Bridging the Digital Gap

ELECTRONIC CLUB

E-CARRIER 2007

Information sharing

However unique we are, we are not alone in the world. Lets find the desiny

Communication

SIP phone, a threat to traditional telecommunication?

Electronics

Quantum computer Is an answer to the quest after

New Tech

Microsoft surface.. a technology or revolution

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Electronic Club
Department of Electronics and Telecommunication Engineering

University of Moratwua

Editorial

Lt Lapenotiere, the commander of HM schooner Pickle managed to reach London from Falmouth quay on 4th November 1805 took only 36 hours to travel 271 miles changing horses 21 times for the prospect of 500 GBP for reporting the British Victory at the battle of Trafalgar and the death of Nelson. It is often reminded in communication, how fortunate we are now to plan a trip with friends over Instant Messengers (IM) or have video conference of new strategy for companies with regional mangers.

We mostly take the technology for granted, nonetheless, it was dreamed versioned and sought after the technical minded people who sometimes sacrificed their lives in the search.

Where we mainly fail, is in identifying the problems around us and devoting time to discover the solutions to them. Either we seem do not see them or be ignorant of them.

However, mostly what we as a solution will not be the real solution. The introduction of new one-way traffic systems in the Colombo and suburbs is a typical example. In addition, sometimes the solutions tend to create more problems. Invention of Atomic Fusion led to Nuclear Cold war, and Google is reminding us to watch our back.

History shows, single-handed revolution is no longer viable or sensitive, but a sustainable engineering approach with great devotion is needed. Thus, we shall be on the front to make the changes we expect by taking the responsibility with a great deal of personal balance.

Let us remember Dwight David Eisenhower's words, "The United States never lost a soldier or a foot of ground in my administration. We kept the peace. People asked how it happened—by God, it didn't just happen, I'll tell you that." And Mohandas Karamchand Gandhi's words, "Be the change you expect"; in fact both set the examples.

Is possible zero time processing or communication?

C.S.Rupasinghe, Level 3

Evolution of the computer

From the Babbage's differential engine realization and technology of the computer has been changing dramatically. Earlier it was a mechanical architecture used to implement algorithms and later it was transformed to architecture of logic gates that are made of electrical valves. Invention of the transistor that led to an acceleration and IC technology (Introduced later) have been shrinking the size and increasing the processing speed of the computer. With the introduction of parallel processing speed is multiplied while clock period remains the same.

Quantum computers

As the computers become smaller, size of transistors and gates become much smaller (A gate may be built of several atoms). To explain the behavior of matter in this scale quantum mechanics is needed (Schrödinger Equations would be the governing equations instead of Newton or Maxwell laws).

Even though internal structure of the Bipolar Junction Transistor cannot be described without quantum mechanics, with suitable models, it can be explained by circuit theories. Therefore, logic gats that are currently used are called as conventional logic gates. As gates become much smaller it arrives to a point where they behave according to quantum principals.
A computer that is made of such gates leads to novel way of processing. New algorithms based on quantum principles will result faster and efficient processing.
Bits quantum computers are known as *Qbits*. State of a conventional bit is either *'0'*or *'1'* whereas state of a *qbit* is *'0'* or *'1'* or *'both 0 and 1'*.The state *'both 0 and 1'* is known as *coherent superposition.* Quantum registers are more efficient than a conventional register. In an 8-bit conventional register, only 1byte can be stored at once whereas a quantum register can store 256 bytes (combinations of 8-bit numbers). Once quantum register is processed by a quantum, processor outputs for all the combinations are given. This is similar to parallel processing. A system with n *qbits* can perform 2n computations at once. Hence, quantum computer algorithms are more efficient than conventional algorithms; for instance, the complexity of factorization is exponential in conventional computing, and polynomial in quantum computing.

Simple quantum logic gates of two qbits are already being constructed in laboratories and probably within next two decades, first quantum computer will appear.

Need for speed

Speed is the quest of the designers, and they always try on something to increase the speed at least by a small amount. Because of these experiments, time taken for a specific micro-operation to be executed becomes close to zero day by day. **However, close to zero is not zero!** Unfortunately, there is a huge gap between zero and close to zero just like an energy barrier. In

fact there is infinite number of numbers exist between these two

$$L_1 = \lim_{\varepsilon \to 0} \cdot \frac{0}{\varepsilon} = 0$$

$L_2 = \frac{0}{0}$. *is indeterminate. Can be 0,1, 1000 or infinity*

To complete 10^{50} micro-operations zero time processor takes no time and 10^{-43}s clock period (10^{34}GHz) takes 4months. Therefore, ultimate target of the humankind would be to achieve zero time processing and zero time communication.

Upper bound of the relativity

According to the special theory of relativity maximum speed of communication is $3x10^8 ms^{-1}$(i.e. speed of light) Maximum speed of a particle with non-zero rest mass should be less. Since the diameter of an atom is about 10^{-13}m clock speed of the fastest computer (Single microprocessor) possibly ever built by will be less than 10^{18} GHz (Disappointing!).

EPR photon pair

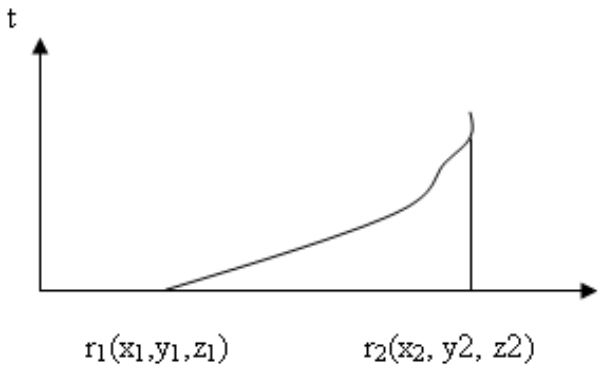
Because of a thought experiment developed by Albert Einstein (E), Boris Podolsky (P) and Nathan Rosen (R) EPR paradox was introduced. This is one of the most discussed phenomena in quantum mechanics.

A basic hypothesis in quantum mechanics is that not all the observables can be known at 100% accuracy. If momentum of a system is measured then its position is affected, for energy its time is affected. Another observable is the spin of a particle (Related to the angular momentum of the particle). Particles have spin in x, y, z directions and they are given as '*up*' or '*down*'. According to quantum principles, the spin of a particle cannot be measured in two directions at the same time.

Using the aforementioned facts, three physicists made a paradox. Out of the discoveries, one is interesting. When two photons are communicating (Even if they travel in opposite directions), speed of a photon relative to another photon is the speed of light. Thus, the communication should be faster than light (If it is possible). While we are dreaming, experiments are conducted on this topic. Meanwhile we are asked to find the alternative ways.

Communication via an extra dimension

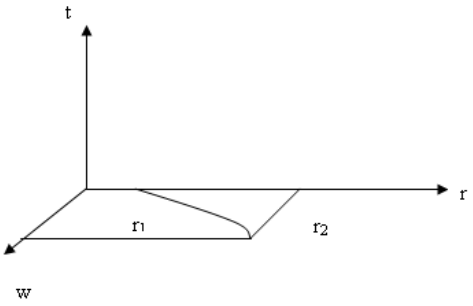
Lets consider five dimensions that are x, y, z, time and one extra dimension (A recent idea about the universe is that it is a five dimensional black hole). For the ease of analysis, entire 3-D Euclidian plane (i.e. R^3 vector space) is mapped in to one direction, which is position r, and time is perpendicular to **r**.



For any object (Wave or particle) to travel from r1 to r2 takes some time. That implies always.

$$\frac{\partial t}{\partial r} > 0$$

This happens because any object that obeys wave particle duality has a property related to time. If we could map that property to a time like dimension, let it **w**, then **w**, t, and **r** perpendicular to each other, and travel from r_1 to r_2 takes no time.



The most challenging thing is finding a way to transform properties of **t** to properties of **w**, only if we could find any object that has no time related property. That would be anything that does not obey the wave particle duality (Does our mind posses wave particle duality?)

I'd sit there and first I'd look through the comments, pick through the security holes, and then I'd see what the developer did to fix it because they'd always leave it well commented - thank you very much – and then I'd work back and figure out how I could write exploit code to exploit their vulnerabilities.

- ***Kevin Mitnick***

Future of Lighting

L Dayasena, Level3

We are used to having switches that directly control the lights in the house, lighting in the form of incandescent bulbs, fluorescent tubes and compact fluorescent lamps (CFL) and other controls like dimmers. Its time for a change, usher in the times of switches that control the lights via a centralized server and new light sources like light emitting diodes (LED) and Electro-Luminescent panels(EL).

The modern day lighting is controlled by a central station that has electronic switches to switch the lights in the house. The control is via switches that are connected by a Local Area Network (LAN) to the lighting controller. The switches are reconfigurable to control any appliance connected to the network. The central switch does even the dimming.

Spot lighting is used for highlighting and for features. For sometime LEDs were used by designers for this purpose. There are units with multiple LEDs in the primary colors so that the color can be changed. The greatest problem with LED lighting is having good efficiency at a reasonable price. This problem is addressed by many companies and is only a matter of time when a solution is found. In addition, the light given out by LEDs is different in color rendition properties.

For diffused lighting applications it is better if the light source can be made as a sheet. This is difficult to achieve using conventional LEDs but is possible with another type of LED called the Organic Light Emitting Diode (OLED). These can be made into sheets and will be available in the near future.Technology is all about turning imagination in to reality and its no secret that many inventions and innovations resulted from merely science fiction. Hollywood film "Minority report" has amazed many by the multi-touch computer interface that Tom Cruise used. Without any disappointments, today's technology has proven that it is no longer science fiction.

The idea of multi-touch screens is not a new technology. Scientists have been doing research on it since the 1980s. However, the first mind blowing, commercial consumer electronic device to hit the market was the apple's iPhone. It utilized a multi-touch display that is capable of recognizing many natural hand gestures.

As people are stunned by this nifty little gadget another techno tidal wave is about to hit the shores. It is the *Microsoft surface™* the first commercially available surface computer from Microsoft Corp.

What is surface computing?

A natural user interface allows people to interact with digital content the same way they interact with everyday items such as photos, paintbrushes and music; with their hands and by gestures.

Surface computing is a novel way of interacting with computers that give experience far beyond the traditional mouse-and-keyboard could ever. These input devices will be more than enough to input text and click the option. It becomes rather limiting when it comes to graphic designing, 3D animations or any other free hand application. Surface computing comes handy here.

