DEPARTMENT OF BIOMEDICAL ENGINEERING

SYNERGY

LEAVE NOTHING TO CHANCE.!

Synergy

FROM EDITORS' DESK

Good ideas start with brainstorming great ideas. Here, we the editorial team is presenting you , the quarterly journal of the DEPARTMENT OF BIOMEDICAL ENGINEERING for April– May– June 2018 with a comprehensive view of the happenings of our Department.

We're excited to share with you the recent accomplishments of our students. We highlight the successes of several learning platforms created, the triumphs of student teams in local and international competitions and several advancement in their project designs. We've also included a set of intriguing articles to take you into the astonishing world of BME. We're dedicating this issue to our students and faculty. Farewell to our seniors of 2014-2018 batch.

We welcome the budding biomedical engineers into the department to take a splendid journey of learning and progress.

Continuing with our themed issues, we present you the assemble of our article that provides of interest to our varied readership.

HIGHLIGHTS

EDITORIAL TEAM

CHIEF EDITOR-	Dr. A. KAVITHA, HOD/BME
FACULTY EDITORS-	Dr. S. ARUN KARTHICK ASSO.PROF/BME
	Ms. K. NIRMALA ASSI.PROF/BME
STUDENT EDITORS-	B APARNA IV YEAR, BME
	K PRIYADARSHINI IV YEAR, BME
CONTENT WRITERS	PREM ARAVINDAN J III YEAR, BME
	KAVYA V KANNAN III YEAR, BME
	ANANYA R III YEAR, BME
	VAISHALI III YEAR, BME
	BHUVANADEVI M III YEAR, BME

FROM HOD'S DESK

Dr. A. KAVITHA, HOD/BME

I feel elated once again to share my thoughts in the department's newsletter-SYNERGY. This volume brings out the campus updates and various events like workshops ,conferences and development programmes organised by the department during April 2018 to June 2018.My hearty congratulations and wishes to all the final year students who have been placed in various companies and to those who have got admits into universities both in abroad and in India for their higher education.

I extend a warm welcome to the second year students to the department and motivate them to use the facilities and resources to their best. I would like to thank all the faculty members for their extensive contribution to the department's laurels. Let's together rejoice and continue to raise the grandeur and glory of the department!

Campus Updates

Sir Timothy Berners-Lee visit

Sir Timothy Berners-Lee the founder of World Wide Web visited SSN Campus on 18th of May 2018.

Sir Timothy John Berners Lee, also known as Tim Berners Lee is an English Engineer and Computer Scientist. He is currently a professor of Computer Science at Oxford University and a Turing Award winner.

Tim Berners Lee is the Director of the World Wide Web Consortium (W3C) which oversees the continued development of the web. He is also the founding chair at the MIT Computer Science and Artificial Intelligence Laboratory (CSAIL).

During this talk, he spoke in brief about the history of World Wide Web and the future of Artifical Intelligence.

Sir Timothy Berners-Lee at SSN College Of Engineering

"Facebook, the social media platform initially allowed the users to like others post. And, now they have these expressions like sad, angry. These expressions make Facebook as a whole community... "

–Sir Timothy Berners-Lee

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SIH'18

In order to work towards our Prime Minister's vision, MHRD, All India Council for Technical Education (AICTE), Inter Institutional Inclusive Innovation Center (i4C), and Persistent Systems organized Smart India Hackathon 2018 which is the world's largest nation building digital initiative to harness the creativity of bright young students for the development of our nation.

This year's initiative, for the first time, launched hardware edition for which 68 problem statements on various themes received from 27 central ministries and 17 state govrnments were posted on my gov platform.

For these 68 problem statements, around 7500 ideas from 752+ technical institutes were submitted .Submitted ideas went through four rounds of selection.300 independent experts from industry and institutions participated in selection process. After initial selection of ideas, students were asked to build a working prototype which had undergone further scrutinisation by veterans in various fields and finally 106 teams ,each

consisting of six team members under 11 themes were selected for Smart India Hackathon Hardware Edition 2018 Grand Finale, conducted from 18th to 22nd July at 10 nodal centres all over India.

Three of 14 teams selected for SIHH-2018 Grand Finale under the theme "Hardware Medical Devices", held at Central Scientific Instruments Organisation, Chandigarh, were from our college, in which team illuminati was from Biomedical Department. Team Illuminati formed by Sreeja Prabakar, Ancy Carshia S, Arun Kumar K, Sucharitha S Prakash, Viswath Narayanan R, Swetha K.V proposed a project idea titled

"To put forward an early non invasive approach for diagnosis of Retinal Ischaemia".

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A few words from the participants..

SIH-2018 team with their mentors

Five days of technical hackathon held at CSIO Chandigarh gave us a lot of exposure regarding medical product development. We were assigned three mentors, Mr. Mohammed Pota, Technology mentor, Mr. Prakash Khanzonde, Design mentor and Mr. Yogesh Borhade, entrepreneur to guide us in various aspects during five days at Chandigarh. We gained a great experience by working long hours for five days in designing and developing a final medical product which would be introduced into the market. We had got a great opportunity to interact with scientists, technologists and entrepreneurs and got insights on what the exact demand is in the market, what already exists and how our idea could be converted into a final product which would be launched into the market. We learnt various steps involved in product development such as CADD modelling, PCB layout, Soldering, Networking, Mobile App Development, 3D printing, mass production and Rapid Prototyping by associating with our mentors.

