Society for Promotion of Excellence in Electronics Discipline

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SPEED e- NEWSLETTER

Main Article

'SPEED' a pathway to Excellence

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Chairman SPEED &
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It is the quest of intellectual human beings to invent and utilize newer phenomena, materials and devices to extend their natural capabilities, which has resulted in the development of science and technology. Historically, we find that human culture has grown exponentially, fuelled by scientific discovery and inventions, which have affected our social, cultural and economical lives. In recent years Electronics is seen to be a very wide field embracing almost all walks of human endeavor. It has freed humans from labor intensive work, barriers of distance and provided comforts and conveniences. The audio/video entertainment appliances, various gaming platforms, mobile telephones, PCs, automated industrial set-ups, satellites, internet, household automated appliances, various defense related electronic gadgets are all developed towards increasing comfort, reach, safety and security. Many of these products are such that they would have been mentioned in the fantasies a few years back, but these are the need of today. Such is the growth rate and power of electronics.

Message

I am extremely happy to inform you that Society for Promotion of Excellence in Electronics Discipline (**SPEED**) as an organization constantly metamorphoses the different aspects of excellence by various means of Electronic Fraternity. The has been rolling in the form of this organization and we all together are here to speed up tye SPEED activities. With a view to provide value-addition to individuals I am confident that SPEED e-Newsletter will immensely benefit in their future endeavors form this value-addition.

Dr. P. B. Buchade, Secretary, SPEED &
Chairman,
Board of Studies in Electronic Science,
Pune University

From Editor's Desk

Dear Readers,

*I am happy to bring this **FIRST ANNIVERSARY** issue of SPEED e-Newsletter. **SPEED e-Newsletter** was launched in October 2011 on auspicious day **Dasera,** as an official publication of SPEED to serve a medium to communicate the activities of SPEED and latest trends in Electronic Science and technology. It also provides Cross-word/Quiz in students' corner to test the basics in subject. The response to the first volume of SPEED e-Newsletter was encouraging.*

Let me wish all readers a very happy Diwali. Let the second year of SPEED e-Newsletter be a year of all round growth of SPEED activities. I look forward to your feedback and comments. I also seek your support and cooperation in disseminating the Newsletter to all possible interested audience.

Dr. Nitin M. Kulkarni
Editor

INSIDE THIS ISSUE:

"*We love those subjects which we understand and later work on it.*"

-N. M. Kulkarni

'SPEED' a pathway to Excellence……

Starting from a small offshoot of the Physics, Electronics as a subject has grown into a full-fledged discipline engrossing different aspects of life. The popularity of Electronics is due to consistent efforts by all the stakeholders including the teachers, students, technocrats and industry, consumers not to be excluded. With growing necessity and the then requirement of expertise in the field of Electronics, Pune University has started **Electronic Science** as a separate branch at graduate level from the academic year 1985-86. In the last ***twenty five years*** the seed sown has grown in to a big tree. Across the state, there are graduation and post graduate programs being conducted by almost all the Universities. Exponential growth has been observed among the industries and business opportunities.

As active members of the Electronics fraternity, a group of likeminded people felt the need to come together and promote excellence. During the interactions/discussions the idea of establishing the **S**ociety for **P**romotion of **E**xcellence in **E**lectronics **D**iscipline **(SPEED)** was originated and it came into being through continued efforts. The organization is nonprofit making and working on voluntarily basis. The fundamental aim of the Association is to exchange information, knowledge and expertise among members of the association. It is being done through organizing competitions, symposia, workshops and conferences, group meetings, lectures from eminent scientists and collaborating with other international bodies with common interests, Promoting educational and industrial collaboration and other relevant activities is also among the primary objects of the Association. **The SPEED is a legal registered Association active from December 2010. Necessary fund are being generated through memberships, participation fees for the workshops seminars etc. Though the organization is initiated by some enthusiastic teachers of Electronic Science, it is aimed to be inclusive of students, teachers and professionals who are associated in one way or the other with the Electronics Discipline.**

Looking back and thinking philosophically, it is realized that **LIFE** is **L**iving **I**n **F**ulfillment and **E**njoyment - fulfillment in our professional careers and enjoyment in our personal lives. This balance is the core of a quality life and carries with it the great benefits of clear thinking, effective decision-making, creativity and a sense of belonging and relatedness. These essential qualities enable the individual to function more effectively and productively. These qualities also enable any individual whether a Teacher, Businessman, Doctor, Engineer, Company Executive, Student or Housewife to excel in their lives. Times change but one thing that constantly determines success, which is EXCELLENCE.