Albeit being similar to iPhone truly amazing thing about surface computing is that *the surface can recognize and interact with real-world objects placed on the surface.* This opens up a completely new dimension in photo sharing, browsing maps and menus, file transfer, entertainment, business transactions etc.

Key attributes of surface computing

Surface computing has four key attributes as listed below.

- **Direct interaction:** Users can "grab" digital information with their hands and interact with content by touch and gesture, without the use of a mouse or keyboard.
- **Multi-touch contact:** Surface computing recognizes many points of contact simultaneously, not just from one finger, as with a typical touch screen could.
- **Multi-user experience:** The horizontal form factor makes it easy for several people to gather

around surface computers together, providing a collaborative, face-to-face computing experience.

- **Object recognition:** Users can place physical objects on the surface to trigger different types of digital responses, including the transfer of digital content.

Specifications of Microsoft Surface

- ***Multi-touch display***: The Surface display is capable of multi-touch interaction, recognizing dozens and dozens of touches simultaneously, including fingers, hands, gestures and objects placed on the surface.

- ***Horizontal orientation***: The 30-inch display in a table-sized form factor allows users to share, explore and create experiences together, enabling a truly collaborative computing experience.

- ***Dimensions*:** Surface is 22 inches high, 21 inches deep and 42 inches wide.

- ***Materials***: The Surface tabletop is acrylic, and its interior frame is powder-coated steel.

- ***Requirements***: Standard American 110–120V power

- ***System***: The Surface custom software platform that runs on Windows Vista™ and has wired Ethernet 10/100 and wireless 802.11 b/g and Bluetooth 2.0 connectivity.

If you place any wireless device on the surface, the wireless connection will be established automatically. Then the screen will show a circle around the device to indicate that it is ready. So if you need to transfer any digital content (photo, file, movie etc.) from the surface to the device, just drag it with your fingers and push it in towards the circle shown around the device. That is it. As soon as you place a digital camera, with wireless capability, all the photos in it will be displayed on the screen and you can do what ever you like with them.

Surface uses a series of infrared cameras (five to be exact) to virtually see objects placed on top of it, hand gestures and touch. This user input is then processed and the result is displayed on the surface using rear projection. It sounds simple but actually its not!

Microsoft is working on this since 2001. Initially they expected to build a gaming platform and a variety of early applications were also built, including pinball, a photo browser and a video puzzle. As more applications were developed, the team saw the value of the surface computer beyond simply gaming. In addition, they focused on the applications that took advantage of the unique ability of Surface to recognize physical objects placed on the table. Continuous research and development went on, functionality and applications were continuously refined. More than 85 early prototypes were built for use by software developers, hardware developers and user researchers.

Future

Surface computing breaks down the traditional barriers between people and technology by providing effortless interaction with digital content. It will change the way people interact with everyday content such as photos, music and games. Although surface computers may not find a comfortable place inside homes yet, you will see them from end of this year, in places like Hotels, Bars, Casinos, Retail stores, Music stores and public entertainment venues.

So watch out, because the day that you will see massive interactive wallpaper like displays in every hallway is not far away.

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http://www.popularmechanics.com
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In the interests of clarity,
it seemed necessary to constantly remind myself
to pay not the slightest attention to the elegance
of the presentation;
I adhered conscientiously to the rule of the
brilliant theoretician, Ludwig Boltzmann,
to leave elegance to tailors and shoemakers.

- **Albert Einstein**

Hungarians assume that everything will soon break.
And they usually want to fix it themselves.
So good Hungarian manuals read more like machine shop specifications than user guides did.

- **János Kosztolányi**

Learning Management Systems (LMS) and Applications

Gartheeban. G, Level 3

Introduction

World widely almost every university has started using LMS or a similar Learning and Activity Management System. For instance, MOODLE - the open source initiative - has evaded many parts of the world. There are 36 sites with more than 20000 users, use Moodle as their LMS where, HSU Moodle provides 12288 courses and serves 42121 users.

Developed countries see LMS as way of minimizing people - people interaction, relaxing time schedules and making studying process flexible; whereas developing countries consider that a method of maximizing the utilization of intellectual resource, reusable teaching process and optimization of resource utilization.

A classical university can implement LMS to assist Instructor Led Courses (ILC) or offer web based assistance for a self-pace module. In addition, it can provide Blended Learning Activities (BLA). Further LMS can be used for administrative purposes and monitoring resource utilization. In contrast, a virtual university can use LMS as a primary method for teaching and administration. Nordic countries lead the world in virtual universities with total number of ten with university standard.

The institutions do not seem to be especially loyal to, or dependent on, one provider of LMS system. Several institutions prefer self-developed systems. They perceive the commercial systems as expensive and complex and want to develop the systems to support their special needs. They wanted cost effective systems with the ability to handle continuous enrollment and integration with student administrative systems and economy systems. The open source has already started influencing the LMS market.

LMS systems have reached a point where user-friendliness, cost effectiveness, and integration with other systems are more important than new features. Some institutions also want to integrate the LMS with existing systems and other services such as student management systems, marketing catalogues, online payment, tracking of textbook shipments, registration of examinations, and multimedia tools.

Usefulness of LMS

LMS integrates text with multimedia such as video, audio, presentations and modeling. Advanced technologies like XML and CML allow the sharing of information of any type from 3D modeling of molecules to skeleton structure. Therefore, virtually anything can be shared, taught or demonstrated online.

Further courses can be organized, monitored and progress can be recorded. Quizzes and other Learning activities (LA) can be conducted online, even possibly exams can be held through secure channels. It gives enormous flexibility to the student and the tutor in LA.

Necessity of Improvement

A survey conducted in Nordic countries reveal that a vast variety of LMS systems is used in the universities with a significant diversity in the

number of courses provided and the tutors employed. The trend proves that universities are still seeking for the best option, not loyal to one particular product, which can be interpreted that LMS systems available have not fulfilled the requirement perfectly. Further, they are from different origins mostly from US and support different languages. Table 02 shows the supported languages. It can be seen that the products available only in limited number of languages mostly in English only. This hinders the usage in the courses conducted in native language.

Table 1. Usage of LMS in Nordic countries

Name of Institution	LMS
University of Southern Denmark	BlackBoard
Nettskolen	ClassFronter
Nettgymnas	CourseKeeper
Globalskolen	FirstClass
Aalborg University	FirstClass
Ventures	FirstClass
University of Art and Design Helsinki	Fle3
University of Oulu	LC Profiler
Skandia	LUVIT
University of Lund	LUVIT
University of Uppsala	Ping Pong

Table 2. Origins and Languages supported of popular LMS

LMS systems	Original Nationality	Language of LMS
Plus English West	BlackBoard	English,Danish
Lotus Learning Space	American Saba	English,Norwegian
FirstClass	Canadian	Norwegian,Danish
Virtual-U	Canadian	

Psychological Impacts

Albeit the benefits of LMS, it seems to have a bad psychological impact on students, by reducing the tutor - student interaction and further develops mental stress due to constant PC usage and using the same system repeatedly without much variations.

Benefits to students

A typical student comment is, ”I would like to say that I was able to learn a lot from the Course, not just about project management but also about working in groups, both faces to face and virtually. I think I am much better at working in virtual groups than I was before. The knowledge about the procedures and the technical aspects of Project Management that I gained will be very helpful when I work on actual Projects.

The pilot study by Anthony P. Trippe, Associate Professor, Rochester Institute of Technology showed that the blended course format works for traditional, on-campus students as well as for distance students who are geographically dispersed. Students especially like the 24x7 availability of the course and the ability to learn anytime, anywhere. Blended groups of diverse students can learn from each other using the easily learned discussion conference features of the LMS.

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Related Items

Benjamin Melançon

It was proposed to KNIGHT BROTHERS 21ST CENTURY NEWS CHALLENGE and, Benjamin Melançon secured 15000USD grant, the highest paid for an individual. Excerpt of his original proposal (with prior permission from Benjamin Melançon) is published here. He can be contacted at ben@agaricdesign.com

Related Items is a concept as much as a technology. It is a rededication to a core principle of both the World Wide Web and real-world communities: human interaction is about making connections. By making it simple to relate items of interest from all the diverse sources that could place the items on the web site – reporters, opinion writers, organizations, businesses, local government, and people themselves – Related Items will establish stronger connections among community members and foster further communication, sharing of ideas, and mutual understanding.

Related Items will allow users of a site to quickly and easily connect any piece of content to any other content they consider related. Unlike the chaos of a comments section, Related Items will provide a built in system for an easy overview of the popular assessment of related content. With a single intuitive click, readers and users will also be able to affirm or contradict the relevancy of connections to other content made by other users. In this way inappropriate connections will be quickly dismissed while those of the highest importance or relevancy are advanced in prominence.

For an example of how Related Items will work in practice, imagine a hypothetical "Sometown News" which serves the coastal community of Sometown, USA. Journalists of Sometown News post an article about a potential redevelopment of the Sometown waterfront involving government grants, tax incentives and construction of a new hotel and casino. Within hours readers of Sometown News would use Related Items to connect that new content to all kinds of related connect. Connections would include previous articles about potential waterfront redevelopment and the history of the Sometown waterfront. Other connections would include community groups working on various issues in Sometown; information on how to participate in public hearings related to the grants, re-zonings and tax abatements the development might require; information about the potential environment impacts; opinions of community activists and leaders of how the waterfront or Some town as a whole should be redeveloped; discussion forums ad-hoc coalitions and just about anything else imaginable.

No matter how skilled or community based a journalist of Sometown News might be, the actual readers of Sometown News will be able to do a much better job at choosing the most important and relevant connections to this new article. Related Items will make this simple to navigate and use, adding significant value to the Sometown News web site; and all without Sometown News itself having to devote time and effort to attempt to make those important connections themselves.

While the internet provides an unlimited ability to draw connections between related information and topics, the technologies currently in use suffer from several problems, which Related Items would solve. Ideas have always been connectable through the World Wide Web, yet it has traditionally required a certain individual or staff to devote time and resources to make those connections.

At the very least, connecting web pages has required knowledge of HTML and a handful of alternative, different markup languages like BBcode, and the know-how and effort to obtain the URL of the page you want to link to. Wikis come the closest in ease of connections, but they still require specialized markup, which must be learned, and manual entry of the related articles title. Wikis also restrict the user-contributed connections to content, which is user-editable.

