ACKNOWLEDGEMENT

We fold our hands to the almighty for making this magazine a reality. We are thankful to Dr. S Thamarai Selvi**,** the Dean, MIT, for providing the platform to bring about this magazine. We are grateful to our Head Dr. K. Boopathy Bagan for his trust and support in the outcome of the magazine. We thank Professor Emeritus Dr. P. Kanagasabapathy, who was the instrument for initiating the magazine. All the staff members have been a great pillar of support and strength throughout, to the entire magazine team. We are obliged to them. We ought to express our gratitude to the alumni for their helping hand.

We thank and appreciate all our student friends without whom "INSTRUE" would have just been a dream.

-Team Instrue

EDITORIAL MESSAGE

We take immense pride in releasing the third issue of "Instrue", the magazine of the Students of IEA (Instrumentation Engineers Association) at MIT-Anna University. The theme of Intecho'12 is "Instrumentation In Health Care" and we students at MIT take pride in stating that we have left no stone unturned in doing our bit towards this issue that is deemed to hold wide repercussions to the way we would lead our lives in the days to come.

What the world needs?

It is riveting to observe how the term 'nutrition' has reached the layman's world. Diseases such as dengue fever, hepatitis, tuberculosis, malaria and pneumonia continue to plague India due to increased resistance to drugs. Indians are also at particularly high risk for atherosclerosis and coronary artery disease. NGOs such as the Indian Heart Foundation and the Medwin Foundation have been created to raise awareness about this public health issue. Automatically the theme 'Health Care' becomes the need of the hour. Having said that the responsibility of ushering a transformation of sorts from the existing standards of treatment to a future of able-bodied life rest well and truly in the engineer's hand, in 2012 it's easy to find bizarre-people go on a diet spree for a month consuming just loafs of bread, oats and never-heard-of kind of juice like the beetroot juice or coriander juice which tastes absolutely yuck! Even crazy to listen to ideas that people have come up with to conserve energy. Amusingly they go on a boozing binge the next month to compensate their so-called weight reduction programme. Finally, we end up being the bizarre outlandish person reluctant in making such efforts. Such endeavors help them only in expanding a few extra centimeters of waist filled with absolute gas. Knowledge is now at the tap-of-a-thumb with smart phones and it is our responsibility to just GOOGLE it(JFJI).We are quite familiar of people overwhelmed for just influenza or COMMON cold which can be easily medicated with MR.Paracetamol, still they seek a doctor's scribble. On the contrary, there are Hypocrites who purchase a sphygmomanometer (B.P instrument), forget to open the mercury gauge knob which indicates the raise of pressure, keep pumping the hand-bulb waiting for mercury level to rise; ironically the BP of the patient shoots up with him still strapped. But then a few mundane people are intellectual as well. We came across a ridiculous incident at multi-specialty hospital. A junior nurse as a part of her daily chores inserted catheter into the patient to give glucose, incidentally the attender found that the thermocol ball was stand-still in the humidifier, indicating the patient was dead, unfortunately only hours after 2 bottles of glucose dripped into the dead body. Jokes apart, there is a grave need to evoke awareness in imparting the righteous knowledge into every Indian citizen.

Dean's Desk

I am extremely happy that the Instrumentation Engineers Association has brought out a magazine for the national level technical symposium "Intecho12", which will go a long way in helping the budding engineers to present their new ideas and help them with necessary exposure to highlight their talents. This attempt will no doubt provide them with opportunities to improve their knowledge in their domains of interest. I appreciate their efforts and convey my hearty wishes.

Dr.S.Thamarai Selvi
Professor and Dean, MIT

"Learn from yesterday, live for today, hope for tomorrow."
-Albert Einstein

We Instrumentation engineers are responsible in building a techo-friendly medical environment which can cater the intellect of common men as well.Schools also report higher learning rate and enthusiasm among students. As real inventions are out dated, the need of the hour is innovation. Moreover, it need not be something extremely abstruse for a layman to grasp; for all the path-breaking inventions of our age have started, being petty but ideas imbued with an optimum dose of common sense. So let us unfetter our intellects and think beyond the self-imposed boundaries for, the solutions to all our problems can be found by prudent excitation of the synaptic relays in our gray matter. Let us hope for an efficient tomorrow. We regret the presence of any glitches present in this magazine that might have crept in accidentally. We wish to thank the whole “Instrue” team without whose solemn efforts, this attempt would not have fructified. Finally, we wish you, the future engineers of India, all the very best in your professional and personal lives and hope that the same hearty welcome that has been provided now, be extended for all our future endeavors…..

Thanking you,

The Editorial Team

HOD’s Desk

I am extremely happy to learn that the Association of Instrumentation Engineers is going forward with the magazine ‘Instrue’ which will be a treasure of the hidden talents in the minds of the budding engineers. This will help the students to explore and expose their knowledge in their field. I appreciate their efforts and wish them a great success in their endeavors.

Dr.K.Bhoopathy Bagan
Head of the Department
Instrumentation Engg.

“Science is always wrong. It never solves a problem without creating ten more.”
-George Bernard Shaw

MIT and IEA

In 1949, Shri.C.Rajam, gave the newly independent India-Madras Institute of Technology, so that MIT could establish the strong technical base it needed to take its place in the world. It was the rare genius and daring of its founder that made MIT offer courses like Aeronautical Engineering, Automobile Engineering, Electronics Engineering and Instrument Technology for the first time in our country. Now it also provides technical education in other engineering fields such as Rubber and Plastic Technology & Production Technology, Information Technology, Computer Technology. It was merged with Anna University in the year 1978. MIT has produced great scientist like Dr.A.P.J.Abdul Kalam, versatile genius like Sujatha and many more. Presently the Vice Chancellor, Registrar of Anna University and the Dean of MIT are all alumni of MIT. The broad-based education, coupled with practice-oriented training in their speciality, has enabled the students of MIT to handle with skill and success a wide variety of technical problems. The Madras Institute of Technology has developed into an important centre of engineering education and earned an excellent reputation both in India and abroad.MIT had received many awards which includes an award for the Best Overall Performance, awarded by Indian Society of Technical Education (ISTE) during the year 1999.

Madras Institute of Technology shall strive towards becoming a world class institution by producing professionals with a high technical knowledge, professional skills and ethical values. We shall be the preferred partner to the industry and community for our contribution towards their economic and social development by providing high quality manpower through excellence in teaching, research and consultancy. Madras Institute of Technology shall be recognized as a point of reference, a catalyst, a facilitator, a trend-setter and a leader in technical education.

DEPARTMENT OF INSTRUMENTATION

Instrumentation precisely is the measurement and control of various parameters of any system. It is fascinating motley of multi-facious disciplines of technology such as process control, Electrical, Electronics and Mechanical measurements and transducer Engineering. This Department offers Instrumentation Engineering at PG level, Electronics and Instrumentation Engineering at UG level and PhD and M.S. (by Research) for both regular and Part-time scholars. Another fact that catapults the fame of the Department to great heights is the strong bond between the students, Professors and Alumni. The Department has unique recognition as DST-FIST sponsored Department. The NBA expert team also visited the department during Dec 2007. Recently, the QIP expert team also visited the Department to give recognition for offering the M.E/Ph.D. under QIP scheme.

VISION OF THE DEPARTMENT

The department of instrumentation strives towards becoming trend setter and a facilitator in Electronics, Instrumentation and Control Engineering for higher learning, research and consultancy.

We shall strive to become a preferred partner to the industry and community for contribution towards their economic and social development by providing high quality manpower with sound technical knowledge, professional skills and ethical values.

From an Alumnus in Atlanta

Gaurav Rajasekar
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This is probably the time when a good number of you who want to study abroad, mostly the 4th years, are waiting with your heart in your throat for admits from universities in the US, UK and other nations. As an alumnus of Madras Institute of Technology's Instrumentation Engineering department and a Masters student in Electrical and Computer Engineering at Georgia Tech, Atlanta, I won't preach to you on the familiar topic of "getting into a university in the States". I'd rather talk about things you should prepare yourself for when you're deciding to take up an offer of admission and when you're studying here to come out of it all better than you were when you went in.

` First of all, be sure about what you want to do - do not take up a PhD offer without being sure of the field of study you want to pursue, especially not for the funding unless you have no other way to finance yourself. Choose where you want to go based on engineering recruiters' opinions of the university (from lists such as those made by the Wall Street Journal), the university's reputation within that country for your course of study (the oft-mentioned US News Rankings are a good starting point if you're looking at US institutions) and the kind of research under way there. There is no point going to a place where there's a huge amount of in-depth theoretical research if your goal is to graduate quickly and find a job in the industry. Some universities are well-known names but they may actually not be anywhere near the top when it comes to your specific line of study. Whatever you're going to be doing though, do brush up your coding skills if you're planning to be doing anything remotely related to engineering.

Draw upon all that you've learnt during your undergrad years and make sure you're really stepping into something you want to do. The most important thing you'll realize when you get here is that you need to be happy with what you're studying and researching. At the same time, be mindful of what fields have a high recruitment count too. All these must factor into your decision-making process. When in doubt, try to get in touch with seniors here - they'll be more than happy to help answer your queries.

Coming to the point where you've decided the university you're going to, I'll be tackling this from the perspective of a grad student in the US - though much of it applies for other nations as well. When you're here, your classes will not come to you the way you're used to it at MIT Campus, instead you'll pick a set of classes and attend them as per your schedule. If you do intend to switch lines from your undergrad, understand that there will be people here that may have been actively pursuing that particular field during their bachelors and have had several years of industry experience before coming back for a graduate degree. In such an environment it's easy to get into a rut where you start questioning your decisions up to that point when you see a lot of people doing much better than you. You'll need all the moral fortitude and courage in the world to keep going without giving up. This is especially true at Georgia Tech (one of the top five engineering programs in the US and top ten in the world) where they pride themselves in stressing out graduate students with 4 courses a semester as against 3 at other top ten institutions. Try to maintain a GPA that's 3.5+ out of 4 at least which is what employers look for. If you're interested in doing a thesis or a PhD, approach professors as soon as you can and ask for information and opportunities. Do not just ask them for funding that never go well.

If you can't find funding within your own department, don't feel shy about contacting other departments and professors and inquiring if they have opportunities available for part-time positions, Teaching Assistants or Research Assistants. The learning curve here is steep, especially in the first semester when you're trying to get settled in and getting used to doing everything on your own. So don't ever waste time, time management is an essential skill. When you're doing your assignments, be wary of "honor codes" that prohibit any sort of discussion and collaboration and the need to cite and reference every single source you've ever used. You can get in big trouble, even be suspended or kicked out for doing a last-minute-

copy-submit that you may have got away with during your undergrad.