Excellence is a talent or quality which is unusually good and so surpasses ordinary standards. It is about going a little beyond what we expect from ourselves. There is nothing more satisfying than overcoming a challenge that was previously deemed insurmountable; nothing more satisfying than looking back at who you are now and realizing that you have grown much more than you thought you could. To be human is to live to our highest potential. Excellence is not so much a battle you fight with others, but a battle you fight with yourself, by constantly raising the bar and stretching yourself.

As an organization SPEED is growing leaps and bounds by way of membership spread across the Maharashtra and neighboring states and expanding in terms of activities for promoting excellence. Since its inception, several activities have been carried out for students, teachers and professionals in the field of Electronics and even more are in store for future.

An official website www.excellentspeed.org is launched to facilitate the interactions among those who strive for the cause of excellence. Launching function was arranged at A.V. Hall of Abasaheb Garware college, Pune - 4 at 4.00 pm on 24th July 2012. On this occasion the SPEED felicitated one of the veterans in the field of electronics and physics, Professor R.N. Karekar, former Head, Dept. of Physics, University of Pune by conferring Honorary Membership of SPEED and a CITATION in recognition of his drive for excellence, exemplary academic contributions and continued encouragement and support to the Electronic Science Community. We are taking this opportunity to 'Reward' the toppers of different competitive activities conducted by SPEED throughout the year. Come and join the "Pathways of Excellence".

- Dr. A.D.Shaligram,
adshaligram@gmail.com

Fiber Optic Sensors

A sensor is a device that detects, or senses, a signal or physical condition. Most sensors are electrical or electronic, although other types exist. Sensors are either direct indicating (e.g. mercury thermometer or electrical meter) or are paired with an indicator (perhaps indirectly through an analog to digital converter, a computer and a display) so that the value sensed becomes human readable. Sensors are profoundly used in industry, medicine and robotics. Ideal sensors would have attributes such as low weight, small size, low power, environmental ruggedness, immunity to electromagnetic interference, good performance specifications, and low cost. One of the major sensor types that have emerged in recent years is a fiber optic sensor. As technology has advanced, these sensors have become increasingly acute in areas such as aerospace, medicine, construction etc. The development of low cost optoelectronic components and scientific advances, like laser and low loss optical fibers have enabled fiber optic sensor technology to approach its ideal potential for many applications.

Although optical fibers were originally manufactured mainly for use in the communication industry, they have been adapted successfully and effectively to optical sensing devices. Fiber optic sensor is a device, which uses light guided within an optical fiber to detect influence of variety of stimuli such as physical, chemical, bio- medical or any other parameters. Optical fibers have been envisioned for sensing physical and chemical parameters since 1966. Much research and development work has been done since then with real life and industrial applications in mind. From an industrial point of view fiber optic sensors are attractive because they offer excellent sensitivity and dynamic range, compact and rugged packages, and potential for low cost and reliability.

The modern optical fiber sensors owe their development to two of the most important scientific advances - the laser and the low loss optical fiber. The optoelectronics industry has brought about products such as CD players, laser printers, bar code scanner, laser pointers etc. The fiber optic communication has literally revolutionized the telecommunication industry by providing higher performance, more reliable links with ever decreasing bandwidth at low cost. Fiber optic sensor technology in turn is driven by the development and subsequent mass production of components from both these industries. As component prices are declining and quality improvements are being made the fiber optic sensors show a better potential to replace traditional sensors and evolve newer innovative applications.

Optical fiber being a physical medium is subjected to perturbation of one kind or the other at all the time. It therefore experiences geometrical and optical changes to a larger or smaller extent depending upon the nature and the magnitude of the perturbation. In communication applications one tries to minimize such effects so that signal transmission and reception is reliable. On the other hand in fiber optic sensing, the response to external influence is deliberately enhanced so that the resulting change in optical radiation can be used as a measure of the external perturbation. In communication, the signal passing through fiber is already modulated, while in sensing, the fiber acts as a modulator.