Related Items would let people connect the wiki article to the news article. In addition, beyond all of that, the forced need to say something about the connection – even if a person did not feel silly simply typing "I think this link is related" – is enough to stop most people, most of the time, from noting a connection that they may not have even worked out in words in their own mind. Related Items reverses the odds. If someone thinks two items are connected they grab the related item from a list of recently visited pages or they surf over to the item they think is related and connect them with a click. Leaving an explanation or even recommended direction (this item is better than that item, flow this way) is optional.

Related Items would use the natural energy of an interested community to create those connections without requiring anyone to know how to code HTML or PHP for a website; nor requiring any individual or staff to devote any extensive energy to even figuring out what those connections should be. It is already commonplace for sites to include a relatively un-moderated comment section where readers and users can post comments including valuable links and connections. But without time consuming editing these comment sections quickly become extremely difficult for later viewers to use.

The most important connection of all does not do much good if it is so deeply buried within pages of minimally useful comments that only the most determined searcher will find it. Perversely, the more important a given subject is to any given thread the more difficult to utilize will be any links buried in a comment section. Finding a valuable relevant link within three individual comments might be easy, but within three pages of comments, it quickly becomes too painstaking for the average user to even attempt to use as a tool. Related Items changes this dynamically.

The John S. and James L. Knight Foundation

A National foundation with focus on journalism and communities, inspiring and enabling them to reach their highest potential.

Since its creation in 1950, the foundation has invested nearly $300 million to advance journalism quality and freedom of expression.

In 2007, Knight Foundation again awarded ***$5 million*** *in grants to individuals, organizations or businesses with ideas and projects that will transform community news.*

Relater Terms concept is simultaneously but individually proposed and implemented (http://drupal.org/project/ulink) by Gartheeban G, for Drupal CMS (http://www.drupal.org).

An excerpt from original proposal is given below and real implementation can be tested at

- http://mwt.argz.com/ulink/tests
- http://www.theebgar.phpnet.us/drupal/?q=test

ULINK

Although Drupal is self sufficient for any corporate site development, having to search and find the internal references while preparing documents is a drawback in using it for a site full of articles and documents like Wikipedia. ULINK solves that by looking for key terms in the text and listing them categorized by the relevant key terms. This enables the user to maintain the line of thought undistracted.

I believe this will make Drupal more user-friendly, especially document-writer-friendly and reduces the time spent in searching for internal references and let the user worry about the content than the connections

Users' activity (key presses) will be listened through Jquerry script and when his activity level drops below a particular threshold value, the module will be called. This will also be called when s/he clicks the submit button. Other possible modes of triggering can also be added.

Data management

Gartheeban G

With increasing volume of Data available instantly, it has become a cumbersome task to find what we need (even if we accurately know what we are after).

Google comes handy at the expense of extreme data processing and awesome algorithms. However, it is done by tracking everything happening in internet, like the sites visited by the users, terms searched for and corrections made in the spelling in the subsequent searches, data involved in others services provided by Google (Gmail, Groups, Orkut, Blogger, etc) and various other data retrievals, which possess a great threat to personal privacy.

In addition, growing Monopoly of Google in information presentation makes it the determiner of neutrality of the information. For instance, if it presents the sides with one side view on 9/11 incident, then people tend to be directed in that direction.

How unbiased information can be retrieved, processed and made available to everyone and without violating personal privacy is a subjective area and being researched at many places.

The concept of Semantic web, evolved sometime back, is looking for ways of representing knowledge in machine understandable format, hence become easily retrievable and presentable.

Albeit it's popularity, still it seems to be an extraordinary task, left at the hands of the inventor of WWW and several others.

Psychology and AI

Madushanka Soysa

Artificial intelligence (often shortened to AI), according to John McCarthy who came up with the term, is "the science and engineering of making intelligent machines". It is the studying and designing of systems demonstrate intelligent behavior; Systems that perceives its environment and takes actions, which maximizes its chances of success.

Artificial intelligence is mainly an engineering discipline. To be more precise, a computer engineering discipline. But AI has being enriched by many other fields like mathematics , psychology, philosophy, neuroscience, cognitive science, linguistics, operations research, control theory, probability, logic, economics and many other social sciences.

In this article, the connections between AI and psychology, how psychology has enriched AI, and how it can be used further to help AI are looked into.

Psychology and AI congruence

At the first glance, psychology and AI does not seem to have very much in common. AI being an engineering discipline and psychology a behavioral science that spans social and natural sciences, does not seem to be that much related. It is a fact that AI and psychology has very different goals, and hence different standards of evaluation. In psychology, a goal is to model or predict human behavior. In AI, modeling human behavior may not have a value at all. A goal of AI is to design a system that solves a problem correctly and efficiently, not solve problems the way humans do. Take a simple example of a calculator. In AI, we need to design a calculator that gives the correct results very quickly of all the calculations we need. How human like methods it is using have no relevance. We surely do not want the calculator to make the common errors that humans do in calculations. Alternatively, take similar amount of time to solve. However, in psychology, it would be more relevant to design a model that approaches a calculation the way humans do. In addition, follow same methods as humans. Moreover, it would even be a goal to design a system that makes same errors humans do. The goal in psychology may be to model human behavior, but in AI, just behaving or thinking, as humans may not be good enough.

Furthermore, we should keep in mind that systems designed in AI do not suffer from many human limitations. Therefore, many procedures, tools and methods that humans use in particular situations, or to solve problems may not be required for AI systems. Hence, deeper analysis in human behavior and thinking done in psychology may not be that relevant for AI. We humans suffer from limitations in memory, and depth of calculations we can go into, the speed of calculations and computational skills. Nevertheless, in AI systems most of these limitations are not there. Well, if we need store lot of data in the system we can always expand the system memory by integrating more hardware. Need quicker calculations, use a faster processor. Therefore, the intelligent systems may not have to go into the trouble humans go to solve some problems. Hence, the methods used can be different. Take the case of finding the

roots of an algebraic function. Humans will try to factorize the function and find roots. However, a calculator will use numerical methods like Newton-Rhapson method to solve it. Therefore, when designing a system, there may be methods easier to implement in the system than the ones human uses. Just think, if we are to design a system that pass XX 101 exam, we might not need to implement complex learning methods or implement logical reasoning. Because we know, sometimes just having a 10 MB memory with a good search method will be more than enough to get a good grade.

All the same, AI needs to design systems that behave intelligently. It is obvious, that to implement intelligence, a high level of cognitive and reasoning processes are imperative. Well, the most intelligent being yet known are humans. Therefore, humans are the best model of intelligent system that we know of. Therefore, we have to accept that for AI, we have lot to learn from humans. Therefore, analyzing human behavior, their thinking and modeling that would be obviously helpful in AI. In addition, this is just what psychology is doing.

Physical Symbolic Systems Hypothesis

One such impact from psychology in AI is the introduction of the Physical Symbolic Systems Hypothesis, which was done by Allen Newell and Herbert Simon. The hypothesis states, "A physical symbol system has the necessary and sufficient means for intelligent action." A physical symbols systems is a set of entities called 'Symbols' and 'expressions', which are structures of symbols. An intelligent system will have a collection of these expressions, and will combine and manipulate these expressions with 'processes' to produce new expressions. The hypothesis said that any system that shows intelligence should have such a physical symbolic system and such a symbolic system would be enough to achieve intelligent behavior. Even though this hypothesis has being criticized a lot, it has helped and led the AI research for many years. Although the necessary condition is doubtful, we can see that the sufficient condition has being influencing many systems. Specially, this has guided the development of Symbolic AI.

General Problem Solver (GPS)

This is a computer program that simulated a logic machine developed by Allen Newell and Herbert Simon. This could solve problems that could be represented in formal mathematical logic. Though this could not solve any real world problems, proving theorems, chess playing, geometric problems and such like could be done. GPS used user defined objects and operations that could be done on them to generate the outputs. These outputs were evaluated by how close they are to the final goal, and this was used as a heuristic when deciding the next step. The specialty of this program was that it followed a very similar approach as to what humans do when presented with a similar problem.

Elementary Perceiver and Memorizer (EPAM)

This psychological model of human learning and memory was implemented as a computer program by Feigenbaum. These studies led the evolvement of expert systems and Feigenbaum is often called the father of expert systems.

There are many other tools like ACT theory by Anderson that influenced AI, and architectures

like Soar, Prodigy that are involved in learning, planning aspects.

How can psychology help?

Many of the recent achievements of AI did not involve lot of help or influence from psychology. This is because AI is moving away from human-like behavior when solving problems. There are many other techniques like generic search methods, and constrains satisfaction problem solving methods to address real world scenarios. Even in planning, although in the past it was done similar to human methods like back tracking (reasoning backwards) from a goal, now forward checking (reasoning from the initial situation) is more prevalent.

Still there are many areas that psychology can still help AI. AI is looking solutions for many problems. Still many systems can function well only in a restricted domain. They cannot yet work with assumptions. They lack common sense. Systems that can revise their knowledge base properly in contradictions are very few. They fail to handle exceptions properly. In addition, in addressing these problems, psychology can come handy.

Common sense

One major problem AI is having now is integrating common sense in to computer systems. One aspect of that is common sense knowledge. When implementing expert systems, it is seeing that many expert systems fail completely when their range of application is widened. They tend to make obvious errors that any human would detect. This is mainly because of the lack of common sense. i.e. the trivial facts that everyone knows. One solution tried for this is to have a huge knowledge base that would contain all the trivial facts that counts as common sense.

Another aspect of this is common sense reasoning. One approach for this is non-monotonic reasoning. In this, new findings or knowledge can change previous conclusions. It is somewhat similar to a situation where we find a contradiction and then we change our beliefs.

Classical logic is monotonic, since new conclusions are supposed to be based on facts that are true in all the cases. Non-monotonic reasoning is important when we need to work with unproven assumptions. This can be very helpful when logical inference is done. When human infer new statements, common sense reasoning helps us to limit ourselves to relevant cases. For example, when we choose a beach to spend the weekend, we do not always consider the possibility of a tsunami occurring. We decide with unproven assumptions that a tsunami will not occur. However, machines are not good at using these unproven assumptions.

Both these approaches were not very successful, and still implementing the common sense of a few year old kid in a computer system is a very difficult thing to achieve. Nevertheless, if psychology can explain common sense, and provide a model on how humans achieve common sense, it would be lot easier to achieve this in AI.

Additionally, psychology can be used to analyze how humans deal with changes. How they handle a slightly new scenario with their current knowledge. How they recover from errors and

mistakes. How humans handle exceptions, learn, plan and behave based on goals. How they filter relevant information from irrelevant. In essence, how humans do what they do. If theories can be formulated to model the human behavior, AI can benefit immensely.

