduced amount of training data. From the figure, it is observed that the performance remains almost unchanged with the reduction in training dataset which favors the validation of the classifier.

$$p(\text{Reduction factor}) = \frac{\text{no of test signals}}{\text{no of training signals}} \qquad (6)$$

VI. CONCLUSIONS

The performance for individual arrhythmia came extraordinary good with 100% correct prediction for normal and right bundle branch block beats, 95.4% correct prediction for ventricular ectopic beats and 98.6% correct prediction for left branch block beats. The false alarm cases were also very less, i.e. only 4 normal beats were misclassified as arrhythmic. The algorithm avoids complicated computations by applying estimations over the samples only around the QRS wave rather than comparing all P-QRS-T waves. The overall good recognition results, optimistic errorbar characteristics, and limited immunity to reduction in training dataset shows the potentialities of the current recognition algorithm. This performance is comparable to the best performances found in the open literature [5], and is better than the results presented in many other works [6], [7]. With some fine-tuning the FTMC algorithm can prove to be a preferable quasi real-time operating technique and can be used for the automatic recognition of ECG arrhythmia in ECG monitors or ECG Holters. This will be the future endeavor of the authors.

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Guest Article

Trends of Communication:

Premise based to Personalized

Dr. Bashudev Dash

There are three primary constituents in communication:

(1) The Speaker,
(2) The Listener, and
(3) The Carrier/Medium.

For example, in a classroom, the professor is the speaker, the students are the listeners and the air between the professor and the students is the carrier.

Let's take a close look at the need for the communication from holistic point of view. From the early stages of civilization to the Internet Age (or rather be MySpace age!), as the perpetual quest for knowledge got progressively intensified, the needfor communication intensified as well. The modes of communication have always been multi-faceted - voice, data, and video.

In a proximity communication, like a classroom or dinning table, the voice from speaker's mouth is carried over air to the listener's ear (the air waves created by the strength of the voice signal from speaker's mouth).

However, the Medium/Carrier started to change as the distance between the speaker and the listener grew. The need for a different medium became apparent: the network as the carrier as the air is no longer the viable medium for distance communication. Different network technologies have evolved over the years (analog vs. digital, wireline vs. wireless etc.) to meet the communication needs.

Research has shown that non-verbal communication, messages communicated through body language, facial expression, eye contact etc, is the dominant mode of communication (55% non-verbal vs. 38% from tone of voice vs. 7% from words). The effectiveness of the communication became challenging due to the absence of non-verbal communication over long distances. Based on these findings alone, the effectiveness through email is at an awful 7%. Even the communication effectiveness over telephone call is mere 45% (much better than email though!).

Communication over the network was primarily premise-based. The technological constraints forced us to compromise our communications need. We adapted very well to the premise-based communication model. A telephone at your office desk or home became the gateway to people you wanted to interact with. With the advent of wireless technology, some premise-based constraints of communication got eased. That seemed to be a paradigm shift: anywhere (rather where your network carrier has the cell coverage) and anytime. Voice was the most commonly used service over wireless. Data services (like email, Internet, SMS etc) over wireless followed. Growth in wireless adaptation was the largest in developing nations.

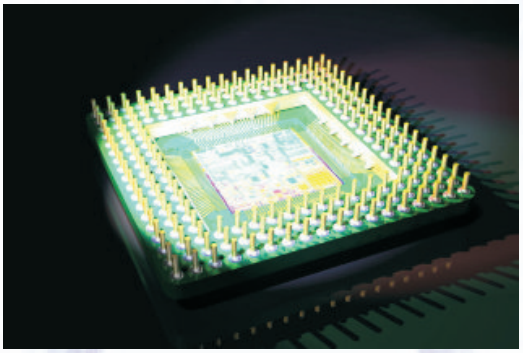
I guess the question is "Are we there yet?" Not quite there. We have made great progress in closing the gap to achieve the 45% effectiveness in communication. The smart phones (iPhone, Blackberry, etc.) have enabled the voice and data services on the go. The forces of change are working relentlessly. So one may ask, what is next? Personalized video, anywhere and anytime, at your mobile terminal is needed for closing the gap to achieve effective communication.

Dr. Bashudev Dash, currently working with Accenture as Senior Manager in the Network Technology group. He has worked previously with Bearing Point, Cisco Systems, and Nortel Networks. He currently leads next generation network planning, architecture, design, engineering, and implementation projects. He has done his Ph.D.(Comp Sc.) from Concordia University in Montréal, Canada.