A general block diagram of fiber optic sensor configuration is as shown in figure.

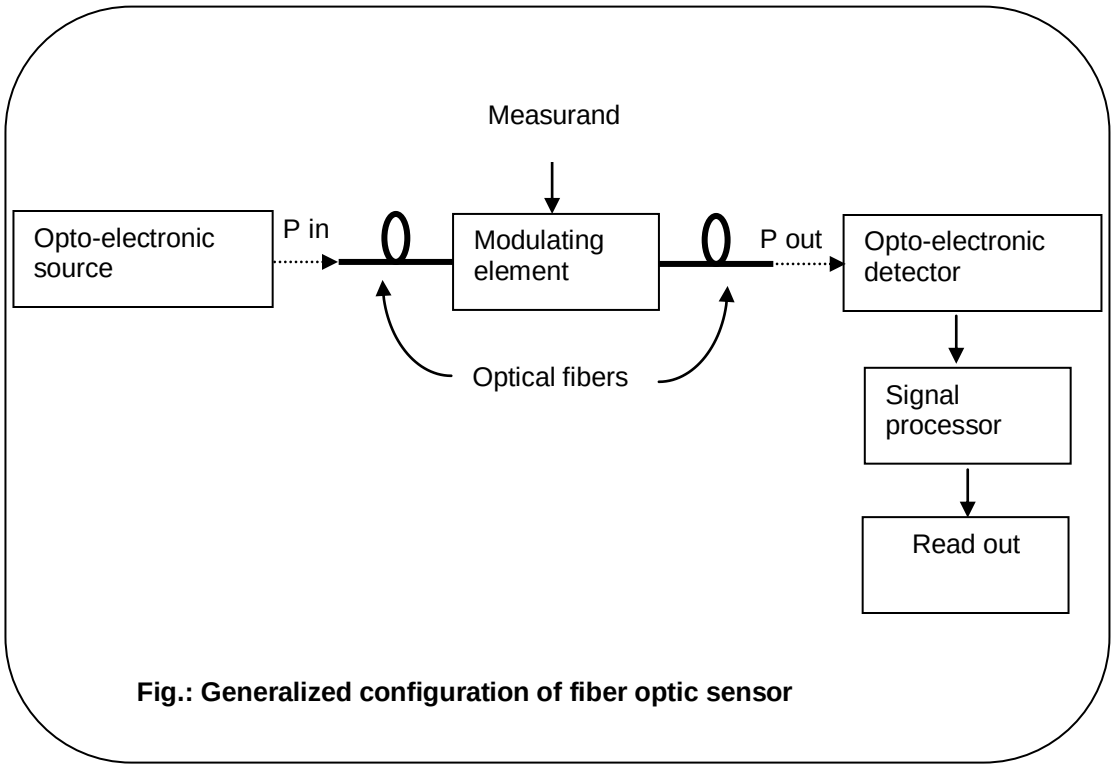


Fig.: Generalized configuration of fiber optic sensor

In case of simple fiber optic sensor the measurand such as displacement, force, pressure, temperature modulates the intensity of light propagating through the optical fiber and the modulating zone. The modulated light changes the detector output, which can be further processed and calibrated to give the value of the measurand. The signal S developed by the detector, to a good approximation, is given by the relation [1.10]

$$S = P(\lambda)\ \eta\ T(\lambda, l)\ M(I, \phi \text{ or } \lambda)\ R(\lambda)$$