Conclusion

It can be seen, though AI and psychology may have very different goals, approaches, there is a strong interaction between the two disciplines. We can see that many tools, models in psychology has being employed for the growth in AI, and still there are many problems in AI that can be addressed better with the help of psychological analysis.
After all, humans are the closest model for intelligent systems, and it would never hurt to understand humans more when it comes to designing artificial intelligent systems.

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- http://en.wikipedia.org/wiki/Physical_symbol_system : last accessed 13-10-07
- Mind Design II – Philosophy, psychology, Artificial intelligence: John Haugeland
- How Can Psychology Help Artificial Intelligence: Alvaro del Val

"Like all Holmes' reasoning," Dr. Watson says, "the thing seemed simplicity itself when it was once explained."

- ***Sir Arthur Conan Doyle***

Engineering approach

Gartheeban G

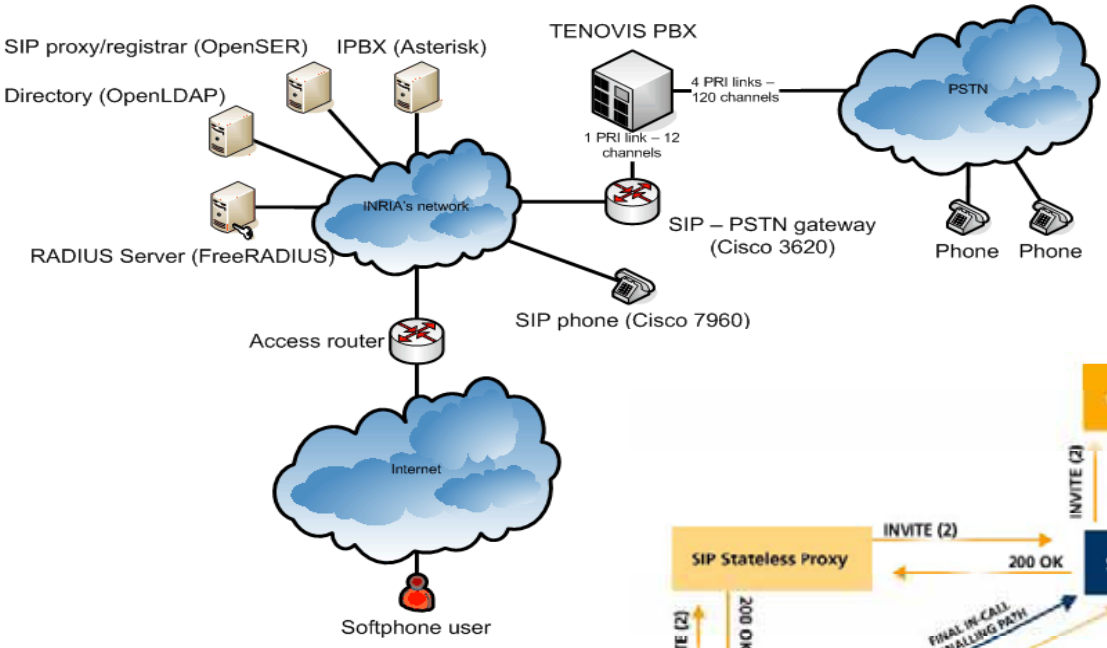
based on the article published in Mechanical Engineering, Vol 129

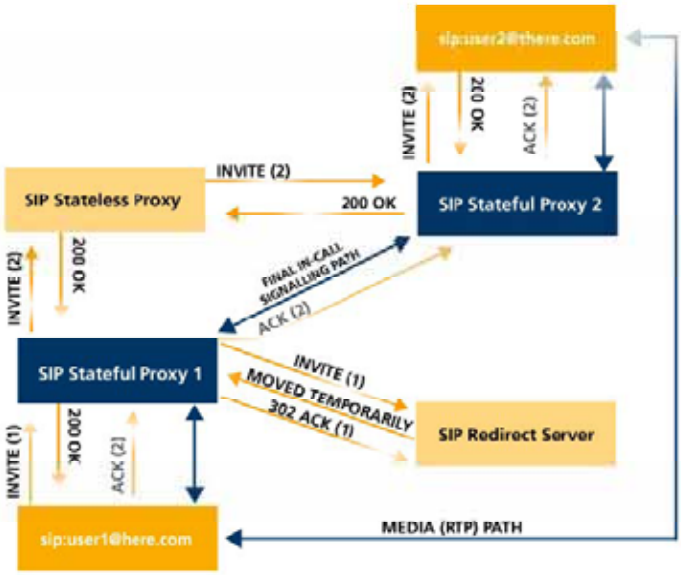
Many would perceive a systematic, analysis involving mathematics and solution described with diagrams and developed is an Engineering approach and it remains true even in the 21st century and surprisingly in IT industry too.

Two prominent scientists of 20th century, Thomas Edison, inventor of perfect filament and holder of 1100 patents in the US who painstakingly thorough in his designs (his search for filaments was a world famed occasion) and very adoptive and methodical (He once remarked, "My principle business consists of giving commercial value to the brilliant, but misdirected, ideas of others"), and Nikola Tesla, designer of guided missiles and hydropower generators and holder of more than 700 patents who was eccentric and regarded as "mad scientist" less methodical and less concerned with details show us two different approaches.

Engineers saw the problem and went after the solutions (in the desired path), however the impact and potential concerns barely mattered. Alfred Nobel didn't worry about the harms of a Dynamite so was Enrico Fermi, left at the hands of the policy makers. Some felt and were deeply concerned about their inventions later, especially Nobel.

Many compare Google's current technology revolution to that, where it is only focused on the problem solving but not the consequences. But let's remind the sage words – "Politics is a serious matter to be left at the hands of politicians"





If VoIP played a dominant role cheap telephony in the beginning of this decade, it is expected to fall in the hands of Soft phone at the latter part of the decade.

Soft phone provides means to communicate a telephone terminal from a PC. This has triggered enormous hope, with the inherent support for VoIP in iPhone. Soft phone heavily relies on Session Initiation Protocol (SIP); hence, it is generally referred to as SIP phone. It was designed by Henning Schulzrinne and Mark Handley in 1996.

As described in RFC 2361, The **SIP** is an **application-layer** signaling protocol for creating, modifying, and terminating sessions with one or more participants. Although mainly it is used for two-party communication (PC-to-telephone) multiparty or multicast sessions that include Internet telephone calls, multimedia distribution, and multimedia conferences are also supported. It is independent of other Layers (Layer 2, 3, 4) as per OSI model. In 2000, SIP was accepted as a 3GPP signaling protocol and widely used as a signaling protocol for Voice over IP.

Protocol design

SIP clients use TCP or UDP. All voice/video communications are done over separate session protocols, typically RTP. SIP provides a that can support a superset of the call processing

functions and features present in the public switched telephone network SIP by itself does not define signaling and call setup for IP-based communication; rather, its focus is call-setup and signaling. However, it was designed to enable the building of such features in network elements known as Proxy Servers and User Agents.

SIP-enabled telephony networks can also implement many of the more advanced call processing features present in Signaling System 7(SS7) although many other VoIP signaling protocols exist, SIP is characterized by its proponents as having roots in the IP community rather than the telecom industry.

The Benefits of SIP Telephony

Although pricing for SIP Telephony is typically 40 – 70% below legacy Telco offerings, features and enhancements for SIP-based (IP) PBXes are the key considerations in the deployment of SIP Telephony. Some features resolve multiple issues related to large-scale enterprise deployments, such as Disaster Recovery, On-Demand provisioning of lines, DIDs and toll free numbers, and geographic abstraction of local DIDs.

SIP clients

- Ekiga
- KCall
- KPhone
- Linphone
- Minisip
- OpenWengo
- PJSUA
- TudoMais
- XMeeting

- Microsoft Windows Messenger (not MSN Messenger or Windows Live Messenger)
- RadiusCat
- CounterPath
- SJphone
- NCH Swift Sound Express Talk
- PhonerLite
- fring
- ZOIPER

- AGEphone
- Eyeball
- Hampton Software's Articulation
- Movial
- Pingtel
- Virbiage
- CounterPath

SIP servers

- *Asterisk (PBX) SoftPBX*
- *OpenSER*
- *OpenSBC*
- *SIP Express Router (SER)*
- *YATE Yet Another Telephony*
- *Siproxd SIP*
- *YXA*
- *CallWeaver –*
- *Avaya Communication Manager SIP Enablement Services*
- *BEA Systems WebLogic SIP Server]*

- *Billion Softswitch*
- *Brekeke*
- *NEC SV7000 Back-to-Back User Agent*
- *Creacode*
- *Eyeball SIP Proxy Server*

State of SIP in Sri Lanka

Currently it is not officially recognized by the telecommunication regulatory council, hence it usage is not officially allowed, and thus telecommunication companies are not the beneficiaries.

However, major telecommunication providers, especially the company invested a lot in web-portal services shows keen interest in the area and expected to start the trial service soon.

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http://www.dmoz.org/Computers/Internet/Protocols/SIP
- *SIP*
http://www.dmoz.org/Computers/Internet/Protocols/SIP
- Henning Schulzinne's SIP homepage
http://www.cs.columbia.edu/sip

Soft phone with VoIP, in a conventional mobile phone > Telecommunication services providers are at a great threat such that few have already started to block VoIP in mobile phones. British Telecom made it a privileged service at higher package rental.

It is no coincidence that the most popular PC books go by names like "Windows for Dummies". Detroit does not sell books like "Oldsmobiles for Idiots" or "A Foul-Up's Guide to Fords".

- ***Patrick L Anderson***

Logic: n. The art of thinking and reasoning in strict accordance with the limitations and incapacities of the human misunderstanding.

- ***Ambrose Bierce***

Rule 1 of writing software for nontechnical users is this: if they have to read documentation to use it you designed it wrong.

- ***Eric Raymond***

If language is not correct,
then what is said is not what is meant.
If what is said is not what is meant,
then what ought to be done
remains undone.

- ***Kong Fu Zi / Confucius***

For want of nail, horseshoe was lost
For want of horseshoe steed was lost
for want of seed is message was undelivered
for undelivered message war was lost.

---

100 pages of comments will not make a poorly written page of code not suck.