For a Masters student here, remember that your quest for an internship should start later into your first semester. An internship on your resume is a big aid when you’re trying to find a fulltime job. Have a professional resume (no more than 1.5 to 2 pages) ready and apply to as many positions and companies as you can. I can’t stress this enough but NETWORK, NETWORK and NETWORK SOME MORE. This isn’t TCP/IP I’m talking about, what I mean here is more of Nokia’s motto. Get to know people outside your friends’ circle. Don’t stick around other Indian students all the time. Go out there, socialize, and make friends with people from different nations as well as Americans. You never know which of those people may be instrumental in getting you an internship or job interview. Use social events to meet people, not just for the free food. Have a LinkedIn profile ready and keep updating it with your projects on a regular basis. Having recommendations from professors and people you’ve worked for helps greatly.

No one will spoon feed you or push you to work harder, self-motivation is the key. Don’t forget to have fun though; you’ll need to do this to keep yourself sane in the midst of what will be a very stressful period no doubt. Go to American football (our ‘football’ is soccer here) games or any other sporting event that your institution is good at and try to assimilate yourself into the college’s culture and spirit. Participate in programs across campus and hit the ground running, never be idle. You’ll find that you can have any two of these three - social life, sleep and good grades - your challenge is trying to have a little bit of everything and still be on the road to success! Madras Institute of Technology has given you the tools and the basic understanding you need, it’s up to you now to go out there, specialize and build upon them.

Overview of Applications of Humanoid Robot in Child Care

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INTRODUCTION

According to the survey conducted by Harvard school of public health, USA, an estimated 930 million children under age 15 are prone to absence of adult care. Working parents are forced to leave their children in unreliable hands, compromising the safety of their child. A child gets emotionally hurt and depressed due to loneliness. This may lead to Monophobia, introversion and other psychological complications.

A suitable solution to this is Nao-a humanoid robot developed by Aldebran Robotics, France. . By integrating the concepts of behavioural simulation, speech recognition and image processing, it can perform an array of child tasks. .The current scenario of usage of robots in child care includes day care centres that make use of child care systems which enhance parental participation through asynchronous communication.

A Humanoid robot (called "Nao") is used to provide an intelligent and interactive child care system for children of age group 4-8 years at home as well as day care environment. Nao can act as a suitable play mate, engaging the child in variety of activities ranging from story-telling to object oriented learning, by responding to the child's stimuli.

BACKGROUND WORK AND PLATFORM USED

Humanoid Robots

Robots whose appearance resembles the external morphology of a human are called Humanoid robots. They are of two types: androids and gynoids, the former resembling males and the latter females. They must be designed in such a way that they do not inflict any harm to humans and have the ability to assist human needs. Communication through speech is another major aspect of Humanoid robots. Pertinent pauses and stresses in a sentence aid in better interaction of robots with children.

PLATFORM USED

Nao is a 57 cm tall Humanoid robot with 25 degrees of freedom. It has various sensors, motors, cameras, microphones, speakers and processors. It also has an array of LEDs to showcase its emotions through change in their colour. It can sense touch through its tactile sensors (capacitive touch sensors) and bumpers. Processors, located in its head and torso, which run a middleware (NaoQi) are completely programmable. Two pairs of Sound Navigation and Ranging (SONAR) emitters and receivers in its chest are used in finding the proximity of an obstacle encountered in its path. The obstacles and uneven surfaces are intelligently tackled using the two bumpers in its feet.

TOOLS USED TO PROGRAM NAO

Nao can be programmed using software tools such as Choregraphe, Telepathe and a simulator. The functionality of Nao can be realised using Choregraphe. It provides us with a user-friendly environment which includes various library files for basic movements and actions. This simple Graphic User Interface (GUI) software acts as a powerful tool to implement complex actions using the integration of different functional blocks. The visual and sensor inputs can be accessed using a software tool called Telepathe. Based on these inputs it can be programmed to interact with its surroundings.

Proposed Intelligent Child Interactive System

This concept deals with fulfilling the most basic requirement of children, reassurance, by providing a *TILE (Teach Interact Learn Entertain)* environment. It can be accomplished through user localization, face recognition, object identification, learning and teaching

On encountering a child, Nao gets the image of the child using its camera and compares it with the images in the visual recognition database. On finding a match, it recognises the child and greets the child with the name attached to that image. It

presents the child with various options and depending upon the voice input given by the child it performs tasks such as playing audio files, narrating animated stories and several other interesting tasks that children love.

Parents can give commands to Nao through *Wi-Fi, LAN*, Bluetooth, e-mail and infrared. They can maintain a visual contact with their children and supervise them from their workplace. This is achieved through periodical video recording of the child's activities and sending these videos through mail.

RESULTS AND CONCLUSIONS

A survey conducted among children in the age group of 4-8 years revealed an encouraging fact that most of the children like to play with, converse and be in Nao's company. This proposed *Intelligent Child Interactive System* will prove to be a boon in ensuring the safety of their precious children in their absence. Thus it can be a meaningful and intellectual companion to the children. As computers form an integral part of every household today, humanoid robots may bridge the gap between humans and machines tomorrow, taking the world one step closer to artificial intelligence.

- ✓ To have your picture taken by the very first camera you would have had to sit still for 8 hours!
- ✓ The first hard drive available for the Apple II had a capacity of only 5 megabytes.

REFERENCE

[1] http://www.hsph.harvard.edu/news/press-releases/2006-releases/press02272006.html

[2] Hiroaki Kawata, Yosuke Takano, Yoshiyukshi Iwata, Naoyoshi Kanamaru, Ken-ichiro Shimoura and Yoshihiro Fujita, "Field Trial of Asynchronous Communication Using Network-Based Interactive Child Watch System for the Participation of Parents in Day-Care Activities", *2008 IEEE International Conference on Robotics and Automation Pasadena, CA, USA*, May 19-23,pp. 2558-2563, 2008.

[3] Uttama Lahiri, Zachary Warren and Nilanjan Sarkar, "Design of Gaze-Sensitive Virtual Social Interactive System for Children with Autism", *IEEE Transactions of Neural systems and rehabilitation*, Vol. 19, No. 4, August, pp.443-452, 2011.

ROF Technologies and Integration Architectures for In-Building Optical–Wireless Access Networks

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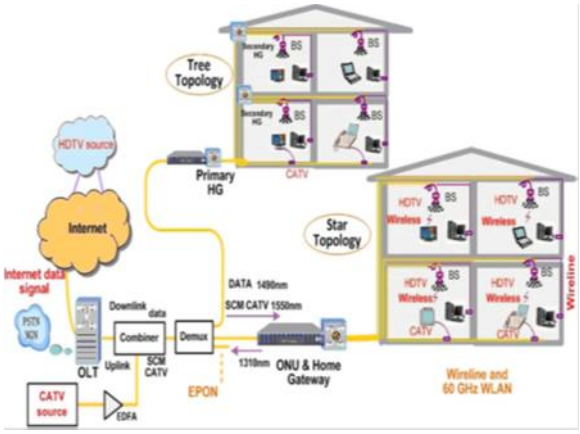
INTRODUCTION

Hot spots, such as conference centres, airports, hotels, and shopping malls have broadband multimedia services demands both in wired and wireless access. Consequently, this requirement has promoted the development of both wired and wireless access technologies. On one hand, the wavelength-division-multiplexed passive optical network (WDM PON) has long been considered as an ultimate solution for the broadband wired access network capable of providing 9 10-Gb/s data to each subscriber. On the other hand, 60-GHz millimeter wave (MMW) is of special interest for local wireless multimedia access, due to the high atmosphere attenuation, close to 15 dB/km .High atmospheric attenuation in this block of radio spectrum results in a small coverage radius for the base station (BS), and thus lots of BSs with full-duplex system would be necessary to cover one specific area, and this requires a BS with low cost and flexible management in order to make it cost-effective and practical. In this case, in order to utilize the huge bandwidth of the fixed access network and provide both wired and wireless services to the subscribers, radio-over-fiber (ROF) technology becomes the powerful choice for the super broadband optical–wireless access for in-building networks.

In-building wired and wireless network architecture for multiservice providing

In order to meet the requirement of network integration among telecommunications, television and Internet, the unified optical network facilities and equipments are used to share the network resources, which reduces the operating and maintenance costs, and provides future ultrahigh-definition TV, stereo television, interactive multimedia games, and other broadband services both in wired and wireless way at indoor environment. The optical network unit (ONU) and HG are combined to realize the traffic providing, frequency up conversion, and the resources control. The system distributes the wireless data services to the terminal multimedia services (e.g., HDTV in EPON) and other rooms over ROF links, expands the EPON services to the subscribers for the last meters, and realizes the uplink transmission, in both wired and wireless way.

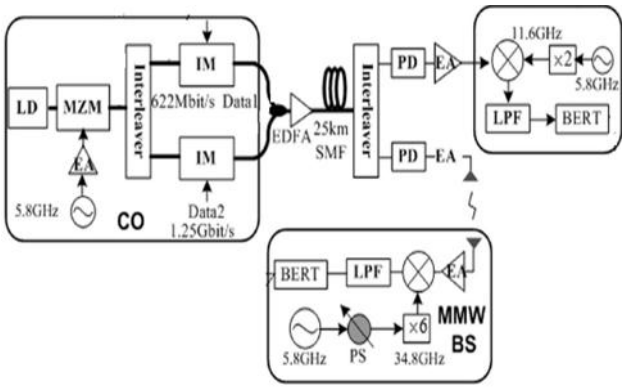


This work is dedicated to the integration of home wired and wireless network with the external Internet and there is no alteration of the existing PON facilities.

ENABLING ROF TECHNOLOGIES AND EXPERIMENT DEMONSTRATION

Full-duplex operation is necessary in practical ROF applications, and the wavelength reuse technique is highly desirable to reduce the cost. We proposed a scheme of full-duplex operation based on an FBG with a reflectivity of 50%. Both downlink and uplink transmissions are experimentally demonstrated. We also proposed a method in which we made the two sidebands of MMW pass through the electric-optic phase modulator (PM) with opposite direction to generate MMW with PSK format. Furthermore,

the generated PSK signals can be demodulated as simply as ASK and no special component is needed.



A 32-GHz MMW over fiber system loading 1.3-Gb/s uncompressed HDTV service by up conversion technique. Both the cost and complexity of the video display equipment (e.g., HDTV) can be decreased, as there is no need to use a transcode to convert a compressed HD video format into another compression format. The optical–wireless system based on ROF technology can distribute the superband multimedia services for in-building network. It should be clarify that, although the HDTV demonstration has not bring any new idea to ROF technology for high-data-rate transmission, this can be the basic platform for HDTV and other multimedia services transmission, and the subcarrier frequency can be extended to much higher, and the encoding as well as transforming of the signals from DVD player is also important for future more multimedia service demonstration.

FURTHER INVESTIGATIONS IN 60-GHZ WIRELESS MULTIMEDIA ACCESS

The 60-GHz MMW band is of much interest since a continuous spectral space (7 GHz) has been allocated worldwide for dense wireless local communications. Unfortunately, the 60-GHz wireless channel shows 20–40-dB increased free-space path loss and suffers from 15- up to 30-dB/km atmospheric absorption, depending on the atmospheric conditions. In principle this higher free-space loss can be compensated for by the use of antennas with more pattern directivity while maintaining small antenna dimensions. When such antennas are used, however, antenna obstruction (e.g., by a human body) and mis-pointing may easily cause a substantial drop of received power, and this makes NLOS communication very difficult at 60 GHz .