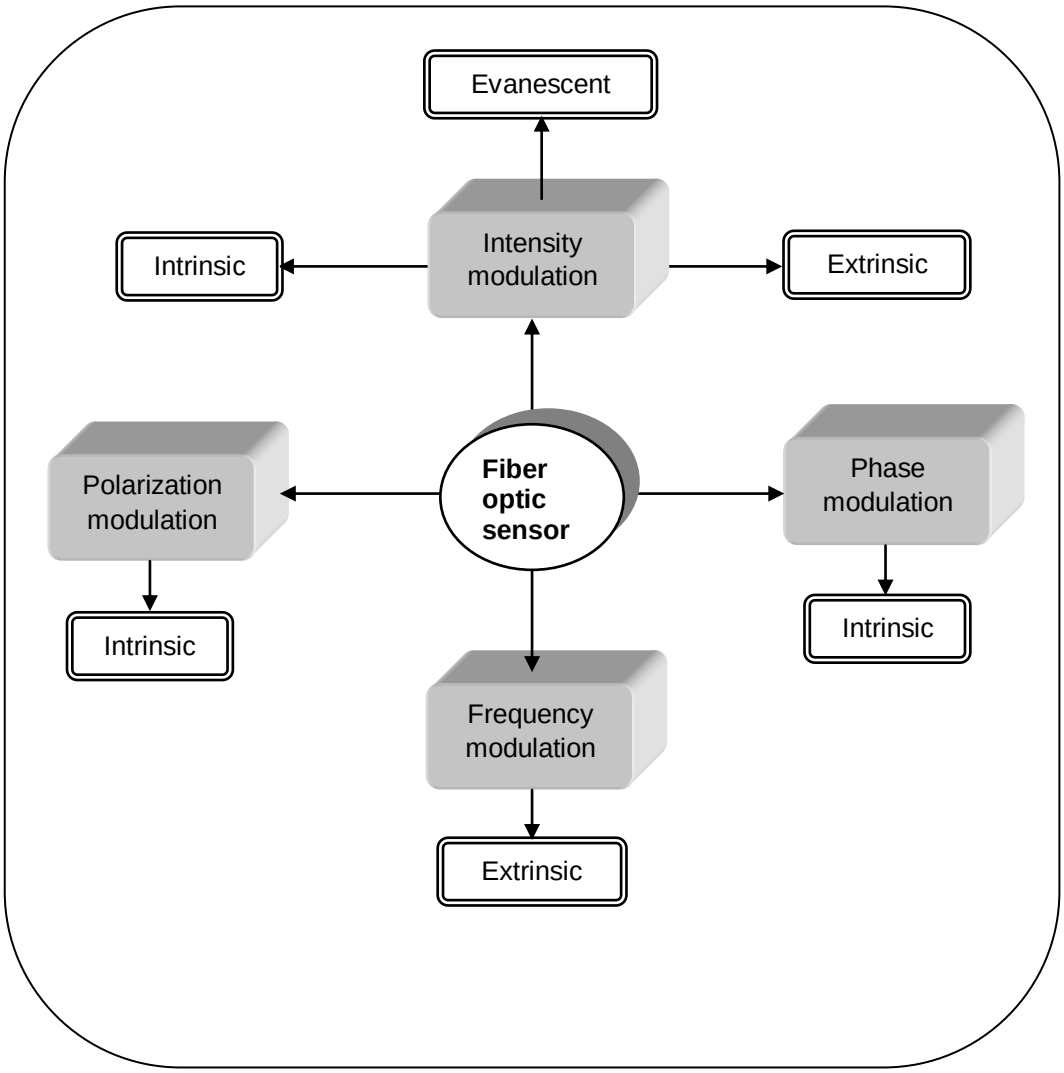
where P (λ) is the power furnished by the opto-electronic source as a function of wavelength λ, η is the coupling efficiency of the input/output fibers with the modulating element, T (λ, l) is the transmission efficiency of the optical fibers and M (I, ϕ or λ) is the response of the modulating element, which may modulate intensity (I), phase (ϕ) or spectral distribution (λ) and R (λ) is the responsivity of the photo detector.

A typical fiber optic sensor (FOS) uses a source of light, a length of sensing fiber and a photo detector. Light from the light source is taken to a modulation region using an optical fiber. It is modulated there in by a physical, chemical or biological phenomenon. The modulated light is transmitted to an optical receiver. The received light is then detected and demodulated.

The most commonly used optical detectors for fiber optic sensors are semiconductor photodiodes (PDs) and avalanche photodiodes (APDs). APD can sense low light levels due to the inherent gain because of avalanche multiplication, but need large supply voltage typically about 100 V. Silicon PD is good for visible and near IR wavelengths.

Since light is characterized by amplitude (intensity), phase, frequency and polarization, any one or more of these parameters may undergo a change during the process of modulation.

