

*Wish you all a very Happy and Prosperous New Year*

### BME ACTIVITIES AT IIT KANPUR

In this institute, the activity was started in 1985. The focus was frequently shifted keeping in view the students' interest, and developments in BME field. However Bioelectric signal and image processing remains major stream. The constant improvement in computing facility could make biomedical signal and image processing richer and richer almost in every passing year. In 1988, Neural Networks was introduced, initially it was 'artificial neural nets', ANN'. The subject quickly became the arena of mathematicians. Initially the BME activity was restricted to EE & Maths Depts but now 'Basic Bioscience and Engineering Department' has been set up. Neural Net is now strong and healthy with the potential to grow.

Apart from large number of projects and thesis, in various areas of biomedical engineering, the following sponsored projects were completed and some patents were registered.

1. Artificial Hand for Below-Elbow Applications : Sponsored by DST. Two pairs of electrodes, mounted on the inner wall of the socket, pick up EMG signals from two muscles - one extensor and one flexor. It is a will-operated device. The electronic package for pattern recognition identifies the intended movement and energizes the appropriate motor. The device could produce finger flexion (grip), wrist extension and wrist flexion apart from rest state.

2. Speech Synthesis in Indian Languages for Vocally Handicapped and Spastics : Sponsored by MHRD. Speech synthesis is done by a DSP (Processor). It uses a four multiplier lattice model along with some new smoothing techniques. It has 112 sentences and any one may be played by selecting the sentence with two switches. The new smoothing technique produces

normal speech (not robotic voice); the device is available in Hindi and Bengali though another half a dozen Indian languages are also tested. IIT Kanpur, holds a patent for this development.

3. Panini : It is a diagnostic equipment and the project was sponsored by AICTE. The DSP-operated Panini is connected to a laptop through serial port. The software picks up the speech signal, displays it and guides for the next operation. The defect in vocal chords (nodules, palsy, carcinoma etc.), vocal tract (excessive bulging or constriction in the area function and identifying responsible group of facial muscles and the corresponding cranial nerves) and change in tension in glottal muscles are detected by analysing sustained vowel only. Panini's concept of grouping the Sanscrit alphabets is used here to improve accuracy.

4. Anaesthesia Monitor / Pain Monitor : This device needs ECG signal only and is picked up by using three electrodes from the patient on the operation table. The equipment is connected to a computer through serial port. The hardware and software processing brings out R-R intervals and then the HRV spectra. The respiratory and baro-receptor peaks are identified. Subsequent processing accurately determines respiratory sinus arrhythmia (RSA) which varies with the level of consciousness. From the power in the two peaks, the parasympathetic dominance (or overall relaxation of the body) is calculated. These two are continuously displayed on the monitor. It helps to decide the dose of anaesthesia needed by the patient. The device can also measure the level of pain which disturbs RSA. The patent of the device is taken by IIT Kanpur.

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Prof. G. C. Ray

## Our Senior Member Suggests...

Being associated with BME movement in India over three decades and having seen this field to grow from no where to somewhere by now I am sure no one would be happy with the pace with which it is coming up and something must be done immediately to speed up the development of this field and to bring it up to the level of international recognition.

Let us have a "Think Tank Group" which can deliberate on various issues related to BME movement in India and suggest appropriate measures. Come out from regional boundaries and whole heartedly cooperate to initiate steps to take BME in India to greater heights.

**Dr S C Saxena**, Director -TIET <[saxenasuresh@yahoo.co.in](mailto:saxenasuresh@yahoo.co.in)>

## NEW PRODUCT

### Digitrack – Digital Holter System



The holter system consists of a portable holter recorder used to record the (ECG) of a patient for period extending up to 24 or 48 hours and a holter analyzer providing automatic or assisted analysis of the recorded ECG. Its main function is to reveal abnormalities of the heart that appear during normal day-to-day activities of the patient, which in most cases do not reveal themselves during the clinical checkup or examination of the patient at a clinic or hospital.

Digitrack is a state of the art system indigenously developed by Concept Integrations (India) Pvt. Ltd. The Digitrack Recorder is a miniaturized battery operated portable device with large digital nonvolatile storage for the ECG data. It can record 3 channel ECG for up to 48 hours along with unlimited number of event markers. The recorder is fully configurable from Digitrack Analyzer and can provide online viewing of the patient ECG prior to start of recording. The recorder provides lead fault alarms in case of dislocation of the patient leads to ensure reliable recording of useful data. The Digitrack Analyzer is a PC based, software driven ECG analysis system which can work in automatic as well as assisted modes for accurate results. The analyzer provides detailed arrhythmia analysis, heart rate variability, R-R analysis and ST segment analysis. The analysis is presented in

## Past President's views....

Something must be done for a National Level recognition to BMESI the sooner the better as we have a good President who might listen to scientists in this area. It is very necessary to collect the contributions of BME scientists and institutions to society/people. Then put forth what is unique about BME which is not a copy of what is done elsewhere?

Projet research done in Indian sciences, such as Yoga, Ayurveda, Rehabilitation Engineering, Telemedicine etc required for Indian conditions (I do not mean cheap substitutes but innovative ones like Jaipur foot),....