-***Robert Mollitor***

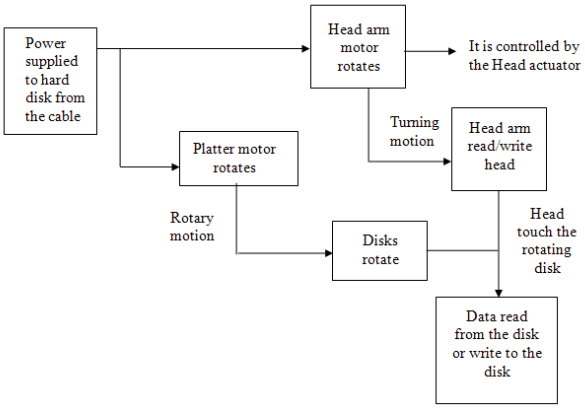
Network: Any thing reticulated or decussated, at equal distances,
with interstices between the intersections.

-***Samuel Johnson in 1755***

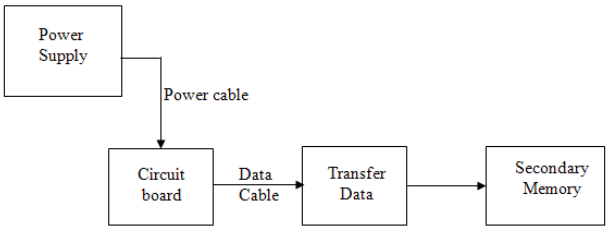
Computer Hard Disk

R.Dhileeban, Level 2

Mechanism – Mechanical Aspect



Mechanism - Electrical & Electronic Aspect

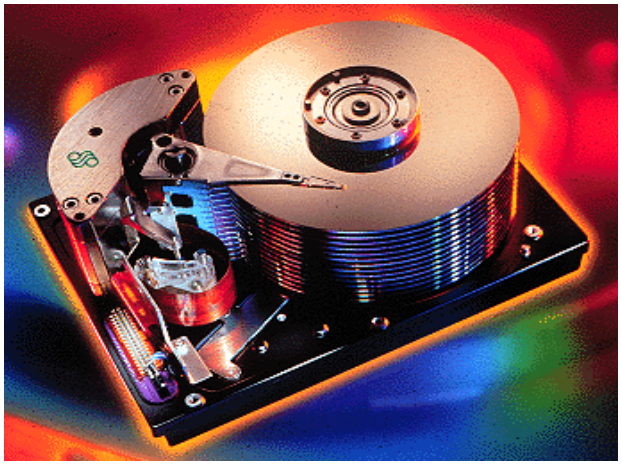


Materials and manufacturing Methods used on Computer Hard disk

A **hard drive** (HD) is a *non-volatile* storage device, which stores digitally encoded data on rapidly rotating platters with magnetic surfaces. The main differences between them are cost, capacity, transfer rate, and access time. Disk drive prices range from 25 cents to a $1 per megabyte, depending on the capacity, size, and manufacturer. They generally have a seek time of less than 20 milliseconds and are able to transfer data at more than 4 megabytes per second.

The primary computer storage medium, which is made of one or more aluminum or glass platters, coated with a ferromagnetic material. Older disks used iron(III) oxide as the magnetic material, but

current disks use a cobalt-based alloy. Hard disks are flat, circular plates made of aluminum or glass and coated with a magnetic material. Most hard disks are "fixed disks," which have platters that reside permanently in the drive. Hard disk is a magnetic storage medium for a microcomputer. Hard disks for personal computers can store up to several gigabytes (billions of bytes) of information. Data are stored on their surfaces in concentric tracks. A small electromagnet, called a magnetic head, writes a binary digit (1 or 0) by magnetizing tiny spots on the spinning disk in.



A computer's hard drive is a device consisting of several hard disks, read/write heads, a drive motor to spin the disks, and a small amount of circuitry, all sealed in a metal case to protect the disks from dust. In addition to referring to the disks themselves, the term hard disk is also used to refer to the whole hard drive.

Drive capacity has been growing thanks in part to improvements in drive platters and read/write heads, which access them. The earliest types of read/write heads were made from a single block of magnetic ceramic material (ferrite). The first major improvement resulted in a composite material made from a mixture of iron and other substances. Today, most drives use thin-film heads. Thin-film technology allows head vendors to achieve much smaller physical dimensions and greater control over the production process, results in better performing products.

Manufacturing Technology

Many methods are used by Hard Disk manufacturers

to deliver industry-leading reliability in its hard drive products. Quality is a never-ending process that encompasses design and technology considerations, component selection, development test engineering, manufacturing test processes, as well as customer expectations, requirements, integration efforts and field experiences. They use a holistic approach to quality and reliability, taking into consideration every aspect in the total quality equation that contributes to a successful product.

The characteristic requirements of each drive type with its specific environmental and operational parameters are submitted to long-term quality and reliability calculations whose results are based on:

- Design and technology
- Component selection
- Development test process
- Manufacturing test process

Early in the drive development cycle, new technologies and manufacturing techniques are evaluated for performance, quality, yield, as well as the ability to enhance product reliability. Verification testing is conducted at the component, subassembly, or at the prototype drive level as applicable to the concept under evaluation. From there, the individual components targeted for usage in the final product design are identified.

Inherent in the disk drive design are other aspects of product reliability that are integral to the development phase including drive optimization functions to decrease heat dissipation and technologies such as on-the-fly error correction, Data Recovery Procedures, error logging processes, and features to ensure data integrity under a broad spectrum of field usage conditions. These technologies, mechanisms and techniques are defined early in the development cycle for testing and verification against critical drive parameters such as performance, data reliability, duty cycles and service life before being integrated into the final drive design.

There are a number of technologies that promise to increase storage capacity and performance when they arrive. One of the most exciting lines of research is holographic storage technology. These units will

eventually store terabytes of data in a sugar-cube size crystal. The Advanced Research Project Agency (ARPA) recently kicked in another $22 million dollars to improve the technology, which builds on other holographic storage research ARPA has been funding over the past decade.

Addressing of Design Issues

The hard disk's spindle system relies on air The inside of a hard disk drive with the disk(s) and spindle motor hub removed. To the left of center is the actuator arm. A read-write head is at the end of the arm. In the middle the internal structure of the drive's spindle motor can be seen.

pressure inside the enclosure to support the heads at their proper *flying height* while the disk is in motion. A hard disk requires a certain range of air pressures in order to operate properly. The connection to the external environment and pressure occurs through a small hole in the enclosure (about 1/2 mm in diameter), usually with a carbon filter on the inside (the *breather filter,* see below). If the air pressure is too low, there will not be enough lift for the flying head, the head will not be at the proper height, and there is a risk of head crashes and data loss. Specially manufactured sealed and pressurized disks are needed for reliable high-altitude operation, above about 10,000 feet (3,000 m). This does not apply to pressurized enclosures, like an airplane pressurized cabin. Modern disks include temperature sensors and adjust their operation to the operating environment.

The magnetic surface of each platter is divided into many small sub-micrometer-sized magnetic regions, each of which is used to encode a single binary unit of information. In today's hard disks each of these magnetic regions is composed of a few hundred magnetic grains. Each magnetic region forms a magnetic dipole which generates a highly localized magnetic field nearby. The write head magnetizes a magnetic region by generating a strong local magnetic field nearby. Early hard disks used the same inductor that was used to read the data as an electromagnet to create this field. Later versions of inductive heads included, metal in Gap (MIG) heads and thin film heads. In today's heads the read and write elements are separate but are in close proximity on the head portion of an actuator arm. The read element is typically magneto-resistive while the write element is typically thin-film inductive

Hard disks have a mostly sealed enclosure that protects the disk internals from dust, condensation, and other sources of contamination. The hard disk's read-write heads fly on an air bearing which is a cushion of air only nanometers above the disk surface. The disk surface and the disk's internal environment must therefore be kept immaculate to prevent damage from fingerprints, hair, dust, smoke particles and such, given the sub-microscopic gap between the heads and disk.

Write Pre-compensation means using a stronger magnetic field to write data in sectors that are closer to the center of the disk. In CAV recording, in which the disk spins at a constant speed, the sectors closest to the spindle are packed tighter than the outer sectors.

One of the hard disk parameters stored in a PC's CMOS memory is the WPcom number, which is the track where pre-compensation begins.

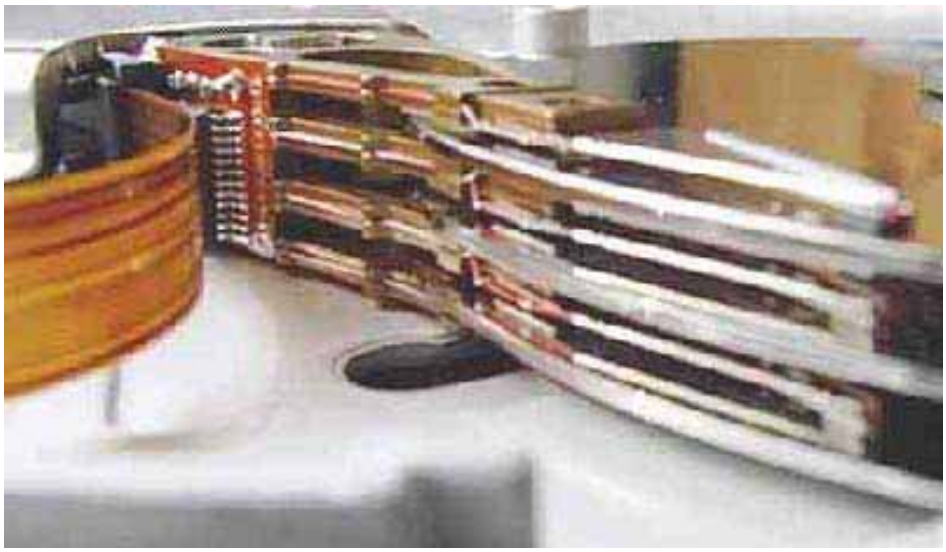
The exponential increases in disk space and data access times for hard disks has enabled the commercial viability of consumer products that require large storage capacities, such as the Apple iPod digital music player, the TiVo personal video recorder, and web-based email programs.

Design Improvements

The platters are spun at very high speeds. Information is written to a platter as it rotates past mechanisms called read-and-write heads that fly very close over the magnetic surface. The read-and-write head is used to detect and modify the magnetization

of the material immediately under it. There is one head for each magnetic platter surface on the spindle, mounted on a common arm. An actuator arm (or access arm) moves the heads on an arc (roughly radically) across the platters as they spin, allowing each head to access almost the entire surface of the platter as it spins.