There is variety of fiber optic sensors. They can be classified with different approaches; Based on the modulation and demodulation process a sensor can be called intensity (amplitude), a phase, a frequency, or a polarization modulated sensor.



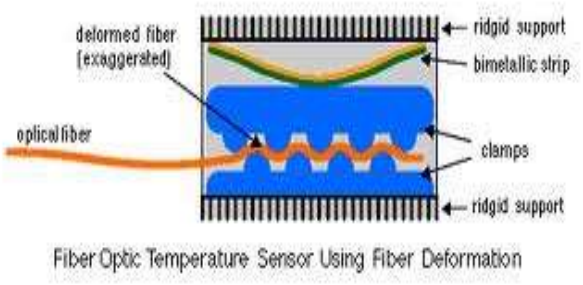
Fiber optic sensors can also be classified on the basis of their application: physical sensors. bio-medical sensors (inserted via catheters or endoscopes which measure blood flow, glucose content and so on). Both the intensity types and the interferometric types of sensors can be considered in any of the above applications.

Extrinsic or intrinsic sensors is another classification scheme. In the former, sensing mechanism takes place in a region outside the fiber and the fiber essentially just serves as a conduit for the to-and-fro transmission of light to the sensing region efficiently. On the other hand, in an intrinsic sensor sensing mechanism takes place within the fiber itself.

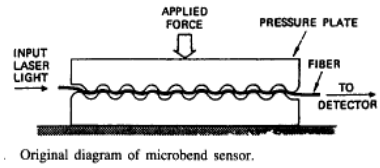
From an industrial point of view, fiber optic sensors are attractive because they offer excellent sensitivity and dynamic range, compact and rugged packages, and potential for low cost and high reliability. Initial applications of these sensors have been in hostile environments, where there may be high temperatures, corrosive materials, high EMI and explosion hazards, and where traditional sensors do not work well.

Depending upon the technique used in sensing, fiber sensors may be divided in to two general classes, interferometric and intensity modulated. Interferometric devices that measure differential phase change in multi-path fiber geometries and intensity-based devices measures environmentally induced changes in received optical power. Displacement can be measured using either interferometric devices or intensity-based devices.

Displacement can be measured with either macrobending or microbending of the optical fiber. In fact the micro bend sensor is one of the earliest sensors. Figure shows the original diagram of microbend sensor. Micro bend is designed using multimode fiber of a few meters in length, which is placed between two rigid plates having an optimum corrugating profile such that the fiber experiences multiple bends. Due to micro bending induced losses the lower ordered guided modes are converted to higher order modes and are eventually lost by radiation in to the outer layers. This results in reduced intensity coming out of the fiber.



Fiber Optic Temperature Sensor Using Fiber Deformation



Original diagram of microbend sensor.

Fig.: Micro bend

Micro bend sensors have been configured for measurement of many different parameters including pressure, temperature, flow, local strain, and speed. Micro bend sensor structure can also be used in distributed and quasi-distributed sensor systems. Intensity modulated sensors offer the virtue of simplicity of construction, low cost, and compatibility to multi mode fiber technology.

The basic structure of fiber optic displacement sensor is used in numerous applications. The FODS has many applications in industry. Angular position of a shaft is one of the most common parameters measured in industrial and manufacturing system. Twist sensor consisting of multimode fiber with a large core and /or high NA sandwiched between two fibers with a small core and /or low NA is designed for optical fiber rotary displacement sensor. Depending up on the length of the twist the usable range is about 135^0 to 160^0 with sensitivity 0.029'.