Another technical challenge is the network integration between ROF links and the existing PON. The exploitation of the ROF technologies including frequency up conversion and wavelength reuse in optical access network is not straightforward. Actually, the present efforts are most dedicated to the physical links for wireless signals distribution over the fiber.

The hybrid system distributes the multimedia services (e.g., HDTV in EPON) and other wireless data services to the terminal rooms over ROF links and thus expands the super broadband EPON services to the subscribers for the last meters in both wired and wireless way.

Data from the micro-controller is also interfaced with the computer by using MAX232 integrated chip. The software module also allows the surgeon to enter the maximum expected time for the utilization of surgical instruments. This system provides a reliable and accurate record of the status of each surgical item throughout the surgical procedure.

INTERACTIVE 3D NAVIGATION SYSTEM FOR IMAGE- GUIDED SURGERY

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Navigation systems based on pre-operative images (CT, MRI) and intra-operative images (ultrasound, fluoroscopy) have shown their usefulness in many clinical situations. We introduce a novel navigation system based on the 3D integral videography (IV) visualization method. Unlike other methods, IV can display full-color, full-parallax 3D images without the need for special glasses; hence, it enables simultaneous observation by many persons. However, the IV image costs much more computationally than a single 2D image, and therefore, interactions such as rotating and scaling are comparatively much more difficult to perform. Taking X-ray post-operation, can be simply eliminated if this idea is implemented.

The system consists of an image acquisition device (CT or MRI), optical position tracking device and main PC for data segmentation, communication and other computational tasks. The patient is scanned by X-ray CT or MRI and 3D voxel data is segmented and reconstructed as a 3D surface model. Objects of interest are segmented from the data set on the basis of the pixels' values. Depending on the complexity of the object interest, the segmentation can be done automatically or semi-automatically. The next task is to register the 3D model to the patient, which is called patient-to-image registration. The most common way to do this is to plant markers directly on the patient's body and perform multi-point registration. By recording a set of surface data and comparing it with the surface model, patient-to-image registration can be done accurately and less invasively.

Integral videography records and reproduces 3-D images by using a micro convex lens array and a high-pixel-density flat display, e.g., an LCD display. This display is usually placed at the focal plane of the lens array so that light rays from the corresponding pixels will converge and form a single dot in physical space.

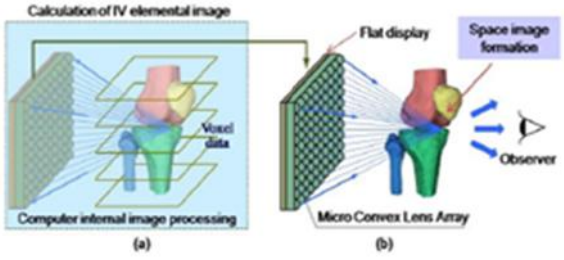

Fig. 3. Principle of integral videography: (a) Computer generated elemental images, (b) IV image spatial formation.

The main concept of image-based rendering is that each light ray is considered to be a function of position and direction. Because the direction of the light ray can be defined by the source and the target, we can represent each ray as a 5D function where the position of a viewpoint is and is the index of the pixel of the image captured at that viewpoint. This representation forms a 5D light space (light field) in which each captured image is a 2D slice. New images are rendered by extracting a bundle of light from the space by using interpolation. For convenience, the plane is called the camera plane and the plane is called the focal plane on which image is rendered. The camera plane can be of any shape as long as it covers all the directions entering the light field. In fact it should be a closed surface surrounding the

rendered object. Since the quality of the extracted image depends on the sampling rate on the camera

plane, the density of sample cameras over the spherical surface should be uniform.

An IV image is constructed by rendering images from a set of the geometry of the viewpoint set are defined by the specifications of the lens array and the display. Light rays from two adjacent viewpoints must end up at two adjacent pixels through a single lens. In other words, the viewpoint set is the inverse magnification of the pixel set behind one lens, and the following equation holds:

$$\frac{d_p}{f} = \frac{d_v}{D}$$

Here, dP is the pixel pitch, dV is the viewpoint pitch, f is the focal length of each lens in the lens array, and D stands for the standard viewing distance from where we actually look at the IV image. Since the viewpoint set is distributed at a spatial frequency, cameras should be sampled at a rate of the twice of the spatial frequency. Interactions by users, like rotating and scaling, are translated into viewing parameters. One feature of our system is that users can focus on the desired location. Because of the configuration of the lens array, objects that are away from the image's focal plane (or the Display) will appear blurred in the IV image. This is because the density of light rays coming from the display is lower in the outer area. So with a scene with objects distributed in the depth direction, the user can set the important part to be "in focus" and the less important part to be "out of focus". The user interface for interacting with the IV image is integrated in a 3D slicer. We use a high-resolution display for IV and a normal display for a 3D Slicer. Both are connected to a PC through a DVI connection. Every change applied to the model is updated in the IV image so that interaction with the IV image can be done exactly the same way as with the CG model.

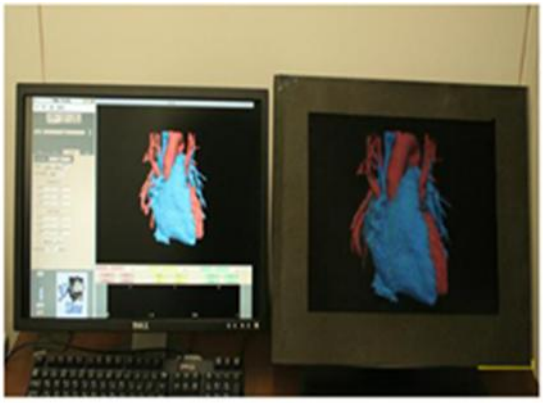

Fig. 10. Displayed 2D image (left) and corresponding IV image (right).

We have developed a high-speed, high-quality 3D IV surgical navigation system. We also built a GUI interface through which interactions with the IV image, like rotating, scaling, and focusing, can be smoothly done. By developing each part of the system as a 3D Slicer module, many tasks can be done in a single application, and therefore, our system is a compact yet powerful navigation system. Regarding future improvements to our system, we think that most of the computational tasks can be processed in parallel and the rendering speed would be significantly increased by improving the GPU computing technique. Instead of displaying only still images, we intend to develop a movie-like IV display system for displaying periodical motion of an organ.

REFERENCES

[1] T. Naemura, T. Yoshida and H. Harashima. 3-D Computer graphics Based on Integral Photography, Optics Express ,vol.8 ,no.4, 2001.

[2] H. Liao, N. Hata, S. Nakajima, M. Iwahara, I. Sakuma, T. Dohi. Surgical Navigation by Autostereoscopic Image Overlay of Integral Videography.

[3] www.slicer.org.

Solid-State Circuit Breakers for Medium-Voltage Systems Having Distributed Power Systems

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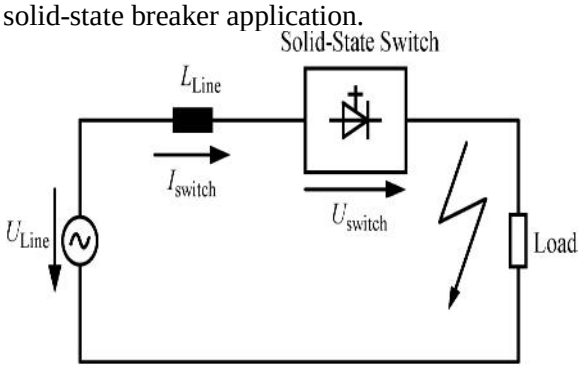
INTRODUCTION

State-of-the-art mechanical circuit breakers in medium-voltage systems allow a safe handling of short-circuits if the short circuit power of the grid is limited. Using delayed time-off, the circuit breakers can be coordinated with lower level protection gear. A semiconductor circuit breaker, however, is able to switch fast enough to keep voltage disturbance within acceptable limits. The optimization and selection of power electronic switch topologies is critical. It is shown that solid-state circuit breakers offer significant advantages when compared to present solutions and can be used in today's medium-voltage power systems. As mentioned, present solutions dealing with short-circuit protection are mechanical circuit breakers. After having detected short-circuit or an over-load situation, some time (several periods) elapses prior to open the switches mechanically. Subsequently, an arc occurs, which initially has little impact on the current. The current can only be quenched at its natural zero-crossing assuming that the plasma is significantly cooled down to avoid resignation. As a result, turning off short-circuit will take at least 100 ms. the main drawbacks of this classical solutions are

- The peak current cannot be influenced.
- Mechanical circuit breakers have a maximum short circuit current rating.
- During the short-circuit time, the voltage on the complete medium-voltage grid is significantly reduced.

Solid-state circuit breakers based on high power semiconductors potentially offer enormous advantages when compared to conventional solutions, since a solid state breaker is able to switch in a few seconds. Hence, the maximum current will never exceed two times rated current and the voltage distortion will just last for around 100 s. Since a complete grid is rated with 1.8 kA, dynamic loads will not lead to a significant increase of the surge current because, in such an overload, the grid voltage would collapse. The available high-power semiconductors are compared, considering the requirements of the solid-state breaker application.



FUNDAMENTAL BEHAVIOR

To analyze the fundamental behaviour of the proposed semiconductor switch, a single-phase equivalent circuit, as shown in Fig 1 is used. The grid is represented by a voltage source and a line inductance. In this example, a pure resistive load is shorted by an *ideal short-circuit* with zero resistance.

SEMICONDUCTOR DEVICES

The grid voltage is higher than the maximum voltage blocking capability of present semiconductor devices although their ratings have increased significantly. As a high reliability is of utmost importance, redundant devices will be integrated. It should be pointed out that device in press-pack housing. Momentarily three different semiconductors are able to fulfil these requirements, namely insulated gate bipolar transistor, (IGBT), gate commutated turn-off (GCT), and gate turn-off (GTO).

The IGBT has a disadvantage that, the on-state losses of IGBTs are significantly higher than the losses of a thrusters based semiconductor. However, the IGBT has the advantage that, as a transistor, it limits the current automatically. Hence, current cannot exceed a certain value. In contrast to this, the current is not limited in a thrusters type devices and the turn-off capability is limited.

It becomes obvious that thrusters based

semiconductors, such as *GCT and GTO, are a much better choice for a solid-state switch* because they have much lower on-state losses.

DISTURBANCES USING SOLID-STATE CIRCUIT BREAKER

Conventional medium-voltage grids use mechanical circuit breakers for short-circuit protection. In this type, voltage of the complete medium-voltage grid is significantly reduced during a relatively long time, when a low resistive short-circuit occurs especially when it occurs near the feeding transformer.

In contrast to the mechanical breaker, the solid-state breaker can interrupt short-circuits so fast that the error free part of the medium voltage grid is hardly influenced. The detailed behaviour of the switch was simulated with the Power System Toolbox, whereas a medium-voltage grid was simulated with PLECS.