In the Beginning

Rohit Bahl

Microprocessor today forms the brain of every computing device. From being a nominal 4 bit processor to the current 64 processor, microprocessors have come indeed a long way with its evolution being filled of many surprising twists and turns. Who invented the first microprocessor? How did they evolve to the current level and will they keep evolving? Let's see what brought the contemporary microprocessor to its present-day configuration ....



Microprocessors are digital electronic devices with transistors on single semiconductor circuits know as IC's. With millions of transistors being stacked on a single wafer, they provided huge computing power, power efficiency and economic viability and hence made the advent of microcomputers possible. With rapid advancements in semiconductor technology, design and layout during the later half of the 20th century, microprocessor was an idea whose time had come. It's an idea which has evolved over the past 40 years, making a humble beginning with Intel's 4 bit processor 4004,to the current 64 bit processor series. This Development explosion was predicted by Fairchild Semiconductor's director of Research & Development Gordon Moore in 1965 that the density of elements in ICs will double annually, and predicted that the trend would continue for coming years. With certain amendments, this came to be known as Moore's Law .But whom do we credit with the first microprocessor? Three projects arguably delivered a complete microprocessor at about the same time, Intel's 4004, Texas Instruments' TMS 1000, and Garrett AiResearch's Central Air Data Computer. The design produced by Garrett in 1970 was considered so advanced that the Navy refused to allow publication of the design, and continued to refuse until 1997. For this reason the CADC, and the MP944 chipset it used, are fairly unknown even today.

The rapid advancements soon scaled new heights with the introduction of world's first 8 bit processor by Intel, 8008, in 1972. Zilong Z80 introduced in 1976 and Motorola 6800 released in August 1974, which cloned and improved in the MOS Technology 6502 in 1975, were other popular 8 bit processors at that time. Their cost effectiveness came from combination of small packaging, simple computer bus requirements, and the inclusion of circuitry that would normally have to be provided in a separate chip. But the clear winner in the 8 bit processor segment was by far Motorola's MC6809 in 1978, which is still pitted as one the most powerful, orthogonal, and clean 8-bit microprocessor designs ever reported.

Introduced in early 1973, National Semiconductor's IMP-16 was the first multi-chip 16-bit microprocessor. In the late 70's many companies came up with various designs of the 16 bit processor, prominent among them being Fairchild Semiconductor MicroFlame 9440. The first single-chip 16-bit microprocessor was TI's TMS 9900 packaged in a large ceramic 64-pin DIP package, while most 8-bit microprocessors such as the Intel 8080 used the more common, smaller, and less expensive plastic 40-pin DIP. Intel at that time having no minicomputers to emulate, instead upsized its 8080 to 8086 , making it the first in the x86 series to come which powered most of the PC at that time .

The 8088 , a variant of the 8086 became the heart of first IBM PC, the model 5150. But the 16 bit designs were only partially into the market when 32 bit designs started to appear. The first single chip 32 bit design to come into picture was AT&T Bell Labs BELLMAC-32A in 1980, whose next generation chips, the WE 32100 and WE 32200, were used to make worlds first desktop superminicomputer, the 3B2.But perhaps the most famous of the 32 bit

Combination of high speed, large (16 megabyte) memory space and fairly low costs made it the most popular CPU design of its time. Intels iAPX 432, despite having advanced object oriented structure was a commercial failure as it had poor performance compared to Motorola 68000. In the late 1980s, "microprocessor wars" started killing off some of the microprocessors.

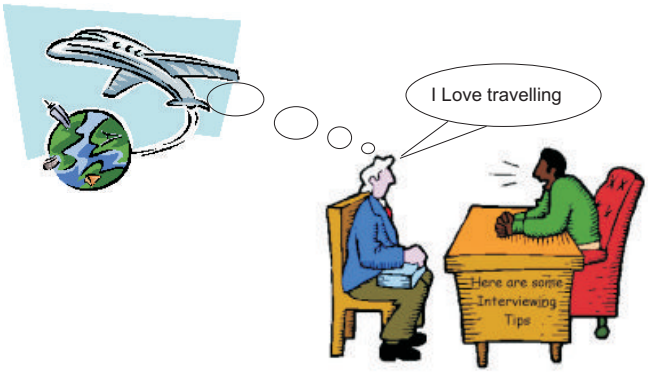
Apparently, with only one major design win, Sequent, the NS 32032 just faded out of existence, and Sequent switched to Intel microprocessors. The early 2000s witnessed another giant leap in the era of microprocessors, the introduction of the 64 bit processor at the PC level. AMD's introduced its first 64-bit IA-32 backwards-compatible architecture, AMD64, in September 2003, followed by Intel's own x86-64 chips, both the processors having the support to run 32 bit legacy apps as well as the new 64-bit software. The 64 bit designs was more than an up gradation of the data bus as it introduces a small increase in register quantity for the aging CISC designs also. Now with introduction of 64-bit Windows XP and Linux that run 64-bit native, the software is also geared to utilize the full power of such processors.