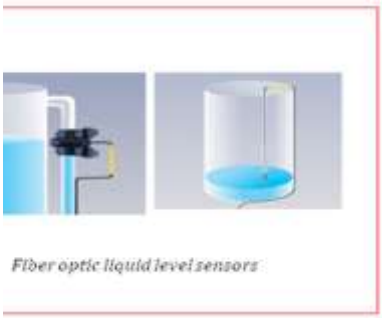
An intensity based FOS for measuring axial and angular displacement utilizes specific fiber bundle geometry to emit and collect light reflected from a flat surface. The basic configurations of fiber optic displacement sensor (FODS) are in turn used to sense many parameters. The deflection of diaphragm curvature is sensed to measure pressure by mounting the transmitting and receiving fibers below the diaphragm and monitoring the received light intensity.Pressure sensors based on movable diaphragms, on small Fabry-Pérot interferometers, or on microbending, are the primary types being used today. They are finding use in biomedical, process control, marine, and engine control applications.The first pressure sensors for biomedical usage relied on piezoresistive techniques. These were developed in the late 1950s for intravascular pressure measurements. Later, fiber sensors based on moving diaphragms and monitoring retro reflected intensity emerged. Few commercially available fiber optic sensors are as shown in following figures.

Fiber optic linear position and displacement sensor

- 25 mm stroke (~1 inch)
- EMI/RFI immune
- 0.0002 mm resolution (with averaging)
- Accuracy of 0.08% FS
- Operating temperature up to 250 Celsius

Compact Pressure transducer

- Fully immune to EMI/RFI
- Intrinsically safe
- 0 - 10 psi to 0 - 10 000 psi transducers
- Precision of 0.1% FS or better
- NPT male or female
- Operating temperature up to 350 Celsius
- All 17-4 PH stainless steel


Fiber optic liquid level sensors

The overall draw back of fiber optic sensors is that of cost, however due to rapid development of fiber optic telecommunication systems are going to reduce the cost of fiber optic components. Thus in near future FOS will find places in almost all sensing applications.

- Dr. P. B. Buchade

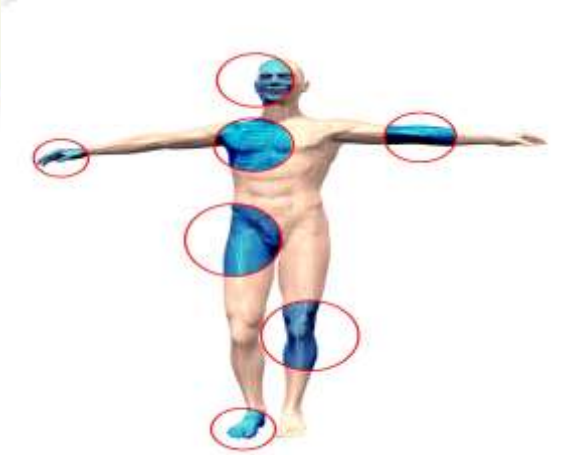
Universal Problem in Medical Instrumentation

Mrs. A. P. Kathe, Dept. of Electronic Science, Fergusson College, Pune

With the growing time-line, one can easily find remarkable growth in the ill health of general mass of society. This growth has obviously given rise to the need of various facets of medical expertise and diagnostic instruments. These facets actually depend upon the generalization of various operations of the human body. This is not many times applicable as every body has an exclusive existence. This basic fact automatically imposes various difficulties or problems in the measurements with medical instruments. Some major problems are discussed here:

- **Inaccessible parameter to be measured:**

In some measurements related to intricate structures like brain (for example- monitoring dynamic neurochemical activity in brain), it is required to position a suitable transducer, which becomes actually hazardous due to the threat of fusing the intricate neural links. Sometimes medical operations are required to position the transducer at appropriate position, which is risky. In some sites like knee or eye or brain, the required physical size and dimensions of transducer are so inadequate that they need to be custom-made. Moreover for desired type of sensor, the required characteristics Viz.- material, operating principle, output type, size, cost etc does not match.



- **Variation of data/signal:**

Every individual body is an exclusive set. It has its individual parameter variations.What we call as standard signal variation may not be the same for all. Measurement taken at one time do not match with the same measurements of the same body at some different time. Factors like situation, condition, and mental status affect the signal to a drastic level. E.g.- blood pressure of a patient taken at comfortable place like his own home comes out to be 60-120 while the same taken for the same patient at hospital may shoot up to 90-140. Moreover there is a drastic change of signal patterns from one body to another. Generally statistical deductions prove to be the best tool in such matters.