MIGRATING SOLID-STATE SWITCHES INTO EXISTING INFRASTRUCTURES

Although an immediate interruption of short-circuits appears advantageous at first sight, a fast interruption conflicts with present day error detection mechanisms. For selective error detection, it is necessary that the overload current continues for some seconds to allow time for the most selective circuit breaker to act, leaving most of the network intact after a short-circuit. However, the strongest short-circuits with the highest impact on the grid occur near the feeding transformers.

LINE DISTURBANCES USING SOLID-STATE CURRENT LIMITER

To combine the advantages of fast semiconductor switching and selectivity, it is proposed to use a solid-state current-limiting switch. In parallel to the semiconductor switch, a *reactive current limiter* is added. The limiter itself consists of a simple inductance, a capacitance (with a small inductance as a limiter in series) or a parallel LC-circuit. As soon as a short-circuit is detected, the solid-state switch opens immediately. However, the current can still flow through the reactive element. This current is chosen (by the reactance) to be higher than the nominal current of this part of the grid but also to be significantly lower than the short-circuit current. Therefore, the disturbance in the remaining, i.e., error-free section of the grid is much lower than without the limiter. As a result, present day selective short-circuit protection can still be applied using only mechanical circuit breakers downstream. Inductive current limiters are commonly used in medium- voltage grids to reduce short-circuit power. A proper combination of inductor and capacitor is applied. To avoid undesired oscillations, a damping resistor is added in series with the capacitance. Here, the single capacitor can be replaced by a series connection of one capacitor per module. Each capacitor is connected in parallel to the GCTs, i.e., behind the diode rectifier. The main advantages of this solution are that these capacitors act as a large turn-off snubber on the one hand and that oscillations are significantly reduced once the capacitors are charged to the peak voltage on the other.

CONCLUSION

The fast acting solid-state breaker is ideal for avoiding drawbacks concerning state-of-the-art mechanical breaker, i.e., it increases power quality. Using available semiconductors, a suitable topology was selected. Since the circuit breaker is rated for a maximum power of 63 MVA no parallel connection is needed for all present medium-voltage applications. From a thermal point of view, it can be used up to 100 MVA. Although if there is a need for higher current ratings a parallel connection should be examined. Due to the large time constant and low in the grid, it should be possible to connected modules in parallel. It is essential to consider the life-cycle costs of a system, to find the most economic and effective solution. The impact of this fast acting switch on the grid is analyzed using simulations. It is shown that line disturbances during short-circuit are greatly reduced using this solid-state circuit-breaker. However, fast turn-off conflicts with present day selective short-circuit protection in medium-voltage grids. To overcome this conflict, a solid-state current limiter is proposed and analyzed. It is shown that a significant reduction of the line disturbances is achievedbwithout compromising existing protection concepts.

REFERENCES

[1] F. Tosato, "Voltage sags mitigation on distribution utilities,"

[2] R. W. De Doncker, "Recent power electronics development for FACTS and costumed power

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Wireless Vehicular Ad-Hoc Networks

The ***Vehicular Communications Networks*** (**VCN**) are created by vehicles equipped with short and medium range wireless communication technology. They include vehicular ad-hoc networks (Vanets), vehicle –to –vehicle and vehicle to infrastructure communications, vehicular ad-hoc network (vanet) are receiving a lot of attention due to wide variety of services they can provide. Their application ranges from safety (accident warning, crash avoidance, weather notification) to non-safety (internet accesses, map download, multimedia and gaming, we conclude by exploring future research directions in this field.

Road safety has been an important concern in the world over the past few years since millions of people die every year because of car accidents and many more are injured .Nowadays, mobile wireless devices have become an essential part of our lives, and the ubiquitous 'anywhere, anytime' connectivity concept is gaining attraction. Internet access from vehicles is in great demand. In 1999, the Federal Communication Commission (FCC) allocated a frequency spectrum for vehicle-vehicle and vehicle-roadside wireless communication. The Commission then established Dedicated Short Range Communications (DSRC) Service in 2003. DSRC is a communication service that uses the 5.850-5.925 GHz band for the use of Public safety and private applications.

CHARACTERISTICS OF VANETs

In comparison to other communication networks, vanets come with some unique attractive features:

Sufficient energy and storage
Higher computational capability
Potentially large scale
High mobility

MAIN REASERCH TOPICS

A. Mobility modeling

Characterizing the motion of vehicles on a road is a difficult task. There can be no one good way to do that. It depends on the layout of the road, the traffic density, and of course the behavior of the drivers. Vehicular traffic flow theory is typically classified as macroscopic or microscopic. When following a macroscopic approach, one focuses on system parameters like traffic density (number of vehicles per mile per lane) or traffic flow (number of vehicles per hour crossing an intersection) in order to compute a road's capacity or the distribution of traffic on a stretch of road. In general, from a macroscopic perspective, vehicular traffic is viewed as a fluid and existing fluid models are applicable.

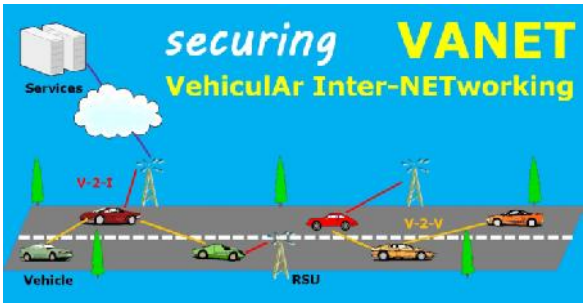
A microscopic approach, the movement of each individual vehicle is characterized with spatial and temporal dependence being important characteristics.

B. Scalability issues

One of the main challenges inherent to the deployment of VANETs is operability, both in very sparse and in highly overloaded networks. VANET must work in situations with a very small density of road traffic and in situations with a very high traffic density, such as traffic jams and major intersections road. The number of active nodes (vehicles) and protocol design have a great impact on scalability.

C. Efficient Channel Utilization

Broadcast and multicast is the most



frequently used method in VANETs. Available wireless bandwidth is scarce, especially broadcast applications demand high bandwidth. Broadcast packets are used for not only disseminating traffic related and safety related information but also discovering explicit routes in routing.

Furthermore, integration of VANETs and the internet requires the highest possible throughput

from VANETs to allow large number of vehicles to connect to the internet at the same time.

D. Security and Privacy

Security is crucial in network. Security issue is prominent in VANETs because the networks are publicly available in any roads at any time. For example , it is essential to make sure that life-critical information cannot be inserted or modified by an attacker likewise the system should be able to help establishing the liability of drivers but at the same time, it should protect as far as possible the privacy of the drivers and passengers.

SECURITY GOALS FOR AD HOC

Availability

It ensures survivability, despite Denial of service (dos) attacks. On physical and media access control layer attacker can use jamming techniques to interfere with communications on physical channel on network layer the attacker can disrupt the routing protocol. On higher layers, the attacker could bring down high level services e.g. key management service.

Confidentiality

Ensures certain information is never disclosed to unauthorized entities.

Integrity

Message being transmitted is never corrupted.

Authenticate

Enables a node to ensure the identity of the peer node it is communicating with. Without which an attacker would impersonate a node thus gaining unauthorized access to resource and sensitive information and interfering with operation of other nodes.

Efficient Life Saving System to Track Surgical Instrument

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INTRODUCTION

The recent reports indicate that one in 1500 surgeries fail as a foreign body gets trapped into the patient's system. Typically these are sponges and surgical instruments used while operation. The trapped foreign body is a potential danger and causes further complications in the health of the ailing patient. Radio frequency identification, infra-red technology and a micro-controller coupled with integrated voice module are the core technologies used. The cotton sponges are tagged with unique radio frequency identification **(RFID**) tags. Low frequency RFID tags are used to enable reliable detection of tags even when soaked in body fluids in the vicinity of metallic objects such as surgical tools, or inside a patient's body. The tray housing the surgical instruments is provided with infrared sensor couple for each instrument separately. Based on the shape of the mould on the tray, only a specific instrument can take the place of a particular instrument thereby depending on the output of the infrared sensor couple, the presence or absence of a particular instrument can be clearly found out. An integrated voice module notifies if any instrument stays missing for an abnormally long period of time. These are interfaced with software component that enables to monitor to number of instruments and sponges in the patients system at any instant. A check-in station and a check-out station, which are essentially antennae that read these RFID codes are used. At the end of the surgery the GSM module is also used which is to send all the details regarding the surgery to the chief authority of the organization concerned in case of any discrepancy in the overall count.**GSM technology** allows mobility, GSM solutions can be implemented within few weeks whereas it may take months to implement the infrastructure for other technologies. Also, this can track the surgical instruments periodically instead one final scan test for instruments. Traditional time-consuming and expensive methods like scanning the patient, taking X-ray post-operation, can be simply eliminated if this idea is implemented.

APPROACH

This approach is to develop an accurate system to keep an account of the number of instruments and sponges used in the surgery. This is mainly based on RFID technology which is used for non line sight of identification. A check in counter and a checkout counter with the RFID is used to track the sponge. Along with that the surgical tray to maintain a list of the surgical instruments as per the orientation of the instruments in the tray, voice module and GSM technology is used here. All of these components are controlled via a software interface to enable easy tracking of the instruments. This data will be fed to micro-controller by means of the software interface. Through the interface, the surgeon is expected to enter the nominal time required for each instrument while being used. Typically the entered time will be equal to the maximum amount of time any instrument is expected to be used for. If the time expires, then the microcontroller issues the corresponding stored voice message and notifies the absence of the instrument.

WORKING CHECK IN COUNTER

The check-in station consists of two orthogonal RFID reader is surmounted on the top. The check-in station is small, simple, and occupies very little space. The barcode reader identifies a package and the number of items within it. Before accepting the package, ASSIST verifies that the package has the expected number of items in it, which is gathered from barcode information. If the package contains a bad RFID tag, the reader will recognize the discrepancy and subsequently direct the removal of the package. In addition, the barcode provides us with a description of the type of sponge associated with each RFID tag. When a package is accepted, every item is registered into the system inventory where it can be tracked throughout the surgery. As previously stated, each sponge is distinguishable by its RFID tag which as a unique serial number. . The kick bucket for the deposition of sponge is equipped with an RFID reader, five orthogonal antennas (four sides plus the bottom), and the means to talk to the software component that

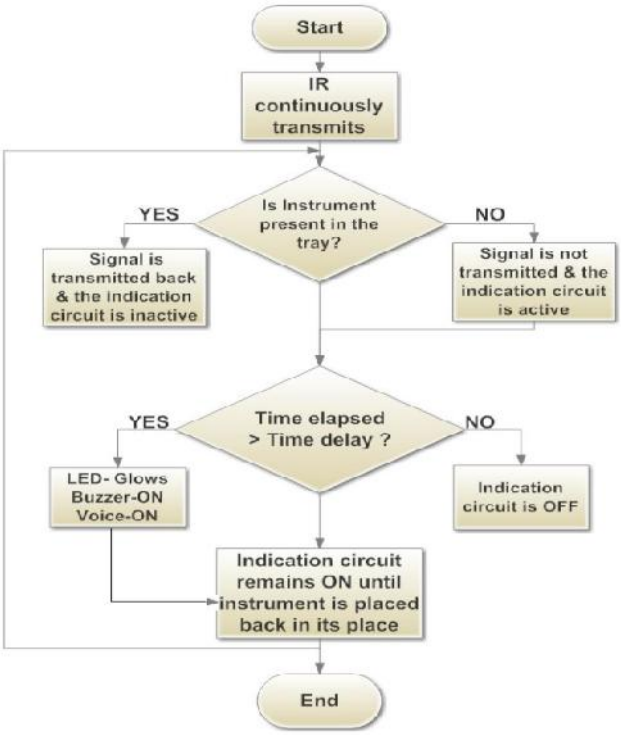
keeps track of the inventory (i.e. wireless serial port). Since every RFID tag is equipped with a serial number that is unique, no sponge is counted more than once.