This brings us to the current scenario where the basic computing device itself, the transistor, is under going major changes as the dimensions enter the nanometer domain enabling to stack an unprecedented number of transistors on the silicon wafer. Newly designed from the ground up, 45nm Intel Atom™ processors pack an astounding 47 million transistors on a single chip measuring less than 26mm² making it one of the smallest processors in the market. In another breakthrough, Intel has demonstrated its 32nm logic process with a functional SRAM packing more than 1.9 billion second generation high-k metal gate transistors. Based on these 45nm-32 nm technologies are multi core processors having energy efficient performance and advanced parallel processing. These current new developments are helping to keep pace with the fast changing digital world, providing us with extreme gaming experiences, internet on the go, enhanced multimedia capabilities coupled with low costs and reduced power consumptions. But just how long can we go on evolving according to the Moores law is a question which is still to be answered

(Rohit Bahl, B.tech 4th year student of ECE Department, IIT Guwahati)

FUN PAGE

not WHAT TO DO @ AN INTERVIEW



Do not tell the interviewer your GRE score! Having dug grave donot go on to mention your GMAT score too.

Do not tell a MNC that you want to join the company because you love to travel.

It is advisable to have convened a festival before writing it in your CV. One of the visiting companies found two convener for the same festival.

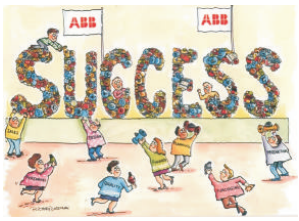
Do not call up the companies inquiring as to 'Why you were not selected and the other guy was?'. Your foolish desperation should answer that.

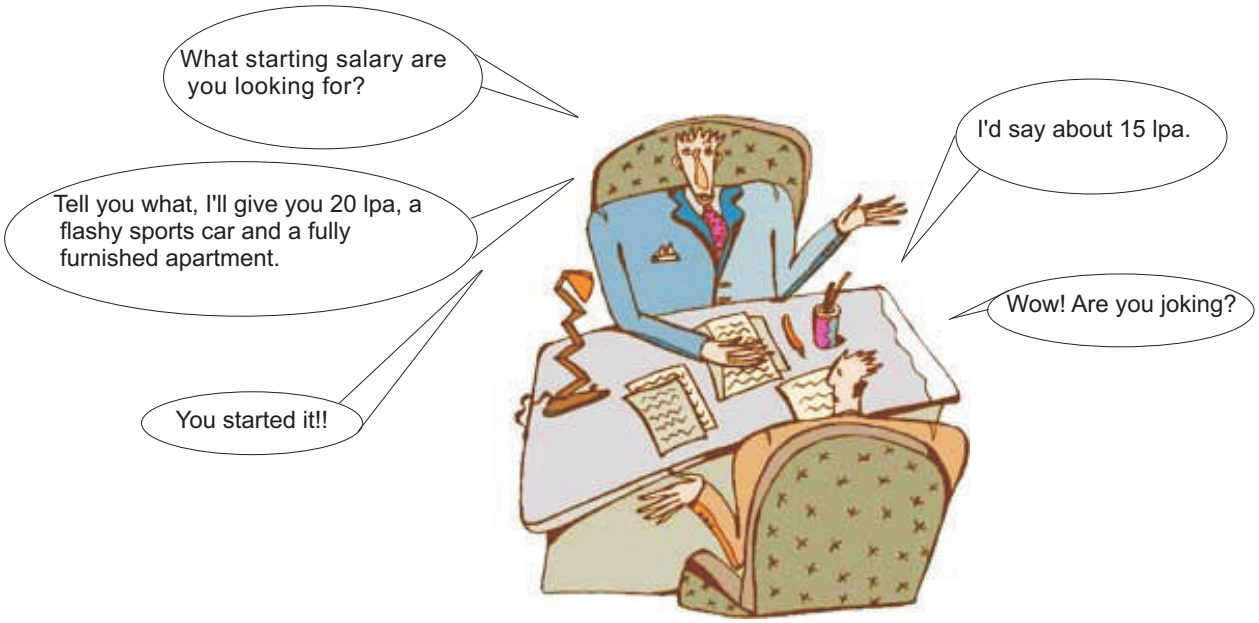
Please make sure that at least one person in your lobby has a nail cutter, comb, shoe polish and other basic stuff. You don't want to be running around just before the interview.