- **Lack of knowledge about interrelationships:**

Human body is still a wonder. Various interdependent main subsystems like the bio-chemical system, the cardiovascular system, the respiratory system, the nervous system and also other supporting systems like the hydraulic system, the bio-optical system, the pneumatic system, the mechanical system work remarkably hand-in-hand to keep the body system going great. That means these subsystems have a considerable influence on each other. Expert with good understanding of these interrelationships can, therefore, succeed in making correct deductions and in arriving at some useful conclusions. On the contrary, due to lack of this knowledge, it becomes fairly difficult to diagnose quickly. E.g.- A back pain which can be easily cured by proper resting and correct posture has to bear enumerable treatments like ultrasound, diathermy etc

- **Effect of the transducer on the measurement:**

As the internal side of the main system is very congested and mainly fluid, simply presence of the transducer changes the reading significantly and further can mislead the treatment. This becomes sometimes risky. Sometimes, presence of transducer in one system can affect responses in other systems E.g.- Transducer in the blood vessel can change the blood flow pattern and pressure, Long-term investigations like ECG, EEG, MRI or simply blood pressure measurement, which goes for long durations, can elevate the normal readings of the patient.

- **Artifacts or noise pick-ups:**

The word artifact relates to the term noise in general instrumentation. This denotes all the unwanted signals those may get coupled to the useful biomedical signals to be measured. These unwanted signals may be sourced from within the instruments or from outside. Even a nearby instrument in the same room (say ICU) can act as source of interference signal or pick-up. These prove to be a threat for the actual biomedical signal, which are in the range of μV. These noise signals sometimes completely distort the signature of original signal.

Motion artifact is another problem faced; peculiarly in neo-natal (treating infants) wards. For a faithful reading it is expected that the organ under the probes be steady (e.g. limb- hands or legs). Movement of the organ introduces a random level shifting, addition of new frequencies. Temporary sedation of patient is the normal way-out that is utilized in these matters.

- **Energy limitations:**

In many techniques it is essential to apply a certain amount of energy (current/ frequency) to the body (many treatments in physiotherapy like ultra-sound, diathermy or nerve stimulation, muscle stimulation like defibrillation). This energy obviously is meant to affect the body system so as to improve its operation. Here, one has to still avoid the energy concentration, which may be dangerous to the body. Problems arise, but if undue pain, trauma or discomfort be avoided or kept minimum, their solutions can be devised. Besides, there can different solutions of the same problem for different patients. To reach the right solution should be the ultimate motive.

26th International Conference on VLSI Design 2013

VLSI DESIGN 2013

January, 5th - 10th, 2013 at Hotel Hyatt Regency, Pune, India

12th International Conference on Embedded Systems

Registrations Open!

http://vlsidesignconference.org/conference-registration.aspx

green technology
A New Era for Electronics

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VLSI Conference 2013 - Design Contest

The aim of the contest is to promote excellence in the design of electronics systems and embedded software system designs in educational, research and industry establishments by providing a venue for professionals in the field of "VLSI and Embedded Systems" to showcase their designs. The design contest is open to all professionals, university and college students studying B.Tech./B.E. /M.Tech./M.E./M.S./Ph.D. in the areas of VLSI, Microelectronics, Computer Science, Embedded Systems are strongly encouraged to submit their student projects. The purpose of this contest is not only to create platform to showcase and share your work with academic/industry experts, seek suggestions but also enhance networking opportunities

Criteria for entry to the design contest in VLSI Conference 2013

For VLSI 2013, we solicit entries for the design contest from full-time graduate and undergraduate students, and professionals from industry and research establishments. The design and implementation should have taken place within 24 months prior to the submission deadline as part of the course, research or development work. It is expected that participants will take necessary clearance from their institutes or organizations. They will need to give a declaration in this regard in specified format.

Scope for Electronic Design Systems: Designs can be for analog, digital OR programmable circuits. Submitted designs can be embodied as digital or analog integrated circuits, programmable processors, SoCs, platform-based or embedded systems designs. Design/project fields include (but not limited to):

- Digital Integrated Circuits, Analog Integrated Circuits, FPGA based designs, Reconfigurable Computing Systems, SoC / Platform-based designs, MEMS/Optics/Bio-Chips

Designs conforming to the theme of conference "Green Technology" will have added advantage. For evaluating the hardware design entries proof of implementation must be provided in the form of die and board photographs along with measurement data and live demos (if possible).