SURGICAL INSTRUMENT TRAY

A tray to hold the surgical instruments with the shape of the instrument moulded is used. The moulding is customized such that each cavity of the tray can house only a particular instrument – a scissors of definite dimensions. Each cavity has an *infra-red transmitter and receiver couple*. The transmitter transmits IR rays. Under normal conditions when the instrument is present, the receiver receives a signal. The output of the receiver is coupled to a micro- controller. Depending on the signal received by the *micro-controller*, the presence or absence of a particular instrument is detected. Initially, a cursory scan is made to make an inventory of the instruments present. The empty cavities will be neglected and not scanned subsequently. This will save power as the corresponding IR couple will not be energized and scanning time in subsequent times is saved. In discrete intervals of time, the tray is scanned to check the existence of the instruments in the inventory. The permissible time till which the instrument can remain missing is entered by the surgeon through the software system. If the instrument remains missing for a time period longer than that, a voice signal indicating the absence of the instrument is sent.

MICROCONTROLLER AND SOFTWARE MODULE

The microcontroller AT89C51 is programmed to *detect the presence of instruments*, issue voice signals etc. The RFID signals are separately reported in the software system. The data from the micro-controller is also interfaced with the computer by using MAX232 integrated chip. The software module also allows the surgeon to enter the maximum expected time for the utilization of surgical instruments. This system provides a reliable and accurate record of the status of each surgical item throughout the surgical procedure.



REFERENCES

[1]A. Gonzalez-Ojeda, D. Rodriguez-Alcantar, H. Arenas-Marquez, E. Sanchez Perez-Verdia, R. Chavez-Perez, R. Alvarez-Quintero and A. Perea-Sanchez, "Retained foreign bodies following intra-abdominal surgery."
Hepatogastroenterology, vol. 46, no. 26.

[2] C. Zhan and M. Miller, "Excess length of stay, charges, and mortality attributable to medical injuries during hospitalization." JAMA, vol. 290, no. 14, pp. 1868- 74, 2003.

BIO-ARTIFICIAL LIVER

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INTRODUCTION

The technical and clinical objective is to provide a temporary liver assist until a patient's own liver regenerates or until a liver transplant can be performed. By using a special technique of naturally available resources like animal cells and synthetic membrane bio artificial liver can be created, which performs 90% of liver functions. Here a completely different approach to developing an artificial liver is used instead of trying to design mountains of equipment to perform each of the liver's functions. It is a device that *uses liver cells obtained from animals*. Because the device contains both biological and manufactured components, it is called a "**bio-artificial liver**." A patient's blood circulates through this bio-artificial liver, where a unique synthetic membrane separates it from the animal cells. The membrane prevents immunologic rejection of the cells, but allows the cells to detoxify the blood in the same way as a natural liver.

The two existing fundamental methods used to clear toxins from the blood of patients with liver failure are plasma exchange by aphaeresis and whole blood exchange transfusion.

The only treatment available for liver failure is liver transplant surgery; but donor organs are difficult to obtain, and the procedure, which is expensive and complex, is frequently unsuccessful. So only we go in for bio-artificial liver.

The two methods of designing bio-artificial liver are:

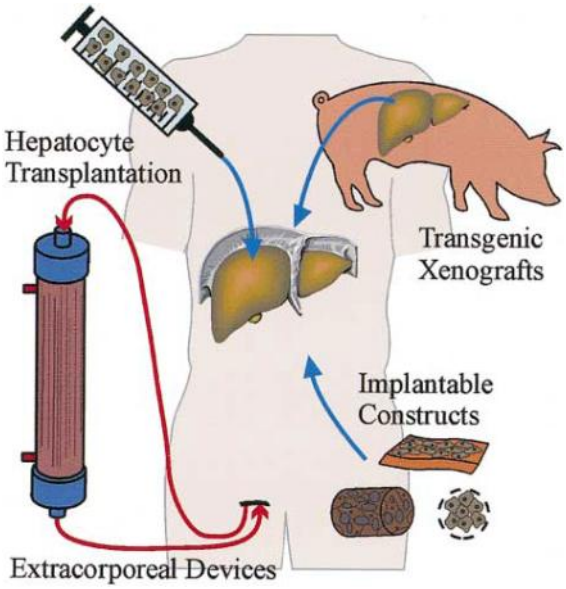
1. Using synthetic membrane
2. Extra corporeal hepatitis bioreactor

METHOD I: Using synthetic membrane

The bio-artificial liver device is intended to provide temporary support to patients with liver failure until their liver recovers spontaneously or until transplantation is possible. The device is connected to a vein and remains outside their body. It should help remove toxins from the patient's own liver cells, as the patient's blood circulates in a chamber with pig liver cells inside polymer and synthetic membranes. The membranes allow toxins to pass through, but prevent proteins, and other cell byproducts from the pig cells to get into the patient's blood.

Patients are attached to the machine by a catheter into a vein, and the blood is initially put through a mechanical filtration process to remove some waste products. Then the blood plasma is passed through cartridges containing the hepatic cells before being returned to the body.

Flow through the artificial liver has four distinct steps: separation of plasma from whole blood by filtration through a micro porous membrane; removal of toxins from the separated plasma as it passes by the functional hepatocytes in the hollow fibers; reconstitution of the plasma with the blood in the extracorporeal circuit; and, finally, rein fusion into the patient.



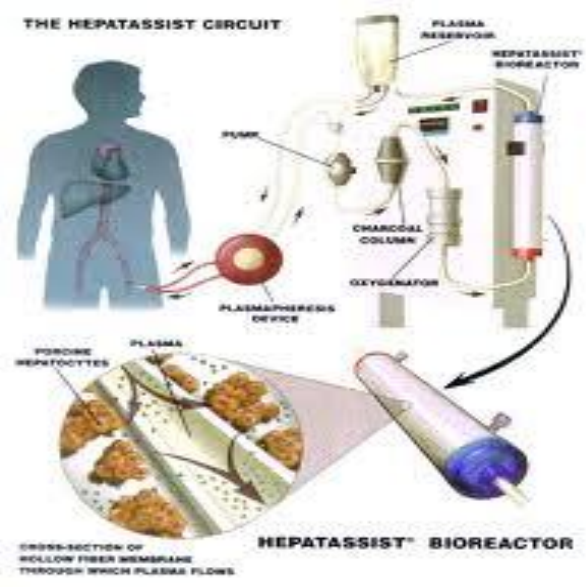
These devices contain the hepatocytes in a separate chamber, isolated by a semi permeable membrane. The separate chamber design allows replacement with fresh hepatocytes. Further, by separating the hepatocytes from the bloodstream with a semi-permeable membrane, the potential for immune responses to cell surface (alloantigens or xenoantigens) theoretically reduced. The potential

exists for soluble antigens or antigenic peptides to pass through the semi permeable barrier and initiate

an immune response.

METHOD II: Extra corporeal hepatitis bioreactor

Advanced Tissue Sciences has developed a technique to grow normal human liver tissue on a three-dimensional framework of polymer mesh.



Hepatocytes adherent to the framework divide and differentiate. This liver tissue can be placed in hollow chambers, separated from the plasma or blood by a semi permeable membrane. By avoiding the attachment to the interface the function and viability of the primary hepatocytes within a bio artificial can be increased. They allow the hepatocytes to circulate through the bioreactor, which is perfused with oxygenated nutrient medium, at a rate optimal for collision and aggregation to occur. The hepatocyte aggregates are subsequently entrapped in a packed bed of glass beads.By removing the hepatocytes from the interface in Li's bioreactor, an efficient countercurrent flow can be incorporated, greatly expanding the effective plasma/hepatocyte contact. This, and the ability to extract "exhausted" cells from the circuit, offers a potential advantage, possibly allowing artificial liver support to be maintained continuously for an extended period.

REFERENCES:

http://en.wikipedia.org/wiki/Bioartificial_liver_device#Hollow_fiber_system
http://www.alinfoundation.com/Medical%20Research/Liver.htm
http://web.mit.edu/lmrt/publications/2001/Allen2001_Hepat.pdf

ALL OPTICAL XOR GATE BY FOUR WAVE MIXING IN SEMICONDUCTOR OPTICAL AMPLIFIERS

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INTRODUCTION

As the data rate per single wavelength has been advancing towards the speed limit of electronics, robust ***all-optical signal processing techniques*** are becoming more crucial to support the necessary network processing in future ultrahigh-speed optical networks. Boolean XOR is one of those common logic operations required in data packet processing, such as data encoding and parity checking. In future high speed packet networks, all-optical XOR gate enables bit-serial header/label processing, thus, the packet header and label can be recognized, erased, and replaced at the network nodes all-optically. Previously, all-optical XOR gate was demonstrated using a nonlinear optical loop mirror. However, its bulky size and poor power efficiency hindered its practicality. On the other hand, it was also realized by utilizing cross-gain modulation and cross-polarization modulation in a *semiconductor optical amplifier* (**SOA**), at 10- and 5-Gb/s signal speeds, respectively.

Recently, ***Return-to-Zero Differential Phase-Shifted Keying*** **(RZ-DPSK)** modulation format has been studied extensively for its improved receiver sensitivity with the help of balanced detection, as well as its reduced patterning-induced degradation in high-speed optical time-division multiplexing systems, due to its constant intensity nature. Thus an all-optical XOR gate operating up to 20 GB/s by four-wave mixing (FWM) in an SOA with RZ-DPSK modulated input signals can be preferred. It potentially supports higher speed operation than the XPM-based schemes since the intra band processes, such as carrier heating and spectral hole burning, leading to FWM have much shorter scattering time than the inter band process.