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**Dr T M Srinivasan**

graphical as well as tabular formats for easy and quick comprehension. The analyzer has user friendly graphical user interface and provides various reports and printouts in multiple formats along with full disclosure. The analyzer is capable of fast downloading and analyzing the captured ECG data from the recorder.

The Digitrack system is being enhanced to support ambulatory blood pressure monitoring. More details on [www.conceptintegrations.com](http://www.conceptintegrations.com) or send email to [conint@vsnl.com](mailto:conint@vsnl.com).

### Motion Artifacts, Noise or Signal ?

Motion artifacts in ECG-s, have been traditionally considered to be a problem in ambulatory recordings. It is also true that motion artifacts may not just be random noise. They occur for a very precise reason, and that reason is movement of the patient during ECG recording. Thus it may be possible to extract information from ECG-s "corrupted" with motion artifacts regarding the movements of the patient, which may help diagnosis, particularly in telecardiology applications. To attain this goal unfiltered ECG signals need to be obtained from ambulatory recorders. Since all ambulatory recorders available in the market provide only filtered ECG signals, such a study is ordinarily not possible. However, the development of an inexpensive, lightweight ambulatory ECG recording system in IIT-Bombay has alleviated that problem. Using this recorder, ECG-s were recorded and analyzed to extract the signatures of three typical movement patterns by characterizing the low frequency artifacts.

The signals so obtained are non-stationary signals which cannot be analyzed effectively neither with Fourier transform (FT) nor with Short term Fourier transform (STFT). Hence wavelet analysis using Daubechies-3 wavelet was used for analysis and denoising. A backpropagation based neural network has been used for characterization. The effects of both amplitude and phase of ECGs (Lead II only) on the performance of the neural network were observed and the neural network

optimized for recognizing and characterizing motion artifacts using 75 data sets for training the network. Using 15 sets of data for testing the following movements could be systematically differentiated and distinguished from each other. Climbing stairs versus walking (100% accuracy), climbing stairs versus moving one's hand (90% accuracy) and walking versus moving one's hand (50% accuracy). The low accuracy on the last group can be attributed to the fact that only single lead recording was used for the purpose of classification.

The philosophy behind this exercise is quite simple. Very many times we reject as noise, data which is not random. Signals that occur for a specific, identifiable reason, will obviously have information regarding the underlying cause embedded in the signal. It is for us to recognize the value and extract such information from complex signals.

*The work was done by Mr. S. N. Vijay under the guidance of Prof. S. Mukherji and Prof. V. Gadre in IIT-Bombay.*

## EVENTS - PAST AND FORTHCOMING

**Pune Chapter** is organizing a series of four workshops on 'Operation and Maintenance of Instruments and Devices' during November 2005 and February 2006. The workshops on 'Clinical Laboratory Equipment and Cardiology Equipment' were conducted on 25th November and 10th December respectively. Imaging Systems will be dealt with in workshop on January 27th and General Purpose Medical Instruments will be covered on 17th February 2006. The workshops are organized in collaboration with IEEE Pune Subsection and IEEMA. Mailing of July and October issues of "engmednews" was done by Pune chapter.

## MASIP - 2006

### Manipal Chapter

A three day workshop on **Medical Applications of Signal and Image Processing** sponsored by BMESI is being organised by the Dept. of Biomedical Engineering, Manipal Institute of Technology during 23-25 January, 2006.

The participants will get an exposure to advance techniques & tools in signal and image processing. The workshop provides an opportunity for the research besides giving an insight into the development in the field of Signal and Image Processing.

The faculty includes - Dr. Rangaraj M. Rangayyan, University of Calgary, Calgary, Alberta, Canada, Dr. Ramesh R. Galigekere, Concordia University, Montreal, Canada, Dr. U.C.Niranjan, Manipal Institute of Technology (MIT), Manipal, Dr. M.S. Vidyasagar, Kasturba Medical College, Manipal, Dr. Ramkumar P.S, Intel Technology India Pvt. Ltd., Bangalore, Mr. S. Bhaskaran, Philips Medical Systems, Bangalore. Registration Fees - •UG/PG students - Rs 500/- •Faculty of Academic Institution / Research scholars

Rs - 1,000/- •Professionals Rs 2,000/-

DD / Cheques be drawn in favour of ' MIT, Manipal ' payable at Manipal / Udupi.

Please register before 11<sup>th</sup> January, 2006. Selection of participation will be communicated by 15<sup>th</sup> January, 2006.

For details communicate with

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## NCBME - 2006

Bharatiya Vidya Bhavan's Sardar Patel Institute of Technology is organizing a National Conference on Biomedical Engineering on 30<sup>th</sup> and 31<sup>st</sup> March, 2006.

The conference will provide a forum for researchers and academicians to present their contributions in the field of " Biomedical Engineering ". In addition to the paper presentation, the conference will have invited talks of eminent persons from engineering and medical fields.