We should increase the speed of the DATA input or output. To do this the main way to decrease access time is to increase rotational speed, while the main way to increase throughput and storage capacity is to increase aerial density. However, aerial density is determined by 2 factors: recording density and track density.



Track density measures how many tracks that can be packed into 1 area of space, while recording density measures the amount of data stored in a given physical length unit. Although higher track density can improve seek time, as disk head does not have to move as far to reach scattered data, improvement on transfer rate is not as important as increasing recording density.

Using rigid platters and sealing the unit allows much tighter tolerances than in a floppy disk drive. Consequently, hard disk drives can store much more data than floppy disk drives and access and transmit it faster. In 2006, a typical enterprise, i.e. workstation HDD might store between 160 GB and 750 GB of data (as of local US market by December 2006), rotate at 7,200 to 10,000 revolutions per minute (RPM), and have a sequential media transfer rate of over 3 GB/s. The fastest enterprise HDDs spin at 15,000 RPM, and can achieve sequential media transfer speeds up to and beyond 3 GB/s. Mobile, i.e., Laptop HDDs, which are physically smaller than their desktop and enterprise counterparts, tend to be slower and have less capacity. In the 1990's, most spun at 4,200 RPM. In 2007 a typical mobile HDD spins at 5,400 RPM and 7,200 RPM models are readily available for a slight price premium.

So the manufacturers should concern in these typical issues to make the Hard Disk with more superior quality.

- They can increase the number of platter disks and using different technologies to store more capacity.
- They can read and store the data quickly through increasing the speed of the header arm.
- They can increase the speed of the platter motor, so that they can get high RPM of the platters.
- To make sure these happen they should increase the size of the data cable which transfers data to the other parts of the computer.

There are only two industries that refer to their customers as *users*.

- **Edward Tufte**

INTRODUCTION TO ROBOTICS

R.Dhileeban, Level 2

The field of robotics has been around nearly as long as Artificial Intelligence - but the field has made little progress. This is only natural, since the field not only attempts to conquer intelligence, but also the body that embodies it - a formidable task indeed! Robotics, though, is not *just* about humanoid robots; but also about their commercial applications in manufacturing, safety and hundreds of other fields. Let us backtrack though, and look at what could constitute a robot.

A robot is a machine designed to do a human job (excluding research robots) that is tedious, slow or hazardous. It is only relatively recently that robots have started to employ a degree of Artificial Intelligence in their work - many robots required human operators, or precise guidance throughout their missions. Slowly, robots are becoming more and more autonomous.

The difference between robots and machinery is the presence of autonomy, flexibility and precision. Indeed, many few robots are mere extensions of machinery - but as the field advances more and more, the current 'fine line' will widen more and more.

A robot consists of:

- A mechanical device, such as a wheeled platform, arm, or other construction, capable of interacting with its environment
- Sensors on or around the device that are able to sense the environment and give useful feedback to the device
- Systems that process sensory input in the context of the device's current situation and instruct the device to perform actions in response to the situation

In the manufacturing field, robot development has focused on engineering robotic arms that perform manufacturing processes. In the space industry, robotics focuses on highly specialized, one-of-kind planetary rovers. Unlike a highly automated manufacturing plant, a planetary rover operating on the dark side of the moon -- without radio communication -- might run into unexpected situations. At a minimum, a planetary rover must have some source of sensory input, some way of interpreting that input, and a way of modifying its actions to respond to a changing world. Furthermore, the need to sense and adapt to a partially unknown environment requires intelligence (in other words, artificial intelligence).

However, robots of today are not exactly the walking, talking intelligent machines of movies, stories and our dreams. Today, we find most robots working for people in factories, warehouses, and laboratories. In the future, robots may show up in other places: our schools, our homes, even our bodies

Robots have the potential to change our economy, our health, our standard of living, our knowledge and the world in which we live. As the technology progresses, we are finding new ways to use robots. Each new use brings new hope and possibilities, but also potential dangers and risks

Motors

A variety of electric motors provide power to robots, allowing them to move material, parts, tools, or specialized devices with various programmed motions. The efficiency rating of a motor describes how much of the electricity consumed is converted to mechanical energy. Let's take a look at some of the mechanical devices that are currently being used in modern robotics technology.

DC motor: Permanent magnet - direct current (PMDC) motors require only two leads, and use an arrangement of fixed- and electro-magnets (stator

and rotor) and switches. These form a commutator to create motion through a spinning magnetic field.

AC motor: AC motors cycle the power at the input-leads, continuously move the field. Given a signal, AC and DC motors perform their action to the best of their ability.

Stepper motor: Stepper motors are like a brushless DC or AC motor. They move the rotor by applying power to different magnets in the motor in sequence (stepped). Steppers are designed for fine control and will not only spin on command, but can spin at any number of steps-per-second (up to their maximum speed).

Servomotors: Servomotors are closed-loop devices. Given a signal, they adjust themselves until they match the signal. Servos are used in radio control airplanes and cars. They are simple DC motors with gearing and a feedback control system.

R/C Servos: Servomotors, used in radio-controlled models (cars, planes, etc.) are useful in many kinds of smaller robots, because they are compact and quite inexpensive. The servomotors themselves have built-in motor, gearbox, position-feedback mechanisms and controlling electronics. Standard radio control servomotors which are used in model airplanes, cars and boats are useful for making arms, legs and other mechanical appendages which move back and forth rather than rotating in circles.

Pneumatics: Pneumatics is the name for fluid power used in a large number of commercial robots. Pneumatics are also used in a variety of animatronics systems that fall under the category of fluid power. A better-known branch of fluid power is hydraulics.

Driving mechanisms

Gears and chains: Gears and chains are mechanical platforms that provide a strong and accurate way to transmit rotary motion from one place to another, possibly changing it along the way. The speed change between two gears depends upon the number of teeth on each gear. When a powered gear goes through a full rotation, it pulls the chain by the number of teeth on that gear.

Pulleys and belts: Pulleys and belts, two other types of mechanical platforms used in robots, work the same way as gears and chains. Pulleys are wheels with a groove around the edge, and belts are the rubber loops that fit in that groove.

Gearboxes: A gearbox operates on the same principles as the gear and chain, without the chain. Gearboxes require closer tolerances, since instead of using a large loose chain to transfer force and adjust for misalignments, the gears mesh directly with each other. Examples of gearboxes can be found on the transmission in a car, the timing mechanism in a grandfather clock, and the paper-feed of your printer.

Power supplies

Power supplies are generally provided by two types of battery. Primary batteries are used once and then discarded; secondary batteries operate from a (mostly) reversible chemical reaction and can be recharged several times. Primary batteries have higher density and a lower self-discharge rate. Secondary (rechargeable) batteries have less energy than primary batteries, but can be recharged up to a thousand times depending on their chemistry and environment. Typically the first use of a rechargeable battery gives 4 hours of continuous operation in an application or robot.

Sensors

Robots react according to a basic temporal measurement, requiring different kinds of sensors.

In most systems, a sense of time is built-in through the circuits and programming. For this to be productive in practice, a robot has to have perceptual hardware and software, which updates quickly.

Regardless of sensor hardware or software, sensing and sensors can be thought of as interacting with external events (in other words, the outside world). The sensor measures some attribute of the world. The term transducer is often used interchangeably with sensor. A transducer is the mechanism, or element, of the sensor that transforms the energy associated with what is being measured into another form of energy. A sensor receives energy and transmits a signal to a display or computer. Sensors use transducers to change the input signal (sound, light, pressure, temperature, etc.) into an analog or digital form capable of being used by a robot.

Logical sensors: One powerful abstraction of a sensor is a logical sensor, which is a unit of sensing or module that supplies a particular percept. It consists of the signal processing, from the physical sensor, and the software processing needed to extract the percept.

Proprioceptive sensors: Proprioception is dead reckoning, where the robot measures a signal originating within itself.

Proximity sensors: A proximity sensor measures the relative distance between the sensor and objects in the environment.

Infrared (IR) sensors: Another type of active proximity sensor is an infrared sensor. It emits near-infrared energy and measures whether any significant amount of the IR light is returned.

Bump and feeler sensors: Another popular class of robotic sensing is tactile, or touch-based, done with a bump and feeler sensor. Feelers or whiskers are constructed from sturdy wires. A bump sensor is usually a protruding ring around the robot consisting of two layers.

Electronic control

There are two major hardware platforms in a robot. The mechanical platform of unregulated voltages, power and back-EMF spikes, and the electronic platform of clean power and 5-volt signals. These two platforms need to be bridged in order for digital logic to control mechanical systems. The classic component for this is a bridge relay. A control signal generates a magnetic field in the relay's coil that physically closes a switch. MOSFETs, for example, are highly efficient silicon switches, available in many sizes like the transistor that can operate as a solid state relay to control the mechanical systems.

On the other hand, larger sized robots may require a PMDC motor in which the value of the MOSFET's "on" resistance Rds(on) results in great increases in the heat dissipation of the chip, thereby significantly reducing the chip's heat temperature. Junction temperatures within the MOSFET and the coefficients of conduction of the MOSFET package and heat sink are other important characteristics of PMDC motors.

There are two broad families of transistor: bipolar junction transistors (BJT) and field-effect transistors (FET). In BJT devices, a small current flow at the base moderates a much larger current between the emitter and collector. In FET devices, the presence of an electrical field at the gate moderates the flow between the source and drain.

Microcontroller systems

Microcontrollers (MCUs) are intelligent electronic devices used inside robots. They deliver functions similar to those performed by a microprocessor (central processing unit, or CPU) inside a personal computer. MCUs are slower and can address less memory than CPUs, but are designed for real-world control problems. One of the major differences between CPUs and MCUs is the number of external components needed to operate them. MCUs can often run with zero external parts, and typically need only an external crystal or oscillator.

There are four basic aspects of a microcontroller: speed, size, memory, and other. Speed is designated in clock cycles, and is usually measured in millions of

cycles per second (Megahertz, MHz). The use of the cycles varies in different MCUs, affecting the usable speed of the processor. Size specifies the number of bits of information the MCU can process in one step -- the size of its natural cluster of information. MCUs come in 4-, 8-, 16-, and 32-bits, with 8-bit MCUs being the most common size. MCUs count most of their ROM in thousands of bytes (KB) and RAM in single bytes. Many MCUs use the Harvard architecture, in which the program is kept in one section of memory (usually the internal or external SRAM). This in turn allows the processor to access the separate memories more efficiently.