There were three judging rounds before the final round where we presented our idea, need for our product in the market, our innovation, our each day work in developing our idea into a product, our future design model, further technology development, cost effectiveness of our model and business class model. Overall, it was a very educative and enjoyable journey!. We would also like to congratulate the winner and the runner up team from ECE and EEE department respectively.

Drexel signs a MoU on joint M.S.

A Memorandum of Understanding for a Master of Science Program in Biomedical Engineering between SSN college of Engineering, Chennai, India and Drexel University, Philadelphia, USA has been signed on May 21, 2018.

It has defined the details for M.S. degree in Biomedical Engineering, stating that competent M.S. students forwarded by SSN may be admitted to Drexel University. People pursuing this MS program will finish their I year at SSN college followed by another year at Drexel University.

Dr. A. Kavitha, Prof/HoD, BME is designated as Collaborating Project director and Dr. Andres Kriete as Dean for Academic Affairs, And Graduate program Director, and Dr. Sriram Balasubramanian, Associate Professor as Project Director for this program. Students interested in this program must demonstrate an excellent command of spoken and written English and must qualify IELTS in addition to TOEFL. A minimum of 90 in TOEFL score is expected.

This program makes SSN the first institutions to offer an international graduate Biomedical Engineering Degree program.

This is program creates an advantage for the students in India by creating an affordable and feasible M.S. in abroad. Courses for this M.S. include Medical science, Biosimulation, Biostatistics, Bio computing language, Tissue Engineering, Genome Engineering, etc. This program creates a great platform for students who desire to pursue their M.S. abroad.

THE HAMDAN AWARD WINNER-Dr.PRAVIN KUMAR

Dr. Pravin Kumar, has been felicitated with the Hamdan International Presentation Award for his paper titled

Dr. Pravin Kumar

"*Evaluation of Sharpness of Lateral Peaks of the Vocal Fold Vibrations in High-Speed Videokymographic Images*"

Congratulations, Dr. Pravin Kumar! The candidate for the award was selected by the Hamdan International Presentation Award Committee, chaired by Advisory Board Member Dr. Srivastava.Dr. Pravin presented his paper at the 47th Annual Symposium: Care of the Professional Voice on Thursday, May 31st at The Westin Philadelphia Hotel, Philadelphia .

The award was presented to him on 2nd June 2018 by the chief guest Mr. Robert Thayer Sataloff at The Westin Hotel.

We wish you all success in your future endeavors.

Department Updates

Ms. Vidusha's visit to Drexel University

DREXEL UNIVERSITY
School of
Biomedical Engineering, Science and Health Systems

Ms. S. Vidhusha, AP/IT and scholar of Dr. A. Kavitha visited the Drexel University, Philadelphia, United states on May 14th 2018. She had an opportunity to interact with Dr. Sriram Balasubramanian, Associate Professor, School of Biomedical Engineering, Science and Health Systems. Dr. Sriram is an expertise in the field of experimental biomechanics in the areas of pediatric head and neck injury, orthopedic biomechanics of the knee, thorax and spine, and knee biomechanics following ligament reconstructions. His research findings in these areas have tremendous potential to impact the current practices in pediatric orthopedics and automotive child safety, and also provide the data and methods needed to guide future innovations.

Ms. Vidhusha also had met Dr. Hualou Liang, Professor, School of Biomedical Engineering, Science and Health Systems and Dr. Hasan Ayaz, Associate Research Professor, School of Biomedical Engineering, Science and Health Systems, Drexel University to discuss about the prospective research collaboration opportunities between SSNCE and Drexel School of Biomedical Engineering. Prof. Liang's research focuses on Neuroengineering, Neuroinfomatics, Functional Brain Imaging, Cognitive and Computational Neuroscience, and Biomedical Signal Processing.

His lab explores neural mechanisms of visual perception during various cognitive tasks using computational approaches. Discussions on current ongoing research works in functional neuroimaging and neuroscience were presented and Prof. Liang was enthusiastic to collaborate in future research works. Dr. Hasan works at CONQUER Collaborative labs with his research interests including neuroengineering in human computer interaction and neuroergonomics, as well as clinical and field applications of optical brain imaging.