Scope for Embedded Software Systems: We value the novelty of the idea and there are no restrictions. But if it supports "Green Planet" theme then it may get added advantage. However we are listing down some of the verticals:

- Embedded system design for Green Habitats and Smart Home, Virtualization and Cloud , Technologies, Embedded systems for Future Data Centers, System designs for, Telemetics, Embedded Software Designs for Mobile Platforms, Embedded system Design for Societies

All the entries in Embedded software designs can be implemented on any available hardware platforms. We are also open to concepts described in posters, presentations and data sheets.

Submission Guidelines: You may want to address some of the following questions and issues in your Project Report:

System Overview For Electronic Design Systems:

- Motivation for designing the system.
- Is the implementation medium appropriate?
- Does this design satisfy all requirements , scalable, adaptable etc.
- Specifications: for electronic designs functional, timing, electrical, and environmental (temperature).
- Trade-offs: architectural and circuit trade-offs, I/O considerations, floorplanning and interconnect approaches. Emphasis should be placed on "why" part.
- Which paths are critical? Have you simulated or measured their delays?
- Block Diagram, Logic / Circuit Diagrams, and Algorithms.
- Photo or Final Layout Plot (annotate so various blocks can be identified).
- Verification/Simulation (keep it brief): how did you assure that the chip would work as specified?

Testing / Statistics:

- How did you, or will you, test this part with I/O pins only?
- What test equipment did you use?
- Actual test results, if available, should be summarized.
- Die size, total power, number of transistors, density of layout, maximum clock speed, and/or other relevant parameters.

Submission Format:

VLSI Conference does not require transfer of any 'intellectual property right'. However, it assumes that any submitted design can be publicly shared and any right protection required is done by the participants or their organizations prior to the submission. Please take all permissions / legal sign offs accordingly.

Design Contest paper submissions MUST -

- be in PDF format only,contain the title of the project and contain an abstract of not more than 300 words, be no more than 6 pages (including the abstract, maximum of 10 figures/tables and references), double column, 10pt Times New Roman font.

The cover page must include

- Title of the design, Names and email IDs of authors, Mailing address and mobile number of the contact author, Area of the application and implementation method, Contribution of each group, if the prototype or software is jointly developed with non-academic parties

MS Word submission templates are available at : *http://www.ieee.org/conferences_events/conferences/publishing/templates.html*

Fellowships: The conference will award limited number of fellowships, based on need and merit, to partially cover expenses of attendees from India. Students with short-listed design contest entries will be given preference. Fellowship application details will be posted at the website

Emails: Questions to be directed to the Design Contest Chair: Shalabh Gupta for VLSI Design and Mahinder Kumar Saluja for Embedded System Design at, *secretary@vlsidesignconference.org* with email subject line **"VLSI Design Contest"** OR **"Embedded System Design"** respectively.

IMPORTANT DATES

Extended Submission Deadline : November 1st, 2012

Technical Co-Sponsors: IEEE CAS CEDA

Sponsored by: VLSI Society of India (VSI)

Published by: CPS

Electronics Excellence Examination (EEE), Dec. 2012

(**SPEED)** is planning to conduct **Electronics Excellence Examination (EEE) for F.Y./ S.Y.B.Sc. (General) & F.Y./ S.Y. B.Sc. (Computer Science) students) on Saturday, December 15, 2012 at various centers and in your city.** You are requested to appoint /recommend a SPEED coordinator (**at various centers)** at the college level, who will **conduct this examination.**

You are requested to please communicate their Name, mobile number and e-mail address as early as possible so that it will be easy for further processes

mld47@rediffmail.com or buchade@rediffmail.com

As you know that, **Best-3 students** as well as **Top-3 students** (**Center toppers**) will be felicitated with special prizes.

(Dr. M.L Dongare) 9823244245
Coordinating Member for EEE
SPEED

SPEED Memberships Details

Membership Type	Fees (Rs.)
1. Patron Members	10,000
2. Life Members	2,000
3. Ordinary members	500 (per year)
4. Student	200 (per year)

"Let us work towards Excellence in Electronics for the betterment of society"
-N. M. Kulkarni

Membership drive Months – December 2012 & January 2013

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