The fourth aspect of microcontrollers, referred to as "other", includes features such as a dedicated input device that often (but not always) has a small LED or LCD display for output. A microcontroller also takes input from the device and controls it by sending signals to different components in the device. Also the program counter keeps track of which command is to be executed by the microcontroller.

Robot Architectures

Brooks' Subsumption Architecture

This approach breaks the problem down into *task-achieving behaviors* (such as wandering, avoiding obstacles, or making maps) rather than decomposing it functionally (into sensing, planning, and acting).

In subsumption architectures, *levels of competence* are stacked one on top of another, ranging from the lowest level (object avoidance) to higher levels for planning and map-making. Higher levels may interfere with lower levels, but each level's architecture is built, tested and completed before the next level is added. In this way the system is robust and incrementally more powerful.

Individual levels consist of augmented finite state machines connected by message-passing wires. Higher levels may inhibit signals on these wires, or replace them with their own signals; this is how they exercise control over more basic functions.

Shakey

Shakey was the forerunner of many intelligent robot projects. The Shakey system was controlled by PLANEX, which accepted goals from the user, called a STRIPS subsystem to generate plans, and then executed them via *intermediate-level actions*. These ILA's were translated into complex routines of *low-level actions* that had some error detection and correction capabilities.

After each action was executed, PLANES would execute the shortest plan subsequence that led to a goal and whose preconditions were satisfied. In this way, actions that failed would be retried and serendipity would lead to reduced effort. If no subsequence applied, PLANEX called STRIPS to make a new plan.

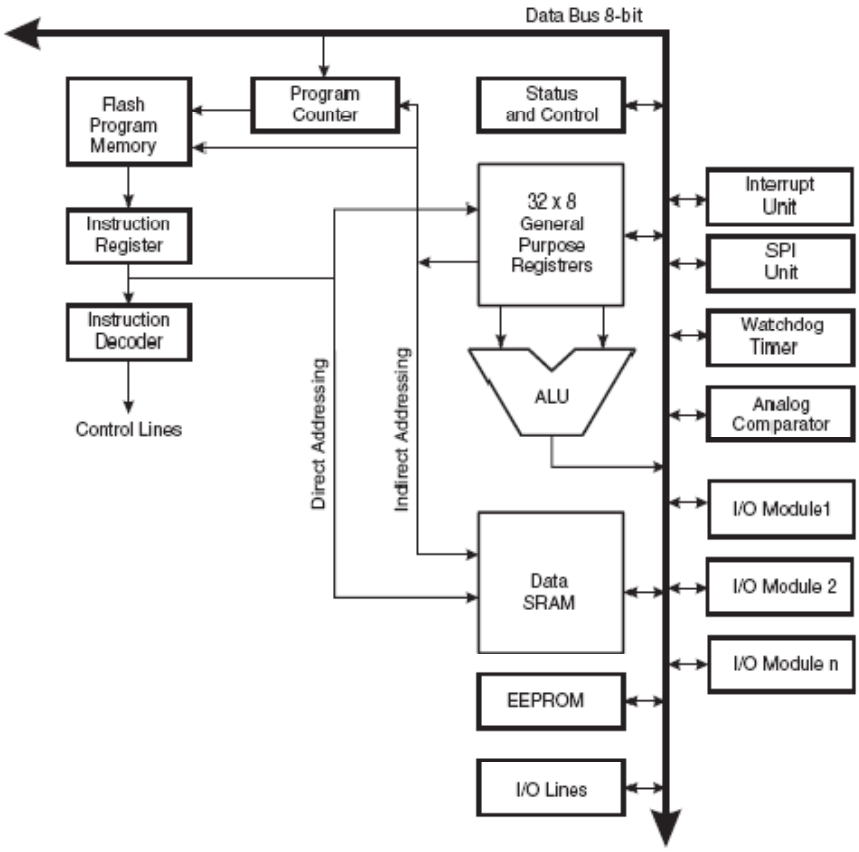
Situated Automata

An approach pioneered by Stan Rosenschein that begins with an explicit representation and reasoning system, but compiles it into a finite-state machine whose inputs come from the environment and whose outputs connect to effectors.

This compilation approach distinguishes between the use of explicit knowledge representation by the designers (the "grand strategy") and the use of explicit knowledge within the agent architecture (the "grand tactic"). Rosenschein's compiler generates FSMs that can be *proved* to correspond to logical propositions about the environment, provided the compiler has the correct initial state and physics.

The FLAKEY system at SRI used situated automata to navigate, run errands, and ask questions, and had no explicit representation.

This article is intended to introduce AVR, justification of its choice in general applications, and development of simple applications with AVR.



Introduction

AVR is a Harvard Architecture, 8 bit, single chip micro controller based on RISC architecture, developed by two Norwegian students Alf-Egil Bogen and Vegard Wollan. Generally, it comes with plenty of program memory starting from 1KB ranging to enormous 256KB. Package size varies from tiny 8 pin to giant 100 pin.

Flash is used for program memory and EEPROM is available for data storage together with SRAM registers (working memory), all integrated in a single chip. It strictly follows the Harvard Architecture with RISC instruction set, hence single level pipeline is inherent. This means the next machine instruction is fetched as the current one is executing. Most instructions take just one or two clock cycles, making AVRs relatively fast among the eight-bit microcontrollers.

Justification of its adoption

Important eye-catching feature in AVR is, it is built with the C code in mind; hence, pointer support is available hardware. In addition, it guarantees the efficient execution of C programs.

AVR development KIT is available as DIY pack and together with AVR studio 4 (4.13 freely available), winAVR and ponyProg robust applications on interfacing and other microcontroller operations can be deployed.

When comparing with other microcontrollers it provides the easiness of PIC family, advanced debugging features (AVR studio 4) similar to of Visual Studio, inherent support for C programming (contrast to traditional Assembly programming) through open source AVR gcc compiler, availability of advanced features like Capture and Compare module, PWM module, USART communication, Watchdog timers, interrupts and excellent jumping instructions (in C code) even in tiny cheap models.

Deploying solutions through AVR microcontroller

The rest of the article assumes, user is in possession of the following software tools.

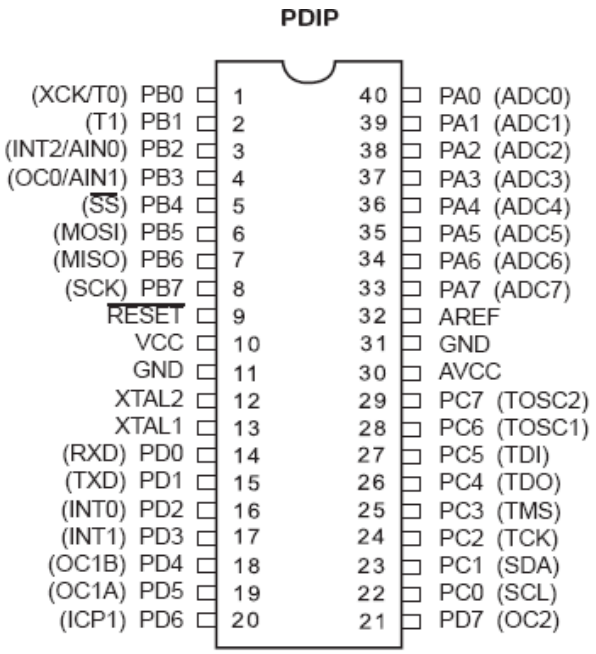
- **Win AVR -** http://winavr.sourceforge.net/
- **AVR studio Setup -** http://www.atmel.com/avrstudio
- **User guide -** http://instruct1.cit.cornell.edu/courses/ee476/AtmelStuff/doc1019.pdf

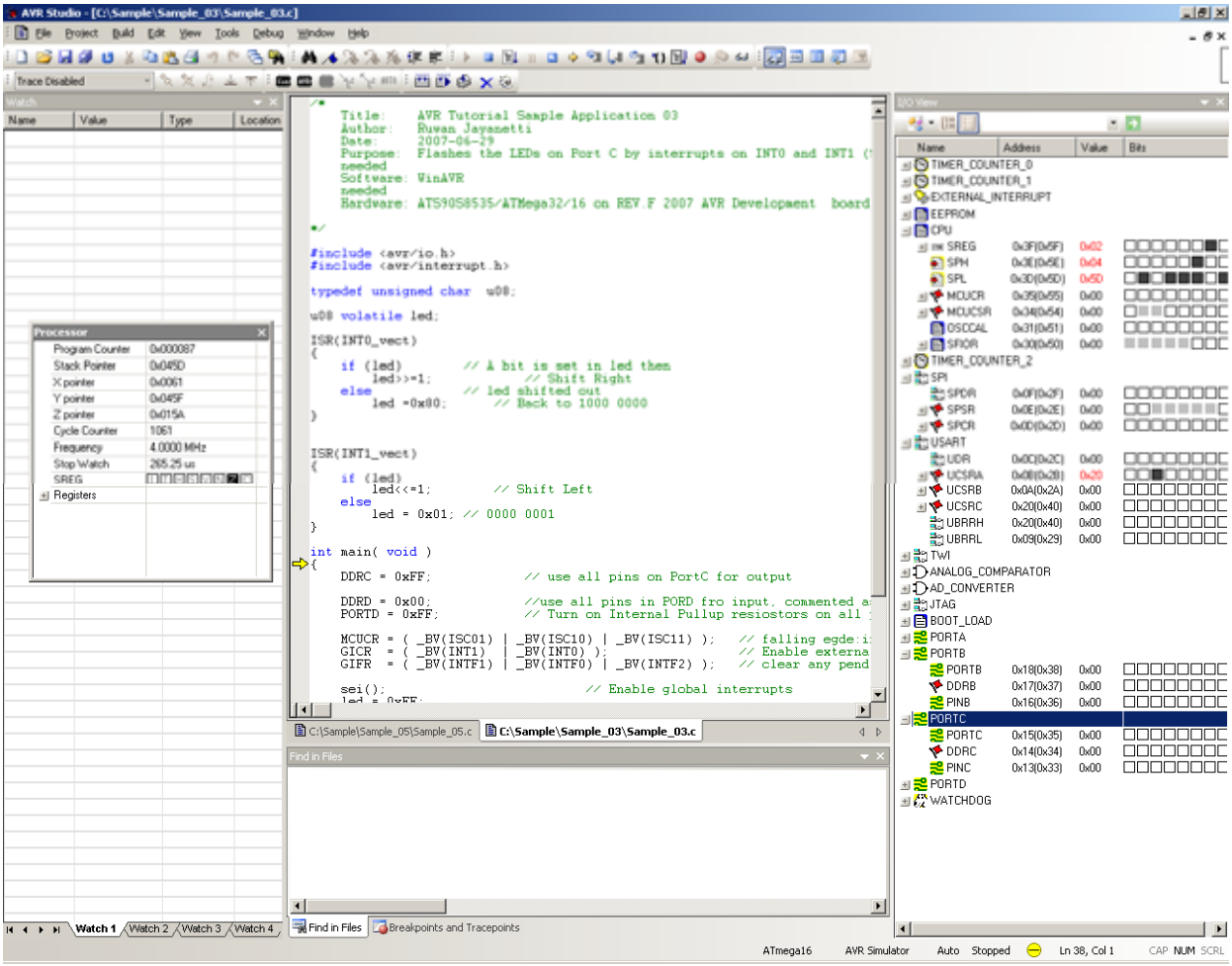
- **AVR gcc reference -**
  http://hubbard.engr.scu.edu/embedded/avr/doc/avr-libc/avr-libc-user-manual.pdf

The following programs are used to explain the operation, and can be tested only using the simulation in AVR studio, hence user will have to simulate the inputs at several instances as specified.