Papers are invited on following topics •Medical Data Coding for Telemedicine •Telemedicine in India and its future •Prosthetics •Biomedical Instruments, Biosensors, BioMEMS •Biophysics of Signaling •Medical Imaging •Artificial Intelligence in Medical diagnosis (Soft Computing and Genetic Algorithms) •Lasers in Medicine •Safety of Electrical Equipment in Hospitals •Electrical Utilization in Hospitals •contributions from related fields are also welcome.

Contributions not exceeding six pages, typed on one side of A4 sheets in Times New Roman font of 12 point size as per IEEE double column format be sent by e-mail (soft copy in MS word format) and two hard copies to the Convener, NCBME-2006, on or before 20<sup>th</sup> January 2006. Acceptance will be communicated latest by 15<sup>th</sup> February, 2006. Papers accepted for presentation will be included in the conference proceedings.

Registration Fees : •Student Participants Rs. 700/- •Academicians and Researchers Rs. 1500/- •Delegates from Industries Rs. 2000/-

Contact Person : Dr. Mrs. N. K. Jog, Principal, Convener, NCBME-2006 Sardar Patel Institute of Technology, Munshi Nagar, Andheri ( West ), Mumbai – 400058.

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### BMESI Website

We are very happy to inform you that our website [www.bmesi.org.in](http://www.bmesi.org.in) has been launched. A sincere effort will be made to update the website. Esteemed members are requested to browse this site and solicit suggestions to improve the features.

On behalf of BMESI, I take this opportunity to thank Dr. G. Kulanthaivel ( L - 469 ) for all the efforts and Dr. A. G. Ramakrishnan, President for guidance to make this happen.

**Dr. G. K. Prabhu, Secretary**

## May their souls rest in peace

We are sorry to inform our members the sad demise of three of our members in the recent past.

### Dr. Gargi Vishnoi

Dr. Gargi Vishnoi, Faculty at School of Biomed. Engg. at IITB and then at IISc, will be remembered by her students, colleagues and also by BMESI members who were in contact with her. We have lost a dedicated researcher.

### Dr. Swamy Laxminarayan



Prof. Swamy Laxminarayan dedicated himself to the research in BME field in US but kept his roots in the country of origin. His academic contributions include 300 papers, 9 books, and 20 conference proceedings. His scientific contributions crossed the BME boundaries encompassing medicine, computational biology, genetics, communications, and information technology, image processing, telehealth, and network security.

Those who worked closely with him during the First BMESI-IEEE Regional Conference on Biomedical Engineering, New Delhi in 1995 were very fortunate in experiencing his organisational skills. This humble man served several professional societies including the IEEE's Engineering in Medicine and Biology Society (EMBS), Computer Society (CS), Society of Social Implications of Technology (SSIT), and others such as AAMI, AMIA, AIMBE, BMESI, and IFMBE. He had tremendous potential in scientific management and human related problems.

Dr Laxminarayan touched every person he came across in his life. He respected others and believed in giving rather than expecting any returns. An unconditional sense of devotion to the professional friends and acquaintances, Prof Swamy Laxminarayan had a positive attitude and dedication to reach the goals set for him. He was a reliable generous friend and virtually was an Indian Ambassador to US in BME.

The tribute to Swamy would be to take the direction from his life and move forward with a multiplying professional sincerity.

< sneha@cbme.iitd.ac.in > by Prof. Sneh Anand

### Elico's DVS Raju is no more.

The first Institutional Life Membership of BMESI was taken up by late Shri DVS Raju, Founder Managing Director of Elico Group of Cos., Hyderabad. He was associated with BMESI for more than 25 years and was very keen on BME activities in Instrumentation and Analytical fields. Born on 21<sup>st</sup> June 1928, he obtained PG Diploma in Electronics from MIT, Madras and in Radar Engineering from Marconi College, UK. Worked as Development Engineer at Furnzhill Laboratories UK and served as Research Officer at Central Water & Power Research Station, Pune. He started his own Industry 'Electronic & Industrial Instruments Company at Hyderabad in 1960. It was the first Electronic Industry in Andhra Pradesh. The same company got transformed into today's "Elico". Elico Group of companies made admirable contributions in Analytical Instrumentation under his stewardship. He was a fellow of IETE, and IE, Sr Member of IEEE, Life Member of Instru.Soc.of India, CSI, QCFI. He was honoured by various national and international professional organizations. He was the recipient of "Udyog Patra" award, Achiever of Century award, ISOI award, IEEE Third Millennium Medal award and many more honours. He made notable academic contributions by way of being a member of Academic Council of Kaktiya and Osmania Universities, REC Warangal, Univ. College for Women, Koti & IDEMI Mumbai. He held respectable positions in various professional bodies, educational institutions, and social organizations. As a strong supporter of indigenisation, we have lost a guiding member of our Society on 8th Dec. 2005.

< jramarao@yahoo.co.uk > by R.Jayaraman

*Your valuable suggestions for the newsletter are most welcome. Activity reports, articles, product reviews related to the field of BME are awaited from the members for inclusion in the newsletter.*

*Members are requested to sent e-mails to the editor to enable us to send you the e-version of engmednews.*

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Published by : Prof. G. K. Prabhu, Secretary, BMESI, Dept. of BME, MIT, Manipal - 576 104.