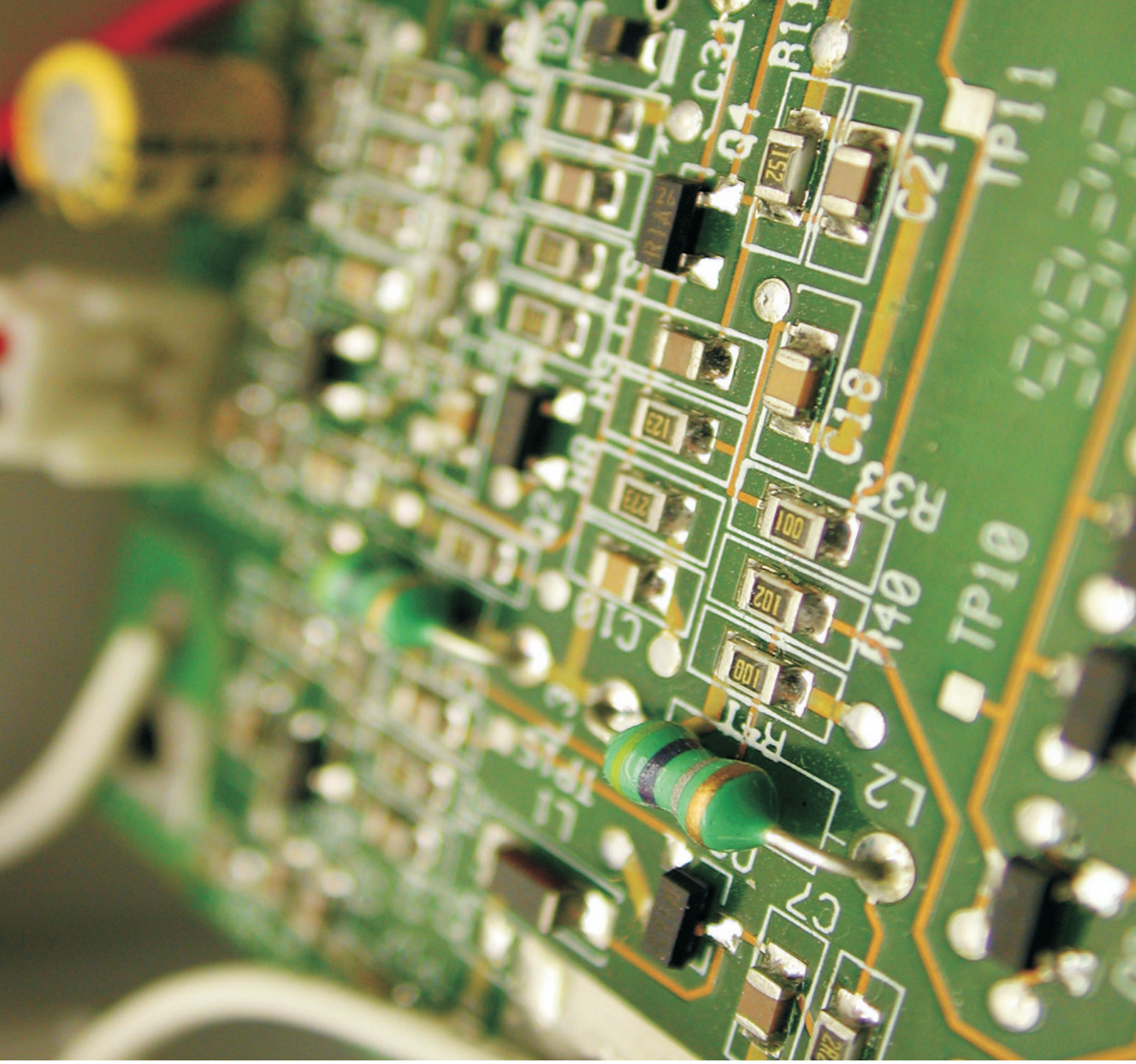
Do not inquire about a managerial position during a technical interview. Fortunately, we have a technical jobs only policy.

A higher CTC is not something to boast about. Companies often increase it with the most weirdest allowances, haircut and eye care allowances to name a few.

Finally, a lower compensation job is not the end of the world. Its just a small step on a really long ladder.







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