When a development board is available (can be purchased as KIT) it is better to be utilized efficiently, and programs with I/O can be tested through USART.

However, AVR studio offers the benefits of an Integrated Development Environment, and at the initial stages of a complex program, it will become handy specially in debugging through breaking into the program code.





```
/* Program 1 - Basics */
#include <avr/io.h>
int main (void)
{

/* let's start with ports */
      DDRA = 0xFF;
      //make PortA output
      /* Turn on Internal Pullup
resiostors on all pins of PORTD as */
      DDRD = 0x00;
      /* make PortD input*/
      PORTA = PIND;

/* trigger the change in PortA equal
to PortD while PORTD becomes equal to
'1' */
      while (PORTA = PIND) ==0x1);
/* running lights for a while - time
extended by double for loops */
      int i; int j;
      for (j =0; j<250; j++) {
            for (i=0;i<250;i++)

            /* do this for ever */
            {
                  if(PORTC)
                        PORTC =
PINC<<1;
                  else
                        PORTC = 0x01;
                        /* set Port C
                        to value read
                        */
            }
      }
}
/* End */
```

```
/* Program 2 - Lower Intermediate */
/* Program explains how long jumps are
used in place of short jumps i.e. goto
statements */

#include <setjmp.h>
jmp_buf set;
int t;

int main (void)
{
      t = 1;
      //start here with t=1
      if (setjmp (set))
/* this will be entered only if it is
returned from a jump */
      {
            t = 3;
      }
      if (t!=1)
/*  execute of if the above error didn't
happen */
      smaplef();
      t = 4;
/*  we come here finally */
      while(1);
}

void smaplef (void)
{
      t = 2;
// ensure we came here
      longjmp (set, 1);
/* error occurred lets return to the
handler */
      t = 5;
// we never came here
}
/* End */
```

```
/* Program 3 - Upper Intermediate */
/* EEPROM writing */
int main (void)
{

  uint8_t x;
  const char *temp = "hello";
  char t[20];

 /* wait till it becomes ready*/
  while (!eeprom_is_ready());

 /*write single byte*/
 eeprom_write_byte      ((uint8_t*)0x10,
(uint8_t)2);

/*read it back to check*/
     x = eeprom_read_byte    ((uint8_t*)
 0x10);

 /* wait till it becomes ready*/
 while (!eeprom_is_ready());

 /* write a block of bytes "hello"*/
 eeprom_write_block (temp, (char *)0x10,
 strlen(temp));

 /*read it back to check*/
 eeprom_read_block(&t, (char*)0x10,
 strlen(temp));

}
/* End */
```

```
/* Program 4 - Advanced */

#include <avr/io.h>
#include <stdio.h>

/* UART Baud rate calculation */
#define UART_CPU 4000000   // 4Mhz
#define UART_BAUD_RATE 9600 // baud rate
#define UART_BAUD_SELECT
(UART_CPU/(UART_BAUD_RATE*16l)-1)


int main(void)
{
      int n,i, tempV=0, tempold=0,
      count=0;
      char temp[10];

/*use all pins on PortC for output */
      DDRC= 0xFF;

/*enable USART transmission and
reception*/
      UCSRB = (1<<RXEN)|(1<<TXEN);

/* Set frame format: 8data, 2stop bit */
      UCSRC = (1<<URSEL)|(1<<USBS)|
(3<<UCSZ0);
      UBRRL = ((u08)UART_BAUD_SELECT);

/*use AVCC as reference, right adjusted,
ADC0 selected*/
      ADMUX = _BV(REFS0);

/*enable ADC and set speed to 115.2KHz
*/
      ADCSRA = (_BV(ADEN)|_BV(ADPS1)|
_BV(ADPS0));

/*using ADC0, set as input*/
      DDRA=0x00;

      while (1) {
            //Start conversion
            ADCSRA |= _BV(ADSC);

            /*wait till it is written to
buffer*/
            while(!(ADCSRA & _BV(ADIF))
);
            tempV= ADC;

/* only transmits through USART if there
is a change to avoid granular noise,
special measure is take; transmit only
if there is a significant change
however this might affect the
sensitivity; hence, allow small changes
initially and suppress only if the
fluctuation continues for a while. */
      if ((tempold != tempV)&&( (4<
(tempold - tempV)) ||(4<(tempV-
tempold))||(count==0) ))  {

                  count++;
/* format it to a 4 digit character */
            n = sprintf(temp , "%4d",
tempV);


/* send backspace characters, so that if
it is viewed in Hyper Terminal, the
digit appearing  gets updated without
cascading with the previous output.*/

      for (i=0;i<n;i++) {
            while ( !( UCSRA &(1<<UDRE))
);
                  UDR = '\b';
      }
      //transmit the value
      for (i=0;i<n;i++) {
/* Wait for empty transmit buffer */
            while ( !( UCSRA & (1<<UDRE)
));
                  UDR = temp[i];
      }

      // save the last value
      tempold = tempV;

      }else{
      count++;
      }
      }
}
/* End */
```

Ponyprog can be used to download the program through SPI port into the AVR micro controller, and write on the flash memory.

Hyper terminal can be used to debug the program code, by receiving the signals sent through USART. However, Hyper terminal should be properly configured for Baud Rate and COM port selected. Usually Parity can be selected and flow control can be selected to be none.

Are compact fluorescent lamps (CFL) the cure for all problems?

L Dayasena, Level 3

As with many things concerned with the environment, the effect of electrical energy usage is an active topic for debate. The CFL is hailed as the best option for energy efficient lighting. This usually neglects the energy used to manufacture the CFL and to dispose of it. With the older incandescent bulb, it was easier to manufacture and only needed glass and tungsten as main raw materials but the newer CFLs need many electronic components like semiconductor devices and costly parts like transformers also the fluorescent tube contains the Mercury, which is a harmful element. Also in some countries, legislations have been passed to make energy efficient lighting mandatory (for example Australia).

The effects of CFLs in a Sri Lankan context are discussed in this article. One of the main points the manufacturers of CFLs do not point out is that the claimed life expectancy is the time for half brightness. The claimed life of the CFL is only achieved by using continuously and not switching it on and off many times. If a CFL is switched many times a day it will not even last half of the claimed time. This could mean full brightness for half the life and a gradual decline, or a two-day decline to half brightness and is dependent on the quality of the tube used also the claimed power usages are normally not tested for correctness by standards institutes.

Lighting is needed in places with diverse requirements like reliability (emergency lighting), robustness against environmental factors (outdoor lighting, oven lighting), heat generation (low carbon footprint designs) and output spectrum (in clothes stores and studios). The problem is that only some of these can be met with the use of CFLs.

CFLs are sensitive to water (in the form of rain, condensation or humidity) and are sensitive to the operating temperature (therefore are not suitable for enclosed lighting fixtures) and consequently are not a viable option for outdoor lighting. Operating CFLs in afore mentioned situations could result in catastrophic failures like explosions and fires. Usage of low quality CFLs will guarantee you personal experiences.

Colors given by interior designers generally consider fluorescent lighting harsh and they favor many variations of incandescent lighting and LEDs against fluorescents. In the end, every technology has its problems.

In terms of efficiency, the best is the conventional fluorescent lamp with electronic ballast. However, a look into the future seems to hint that LEDs are the way to go.

For more information see
http://sound.westhost.com/articles/incandescent.htm

Moon instructs a student

One day a student came to Moon and said, "I understand how to make a better garbage collector. We must keep a reference count of the pointers to each cons."

Moon patiently told the student the following story: "One day a student came to Moon and said: I understand how to make a better garbage collector..."

Note: Pure reference-count garbage collectors have problems with circular structures that point to themselves.

Greenblatt sticks it in

A student, in hopes of understanding the Lambda-nature, came to Greenb-
.latt
As they spoke a Multics system hacker walked by. "Is it true", asked the stu-
."dent, "that PL-1 has many of the same data types as Lisp
Almost before the student had finished his question, Greenblatt shouted,
."FOO!", and hit the student with a stick

Knuth on a pilgrimage

A man from AI walked across the mountains to SAIL to see the Master, Knuth. When he arrived, the
Master was nowhere to be
.found
Where is the wise one named" Knuth?", he asked a passing
.student
Ah," said the student," you" have not heard. He has gone on a pilgrimage across the mountains to the
temple of AI to seek out new disciples." Hearing this, the
.man was Enlightened

The Lisp Hacker and the Undergraduate

A famous Lisp Hacker noticed an Undergraduate sitting in front of a Xerox 1108, trying to edit a complex
Klone network via a browser
Wanting to help, the Hacker clicked one of the nodes in the network with the mouse, and asked "what
"?do you see
Very earnesty, the Undergraduate replied "I see a cursor
The Hacker then quickly pressed the boot toggle at the back of the keyboard, while simultaneously
hitting the Undergraduate over the head with a thick Interlisp Manual
.The Undergraduate was then Enlightened

ELECTRONIC AND TELECOMMUNICATION ENGINEERING

Bridging the Digital Gap

Keeping up with the theme, the scope will be broaden to disseminate general working knowledge in various Electronic and telecommunication related areas among general public. With the success of the exhibitions "Expose 2005 / 2006" of past two years, the E-Club has decided to carry forward the tradition as an annual event in an even more effective manner. Expose 2007 exhibiting undergraduate, postgraduate and various industrial projects will bring together the industry, undergraduates and all other knowledge sources creating mutual benefits