FWM is a third-order nonlinear process, by which a new field is created in a medium that depends on the product of three electrical fields presented. In an SOA, three input fields beat to produce gain and phase gratings, which scatter the input fields to generate upper and lower sidebands as described by E132 = (A1*A3) γ(W1-W3)A2 * exp[j(w1+w2+w3)t+ (φ1+φ2-φ3)]

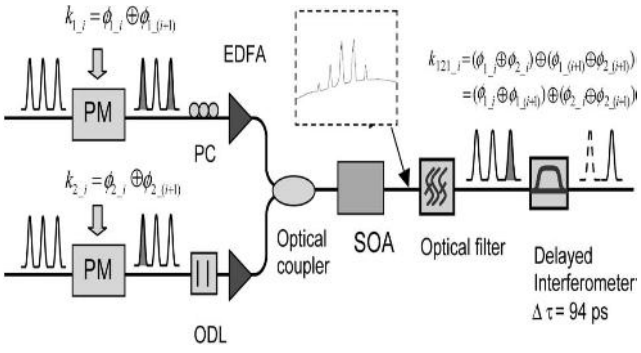
Where, A*i* *(i* ϵ 1,2,3) , Wi and φi are the respective input field amplitudes, angular frequencies, and phases, γ(W1-W3) describes the conversion efficiency, and E132 is the FWM-generated field. The polarizations of the input fields A1 and A3 are well-aligned in order to maximize the output field intensity. With phase of the input fields taking values either 0 or π, the possible phases of the generated new field will be 0, π , 2π or $-\pi$. By assuming Boolean values 0 and 1 as the signal phases of 0 and π respectively, the FWM process can be regarded as a three-input XOR Boolean XOR operation in the phase domain, i.e.,

$$\varphi 132 = (\varphi_1 \text{ XOR } \varphi_2 \text{ XOR } \varphi_3)$$

Such FWM-based Boolean operation is obtained using RZ-DPSK as the modulation format of the input signals, in which the bits 0 and 1 are represented in form of phase change between adjacent optical pulses.

ALL INPUT XOR GATE:

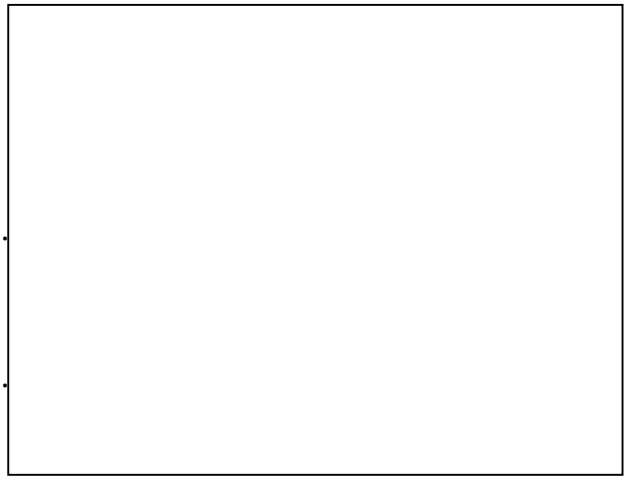
The experimental set up is shown below.



Using a pair of electro-absorption modulators, the RZ pulse streams are generated at 1547 and 1551 nm, respectively. The optical pulses have a pulse width of about 15 ps and a repetition rate of 10.61 GHz. The pulse streams were then phase-encoded separately via optical phase

modulators using 10.61-Gb/s ***pseudorandom binary sequence*** **(PRBS)**. The two input signals were modulated at a depth of W1 instead of π/2, amplified by erbium-doped fiber amplifiers (EDFAs).The DPSK coded pulse streams were then combined using a 3-dB fiber coupler. A polarization controller and a tunable ***Optical Delay Line*** (**ODL**) is inserted to co polarize and align the two input signals. The SOA used in the experiment is a commercially available (Samsung OA40B3A) SOA with a small signal gain of 25 dB and the applied bias current of 180 mA. The average power launched into the SOA is 6 dBm, with the two inputs at similar power level. From the output of the SOA, the FWM-generated signal at 1543 nm has an optical signal-to-noise ratio of 20 dB, measured with resolution bandwidth of 0.1 nm and the conversion efficiency is about 20 dB. It is then extracted by a 1-nm (full-width at half-maximum) optical band pass filter (BPF) before being DPSK-demodulated via a DI with a relative delay of 94 ps. The unsatisfactory extinction ratio is caused by amplitude fluctuation at 1 and 0 level from the modulator driver output, which lead to inaccurate phase modulation during DPSK encoding. All-optical XOR gate can be operated at a high speed if the input signals are multiplexed to 21.22 Gb/s, before being launched into the SOA.Compared with the XPM-based all-optical gates, in which the operation bit rate is generally limited by the patterning effect in SOA, RZ-DPSK modulation format avoids gain modulation in the SOA, thus the operation speed is not limited by the carrier lifetime.

Therefore, higher speed XOR operation can be achieved with sufficiently narrow optical pulses. This method requires the Boolean input signals to be launched into the SOA simultaneously; thus, it eliminates the need of using differential inputs as in the case of XPM-based inter ferro metric configurations



REFERENCES

[1] A. J. Poustie, K. J. Blow, A. E. Kelly, and R. J. Manning, "All-optical parity checker with bit-differential delay," Opt. Commun., vol. 159, pp.208–214, 1999.

[2] J. H. Kim, Y. M. Jhon, Y. T. Byun, S. Lee, D. H. Woo, and S. H.Kim, "All-optical XOR gate using semiconductor optical amplifiers without additional input beam," IEEE Photon. Technol. Lett., vol. 14, pp. 1436–1438, Oct 2002.

[3] H. Soto, D. Erasme, and G. Guekos, "5-Gb/s XOR optical gate based on cross-polarization modulation in semiconductor optical amplifiers,"IEEE Photon. Technol. Lett., vol. 13, pp. 335–337, Apr. 2001.

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ECG Sensing Monitoring Alarming and Telemetry system

INTRODUCTION

The emergency of heart disease often attacks dangerously in a short period. Since that it is very important to capture the ECG signal timely, to analyze the ECG signal effectively and to transmit ECG signal to hospital centre accurately. The traditional method for getting the ECG requires the patient to stay in hospital. With the single chip, the portable monitor became possible. But for limited calculating capability of normal single chip; the result of the signal processing was not very desired.

This monitor used the digital signal processor TMS320VC5509A for data processing, also as the MCU to complete the logical control. The DSP C5509A, which worked in the 60MHz frequency with high-quality and very low-cost, can implement the algorithm of arrhythmia detection based on wavelet transforms.

DESIGN AND METHOD

System and hardware design

Two ECG leads, mv1 and mv5, were used in this system for capturing more biomedical signal information. The two-led ECG was synchronously sampled through the two channel analog-to-digital converters of DSP.

Since most frequency of ECG signal is from 0.05Hz~100Hz, as the SyQuest sampling theorem, the sample rate of ADC was set to200Hz and the resolution of ADC were 10-bit.The Multi-media card is 64MB. It enabled the monitor to record two-led ECG continuously for about 6 hours long. The large capacity rechargeable Li+ battery supplied the power for the whole system.

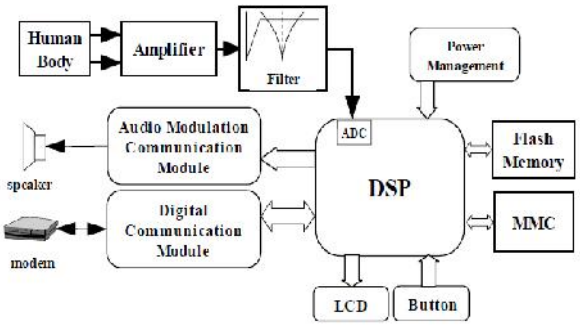

Fig.1. System hardware design

ARRHYTHMIA DETECTION ALGORITHM and IMPLEMENT ON CHIP

Wavelet transform has many advantages in ECG automatic analysis, such as the wavelet transform (WT) of a function *(t)* is an integral transform defined by

$$WT_f(a,b)=\frac{1}{\sqrt{a}}\int_{-\infty}^{+\infty} f(t)\varphi^*\left(\frac{t-b}{a}\right)dt, a>0 \qquad (1)$$

This transform can decompose the ECG signal across different scales, and describe the local feature of ECG signal well in both time domain and frequency domain. A wavelet- based algorithm for arrhythmia detection was described in reference. Wavelet was finally chosen as the wavelet function and the scale was set to 3 and 5.Eventually we got the discrete transform as below:

$$WT_3(i)=\sqrt{3}\sum_{k=0}^{49} x(i-k)(W_3(49-k)-W_3(49-k-1)) \qquad (2)$$

$$WT_5(i)=\sqrt{5}\sum_{k=0}^{81} x(i-k)(W_5(81-k)-W_5(81-k-1)) \qquad (3)$$

where the $W_3(k)$ and $W_5(k)$ are the discrete coefficients of Marr wavelet function $\varphi(t)$ at the scale 3 and 5 as below:

$$W_3(k)=\psi(k/3), \quad 0\le k\le 48 \qquad (4)$$

$$W_5(k)=\psi(k/5), \quad 0\le k\le 80 \qquad (5)$$

Arrhythmia of ECG was detected by the judging rule, comparing the WT_3 (*i*) and WT_5 (*i*) with previously computed threshold and template. Based on test results using data of *MIT-BIH* Arrhythmia Database on pc computer, the veracity of QRS detection is 99 %. The veracity of detection of APC and PVC is also above 90 %.

For more practical detection, this algorithm was embedded in the DSP C5509A. The high speed dsp can Process the WT every an ADC sampling in real-time. Through the test using the electronic ECG generator, the veracity was most approximate to the result of simulation on computer. The speaker will raise the alarm sound, while the arrhythmia was detected

ECG TRANSMISSION

There are two methods for transmitting the ECG to hospital centre: the digital transmission method and the audio modulation transmission method.

Fig.2. Digital Transmission

In Fig 2, the digital method was described that ECG was transmitted from the client modem to the sever modem through the PTSN. After the process of log in server software, the user information and collection time, by which the hospital centre server could establish ECG database for different users, were transmitted first. Then the actual ECG data was transmitted. The maxim transmit speed was set to19.2kbps for almost safety and stability.

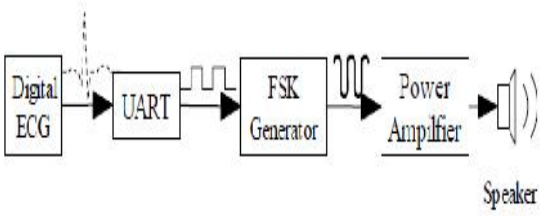

Fig.3. Audio modulation

For audio modulation method, in Fig 3, the digital ECG stored in the MMC was converted to serial data flow through the UART max3111E. Then the serial data controlled the MSM7512B to generate 1200bps FSK signal. The FSK signal contained 1300hz and 2100hz frequency which represented the digital '1' and '0'. Finally, the analog FSK signal was amplified to drive the speaker. As shown in Fig 4, at the hospital centre, the FSK signal received from the telephone mike lines was demodulated to serial data which was transmitted to the computer server through the RS-232 serial port.

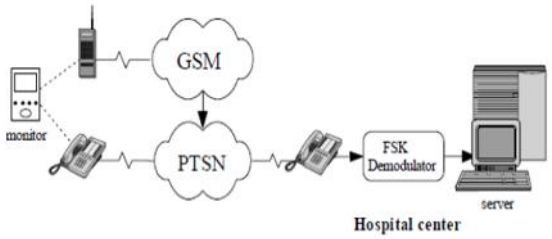

Fig.4. Audio modulation transmission

REFERENCES

1. Hongtao Xie, Yonghong Zhang, Jupeng Zhang.Development of a portable home ECG and blood pressure monitoring device based on 80C196KC Micro-controller [J]. Beijing Biomedical Engineering, 2001, 20(4):271-274

2. Jingwen Xi, Hongquan Zhou. Development of ECG monitoring module using DSP [J].Application of electronic technique, 2001, 27(11):75-78

BRAIN CONTROLLED CAR FOR DISABLED USING ARTIFICIAL INTELLIGENCE

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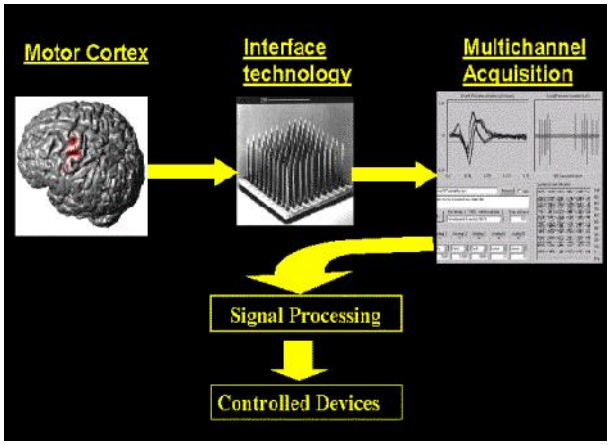
The video and thermo gram analyzer continuously monitor activities outside the car. When the driver (disabled) nears the car the security system of the car is activated. Images as well as thermo graphic results of the driver are previously fed into the database of the computer. If the video images match with the database entries then the security system advances to the next stage. Here the thermo graphic image verification is done with the database. Once the driver passes this stage the door slides to the sides and a ramp is lowered from its floor. The ramp has flip actuators in its lower end. Once the driver enters the ramp, the flip actuates the ramp to be lifted horizontally. Then robotic arms assist the driver to his seat. As soon as the driver is seated the EEG (electroencephalogram) helmet, attached to the top of the seat, is lowered and suitably placed on the driver's head. A wide screen of the computer is placed at an angle aesthetically suitable to the driver. Each program can be controlled either directly by a mouse or by a shortcut. For starting the car, the start button *is clicked*. Accordingly the computer switches ON the circuit from the *battery* to the A.C.Series Induction motors.

The bio control system integrates signals from various other systems and compares them with originals in the database. It comprises of Brain-computer interface, Automatic security system, and Automatic navigation system. Brain-computer interfaces will increase acceptance by offering customized, intelligent help and training, especially for the non-expert user. A single-position, brain-controlled switch that responds to specific patterns detected in spatiotemporal electroencephalograms (EEG) measured from the human scalp. This is known as the **Low- Frequency Asynchronous Switch Design**. The EEG is then filtered and run through a fast Fourier transform before being displayed as a three dimensional graphic. The data can then be pipe into MIDI compatible music programs. Furthermore, MIDI can be adjusted to control other external processes, such as robotics.

EEG Transmission

The principle behind the whole mechanism is that the impulse of the human brain can be tracked and even decoded. The Low-Frequency Asynchronous Switch Design traces the motor neurons in the brain. When the driver attempts for a physical movement, he/she sends an impulse to the motor neuron. These motor neurons carry the signal to the physical components such as hands or legs. It can decode the message at the motor neuron to obtain maximum accuracy. By observing the sensory neurons we can monitor the eye movement of the driver. As the eye moves, the cursor on the screen also moves and is also brightened when the driver concentrates on one particular point in his environment. The sensors, which are placed at the front and rear ends of the car, send a live feedback of the environment to the computer. The steering wheel is turned through a specific angle by electromechanical actuators. The angle of turn is calibrated from the distance moved by the dot on the screen.



Brain-to- Machine Mechanism

The EEG of the driver is monitored continually. When it drops less than 4 Hz then the driver is in an unstable state. A message is given to the driver for confirmation to continue the drive. A confirmed reply activates the program automatic drive. The computer prompts the driver for the destination before the drive.

As the computer is based on artificial intelligence it automatically monitors every route the car travels and stores it in its map database for future use. The map database is analyzed and the shortest route to the liked destination is chosen. With traffic monitoring system provided by xm *satellite radio* the computer drives the car automatically. *Video and anti-collision sensors* mainly assist this drive by providing continuous live feed of the environment up to 180m, which is sufficient for the purpose.

When the above requirements are satisfied and if this car becomes cost effective then we shall witness a revolutionary change in the society where the demarcation between the abler and the disabled vanishes. Thus the integration of bioelectronics with automotive systems is essential to develop efficient and Futuristic vehicles, which shall be witnessed soon helping the disabled in every manner in the field of transportation.

REFERENCES

1 .Off line Classification of EEG from the "New York Brain- Computer Interface (BCI)"

2."Man-Machine Communications through Brain-Wave Processing" Keirn, Z.A. and Aunon, J.I., IEEE Engineering in Medicine and Biology Magazine.

Smart Grids

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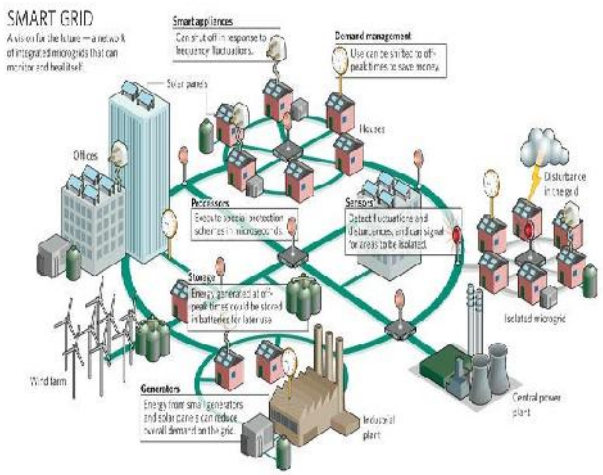
Nations across the world are facing the challenges of increasing the power production. Deregulation and privatization is posing new challenges on high voltage transmission and on distribution system as well. System elements are loaded up to their thermal limits, and power trading with varying load pattern is contributing to an increasing congestion. Numerous pressures on the electric power delivery system are converging, and forcing the new systems to evolve. Rising costs of capital, raw materials, and labour; Aging infrastructure and workforce; Continuing national security concerns; Need for and viability of energy efficiency caused by the expansion of the global economy; Rising energy costs with viable options; Social pressures; Calls for energy efficiency; Growing demand for energy; Rising consumer expectations; Rapid innovations in technology; In addition to this, the dramatic global climate change ,Increasing awareness of environmental issues, including global warming put regulatory pressure demand for changes in the way electricity is supplied .

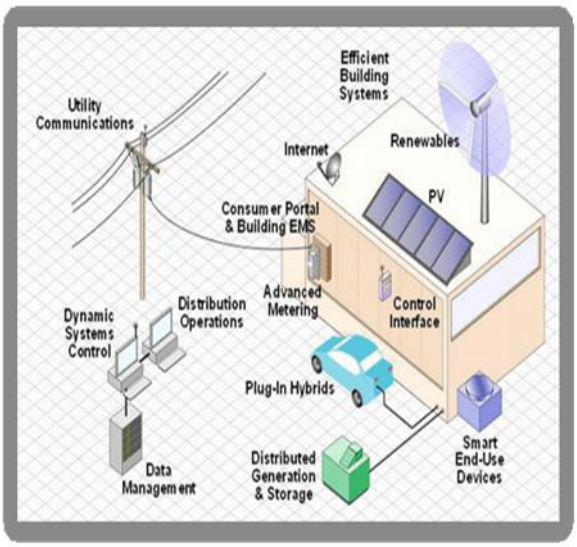
Environmental sustainability and security of power supply are the goals for future grid development. The electric network of the future must be secure, cost effective and environmentally compatible. And a Smart Grid is capable of addressing these challenges. Smart grids co-ordinate the needs and capabilities of all generators, grid operators, end-users and electricity market stakeholders to operate all parts of the system as efficiently as possible, minimizing Costs and environmental impacts while maximizing system reliability, resilience and Stability. A Smart Grid that incorporates demand management, distributed electricity generation, and grid management allows for a wide array of more efficient, "greener" systems to generate and consume electricity. It is an intelligent electric system technology that incorporates with IT.

Because of above discussed problems around the globe and the solutions given by this new technology, it is the right time to go with "smart grids".

The Smart Grids vision is about a bold program of research, development and demonstration that charts a course towards an electricity supply network that meets the needs of future energy requirements. Smart grid is a digital upgrade to the existing electric grid technology that uses digital and other advanced technologies to Monitor and manage the transport of electricity from all generation sources to meet the varying electricity demands of end-users. A smart grid requires flexibility, accessibility, reliability and monetary benefits for future networks. It is a Distributed generation system which is the use of small-scale power generation technologies located close to the load being served, capable of lowering costs, improving reliability, reducing emissions and expanding energy options. It incorporates into the grid the benefits of distributed computing and communications to deliver real-time information and enable the near-instantaneous balance of supply and demand at the device level.



Smart Grid have the components of Home Area Network Device for sharing energy consumption data and receiving commands to turn off or hibernate the equipment when unused , Renewable Energy Sources and Smart meters. They have the pros of improved reliability, reduced operations and maintenance cost, increased efficiency of power delivery, integration of renewable energy and distributed resources, security and reduction in green house gases emission.



Smart Grid systems benefit all those who are involved in it. They provide opportunity for GDP uplift and green-collar job creation and creation of new revenue channels and ways to improve customer service and etc.

Smart grids represent a rare opportunity to achieve a two-fold global good: protecting the environment and fostering social and economic progress. A Smart Grid presents opportunities for utilities and consumers to benefit from efficient management of energy and advanced equipment and devices. It offers significant opportunities to wisely manage the nation's fuel resources by potentially reducing the national need for additional generation sources, better integrating renewable and non-renewable generation sources the grid’s operations, reducing outages and cascading problems, and enabling consumers to better manage their energy consumption. It has so many challenges but it provides more opportunities so that a nation can achieve many benefits from a Smart Grid. We operate in a 21st century society, built on an electrical infrastructure with little intelligence. For a smarter grid to become a reality, utilities will need to upgrade systems to manage the complexities of our modern solutions.

NANOROBOTICS FOR CANCER TREATMENT

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INTRODUCTION

"Bigger isn't always best"

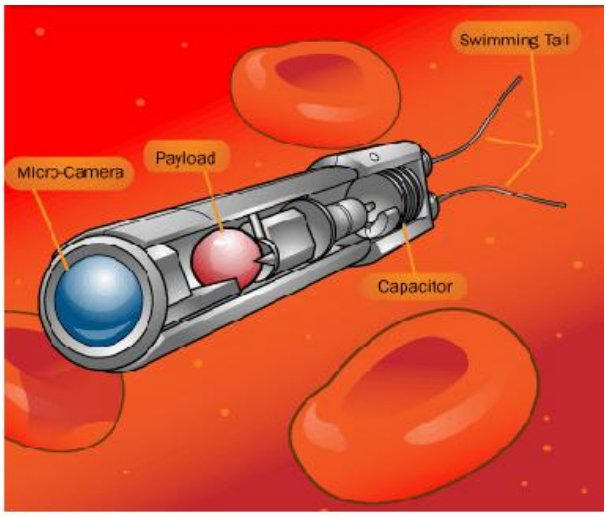
CANCER- one of the most deadly diseases primarily starts at the molecular level. At this molecular level, even the finest scalpel is like a huge instrument designed more to rip and tear than to heal and cure. The traditional methods those are available today to detect and treat cancer damage many of the cells which are non-cancerous and not harmful. The detection of cancer by the traditional methods that are available today does not discover the disease at the earlier stage. So, the medical field is in need of some well structured and well organized simple tool that can detect and treat cancer efficiently and earlier. So we present an idea of using NANOROBOTS for detecting and treating cancerous cells at an earlier stage. To design the nanorobots, we use the NANOTECHNOLOGY, which is normally called as the molecular engineering. Nanobots help in curing the disease efficiently without giving much pain to the patient.

STRUCTURE OF NANOBOTS

Its components include:

- Molecular sorting rotors
- Propellers
- Fins
- Sensors

The exterior of a nanorobot will be constructed of **carbon atoms** in a **diamonded structure** because of its inert properties and strength. Super-smooth surfaces will lessen the likelihood of triggering the body's immune system, allowing the nanorobots to go about their business unimpeded. According to current theories, nanorobots will are capable of two-way communication; will respond to acoustic signals; and will be able to receive power or even re-programming instructions from an external source via sound waves.



Nanobot

CANCER TREATMENT USING NANOROBOTICS

The robots could either attack tumors directly using lasers, microwaves or ultrasonic signals or they could be part of a chemotherapy treatment, delivering medication directly to the cancer site. The three main considerations need to be focused on when looking at nanorobots moving through the body are **navigation**, **power** and how they **destroy the cancerous cells**.

External navigation systems might use a variety of different methods to pilot the nanorobot to the right location. One of these methods is to use **ultrasonic signals**. Ultrasonic signals should be beamed into the patient's body. The signals would either pass through the body; reflect back to the source of the signals, or both. The nanorobot could emit pulses of ultrasonic signals, which doctors could detect using special equipment with ultrasonic sensors.

Using **Magnetic Resonance Imaging** doctors could locate and track a nanorobot by detecting its magnetic field. Alternatively the nanorobot emits a **radioactive dye**, creating a pathway behind it as it moves through the body.

We can then use a fluoroscope to detect the radioactive dye.

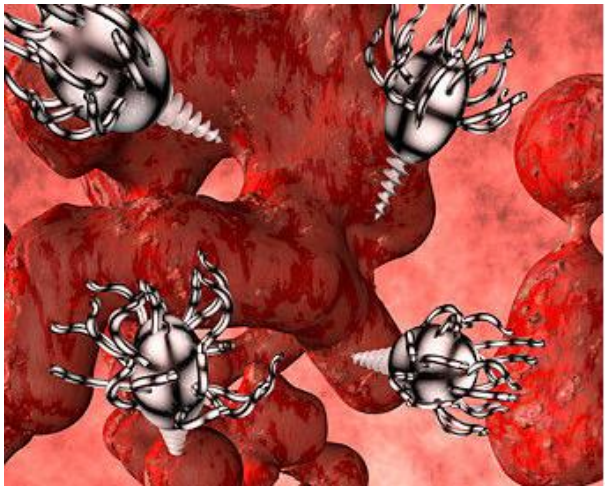
Other methods of detecting the nanorobot include using X-rays, radio waves, microwaves or heat. Onboard systems, or **internal sensors**, might also play a large role in navigation. Nanorobots might include a miniature **television camera**. An operator will be able to steer the device while watching a live video feed, navigating it through the body manually.

While it might be possible to create batteries small enough to fit inside a nanorobot, they aren't generally seen as a viable power source. A more likely candidate is a **capacitor**, which has a slightly better power-to-weight ratio. Another possibility for nanorobot power is to use a **nuclear power source**.

KILLING OF CANCER CELLS

Here are some of the methods for killing the cancer cells:

Medicine cavity -- a hollow section inside the nanorobot might hold small doses of medicine or chemicals. The robot thus could release medication directly to the site of injury.



Probes, **knives** and **chisels** -- to remove blockages and plaque, a nanorobot will need something to grab and break down material. They might also need a device to crush cells into very small pieces.

Microwave emitters and **ultrasonic signal generators** --By using fine-tuned microwaves or ultrasonic signals, a nanorobot could break the chemical bonds in the cancerous cell, killing it without breaking the cell wall. Thus the chance of spreading up of cancer is reduced. Alternatively, the robot could emit microwaves or ultrasonic signals in order to heat the cancerous cell enough to destroy it.

Electrodes -- two electrodes protruding from the nanorobots could kill cancer cells by generating an electric current, heating the cell up until it dies.

Lasers-- tiny, powerful lasers could burn away cancerous cells. The lasers would literally vaporize the tissue.

ADVANTAGES:

"Treatments would be better if the surgeons get inside the patient's body, localize the site of infection, looks around the flaw and treats the disorder..."A few generations from now someone diagnosed with cancer might be offered a new alternative to chemotherapy, the traditional treatment of radiation that kills not just cancer cells but healthy human cells as well, causing hair loss, fatigue, nausea, depression and a host of other symptoms.

A doctor practicing Nanomedicine would offer the patient an injection of a special type of nanorobots that would seek out cancer cells and destroy them dispelling the disease at the source leaving the healthy cells untouched. **The extent of the hardship to the patient would essentially be a prick to the arm**. Since nanorobots kill the cancer cells without rupturing the cell wall in it, there is less probability of spreading menace of the cancer cells. Doctors believe that by delivering small but precise doses of medication to the patient side effects will be minimized without a loss in medication's effectiveness.

EXPULSION OF NANOBOTS

Generally nanorobots are designed in such a way that they are either expelled through the normal human excretory systems or being decomposed inside the blood stream without causing any harm.

Another way of removal of nanobots is to pass the blood stream into a specialized centrifugal apparatus where acoustic transmitters command reciprocates to establish neutral buoyancy. Filtered plasma is recombined with centrifuged solid components and returned undamaged to the patient's body.

SOME OF THE NANOROBOTS

Nanorobots make use of a technology named MOLECULAR MANUFACTURING which is nothing but the production of complex automatically precise structures using positionally

controlled fabrication and assembly of nanoparts inside the nanofactory.

RESPIROCYTE

Respirocytes are nanomachines, tiny mechanical devices designed to operate on the molecular level. Respirocytes function as artificial red blood cells, carrying oxygen and carbon dioxide molecules through the body.

CHROMALLOCYTE

It is a cell repair nanorobot that could be used for chromosome replacement therapy. The replaced chromosome is generated outside the patient's body using desktop nanofactory optimized for organic material. The existing chromosome in the patient's body not only acts as a blueprint for generating the new one but can permanently cure any genetic disorder and permit cancer cells to be reprogrammed into healthy cells.

MICROBIVORE

It is a medical robot acting as artificial mechanical white blood cells. It seeks out and digests unwanted pathogens (may be a bacterium, virus or a fungus) present in the blood.

CONCLUSION

Thus *Nanorobotics*, a blooming technology would definitely attain its practicability in the near future. Despite of its own complexities, it has lots of advantages to be gained. Apart from cancer it could also be used in the treatment of kidney stones, heart stroke and atherosclerosis. Virtually, nanomedicine will eliminate all medical pain, suffering and common diseases of the twentieth century and allow the extension of human capabilities, most especially our mental abilities. Hence nanorobotics will surely achieve a better edge in the future creating waves especially in the field of medicine.

National Hub for Health Care Instrumentation Development

Auto Calibration and Data Processing Circuitry for Milk Protein Analyzer-UV meter

Instrumentation is to do with measurement or quantization of various physical quantities. Composition or concentration of a particular compound in solution or mixture is a key concern in situations where the composition defines the value of the solution/mixture. One such is the concentration of Protein in the milk. Protein percentage in milk can vary from 2-6 % and hence the milk processing industries hugely rely on Protein Analyzing techniques to select and pay for the raw material-milk. This necessitates the development of Milk Protein Analyzers that are accurate.

Need for UV Based Spectrophotometer:

The conventional protein analyzer that is of primary use today is based on chemical titrations. This method provides very accurate results but can be easily fooled by a small amount of urea which shows falsely high protein concentration. This has necessitated a funding to the Anna University Chennai under NHHID to develop an alternative method that is accurate as well as fast to quantize protein in the milk.

The faculty of Biotechnology, Anna University devised a method based on UV spectro-photometry using Beer Lambert's law to relate the absorbance and protein value. The output was realized in means of current through a photo-diode and the equivalent voltage signal ranging from 0V to 5V indirectly represented the protein percentage. It required suitable signal processing and calibration circuitry to extract the protein percentage and a human machine interface for calibration purposes.

This work was handed over to the Department of Instrumentation, MIT, Anna University which in-turn deputed three of its UG students to accomplish this task.

Tasks accomplished and Calibration procedures involved:

Calibration necessarily means determining the slope and bias/drift in a linear static response curve. Usually the instruments we encounter have fixed or well-defined static parameters while the milk protein analyzer needed recalibration procedures every-time it started owing to the time variant characteristics of the measuring circuitry and sensitivity to measuring environment. The NHHID did not want the end-users to find any difficulty in re-calibration procedures and hence an intelligent microcontroller based circuit was designed and programmed to take care of calibration procedures. This smart or intelligent transmitter must perform another additional task namely linearization. Thanks to Beer Lambart's law that provided a theoretical basis to linearize the relation between input and output as the output was related to the log of input.

Human machine interface was designed to help in calibration procedures which included a keyboard and LCD screen. As per the directions from the NHHID, the interface was made simpler and multitasking with menus that complicated the programming further. It was recommended that a data logging system be introduced that gives the 'transmitter' more sense and RS232 based serial communication was used to accomplish it.

Proposal was finalized and simulations were confirmed after which the real circuitry was built and tested against standard voltages.

Another unwelcomed guest came into picture, "random errors." Unlike conventional instrument where random errors does not play dominating role in accuracy, here the inverse log of very small error produces a considerable error in the final output. Hence an auto-averaging feature was introduced and number of samples to be taken is user-defined.

After various tests performed on the circuit by the NHHID members, the circuit was given acceptance and the Auto-Calibration and Data Processing Circuit is due to be coupled to the UV meter in a couple of days.

About the team involved in UV meter

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