INTERNS FROM DREXEL UNIVERSITY

As a part of the Memorandum of Understanding between SSN College of Engineering and Drexel School of Biomedical Engineering, three undergraduate students have come to the Cognition and Bioengineering Lab of Dr. A. Kavitha Prof & Head, Department of Biomedical Engineering. Three projects were selected by the students of Drexel University during their STAR meet in April and they are working under Dr. Kavitha's guidance for a period of 10 weeks (June to August 2018). The students are Mr. Nadim Amin, who works on an **exoskeleton design project** mentored by Ms. R. Nithya, Asst. Prof., Department of BME, Ms. Ashley Bishop who works on a **speech imagery** project mentored by Ms. C. Sandhya and Ms. R. Ananda Sree, research scholars of Dr. Kavitha and Ms. Malena Farber who works on **Virtual reality environment for Autistic children** mentored by Ms. Vidhusha, Asst. Prof. Department of IT

DREXEL UNIVERSITY

Founded in 1891, Drexel University is located in Philadelphia, Pennsylvania, United States of America, and has many different majors, clubs, and opportunities available to students, such as STAR. STAR stands for Students Tackling Advanced Research. It is a program sponsored by Drexel University's Office of Undergraduate Research for freshman. Students can apply and be preliminarily accepted before they even come to Drexel, but most apply about half way through their 2nd term. Not everyone participates, and it's a selective process. Students have to write two essays, have a letter of recommendation from a faculty member, and maintain high grades. Of the hundreds that applied this year, only 135 were selected. Once selected, students have the option of looking for a faculty mentor to do research under in Philadelphia or applying to a secondary round for pre-selected international opportunities. This year, there were Environmental Science programs in Cuba, Chemistry programs in England, Public health programs in Southern Africa, Engineering programs in India (SSN and IIT-Madras), and a Dance program in Beijing. This program is made for students in every college/discipline at Drexel but the STEM fields make up the bulk of the opportunities. One of the key features of Drexel University that draws most students is their cooperative education program.

Most students are on a 5 year plan where the first year is just class, they have their first summer off (if they choose not to participate in STAR), followed by 3 years of working full time for 6 months alternating with going to school full time for 6 months, and then one final year of classes. This allows most students to not only learn on the job and build their resume but also graduate with 18 months of work experience, making them competitive applicants for future positions.

On the reasons Ashley Bishop chose to participate in iSTAR, she said, "I chose to participate in the international program because not only was it a rare opportunity for me to go abroad; I was also genuinely interested in the research with brain-computer interactions and speech imagery. I also specifically chose to study biomedical engineering for BCI's as well, so I also saw this as the perfect chance to gain meaningful exposure that I wouldn't otherwise receive by just taking a couple of courses in the subject."

Malena Farber comments that "I chose to come to SSN because I wanted both an engaging research experience and I love to travel. My project centers on teaching autistic children through a virtual reality environment. Back home, I used to volunteer with these kids a lot so I saw this as an opportunity to combine my previous volunteer work with my choice of study, Biomedical Engineering. I've been exposed to so many new things here besides EEG signal processing and truly value every new experience."

Nadim Amin says, "The STAR program only requests one's time and commitment. It offers far more in return: the opportunity to study abroad without the cost, the chance to enter high level research regardless of experience, and the ability to work in one's major before getting a degree. That is why I applied to the STAR program. SSN is where the research I am interested is in, so I followed the research. I truly believe that the future of medicine will largely involve robotics and how it can be applied to the human body. A hand exoskeleton seemed like a great project to enter that field of research through."

INTERNS FROM DREXEL UNIVERSITY

Malena Farber

Research work : To evaluate the efficacy of a virtual reality environment as a learning tool for kids with autism through the analysis of EEG signals.

When asked about her progress, she said, "So far, we've done extensive literature review on the subject, developed the VR environment, and taken signals from non-autistic children. Currently, we are teaching ourselves about signal processing and next week, we will hopefully be going to teach the autistic children with the platform and collect signals from them as well. Along the way, I've been working with my two peer mentors Yaamini and Viswath as well as my faculty mentor, Ms. Vidhusha. Overall, they've all been very kind, helpful, and a pleasure to work with. "

"They've all been very kind, helpful, and a pleasure to work with."

-Malena

Ashley Bishop

Research work : The work focuses on the concept of speech imagery, the idea of imagining speech and letters in one's brain without physical vocalization, and the classification of the vowel phonemes and 'E-set' consonant phonemes by recording and processing EEG signals. Currently, the project is still in the phase of taking recordings from subjects, and efforts are being made in developing a program for the pre-processing and feature extraction of the EEG signals.

So far her role in the project has included spending the first few weeks here studying and analyzing related literature of past experiments and assisting in recording the EEG signals. Besides current involvement in recording, She is also in the process of designing a program to filter, process, and extract the necessary features from their signals that will help best classify and identify the letters from the data.

"As my first time being abroad overseas, my experience in India and with the research has been remarkably astonishing. I personally find the work I'm doing to be amazing and immensely intriguing"

-Ashley

Amin Nadim

Research work: To create a hand exoskeleton for sufferers of hand paralysis. Their team aims to create a device that attaches to the dorsal side of the hand, leaving the palm free and open, that can assist users in the opening and closing of their fingers. This sort of exoskeleton can not only assist in daily life, but serves a physical rehabilitation function. Over time, usage will lead to the progressive regain of motor control in the hand.

In so far, they have designed the exoskeleton in CAD, and have begun testing for effective sEMG signal acquisition. sEMG signals are produced when muscles tense. They hope to use these signals as control inputs for the exoskeleton, so that users are able open and close their hands as if the device was not present.

"The experience so far has been fantastic. Since I only speak English, there is a communication barrier, but the students and professor I have been working with have been accommodating and understanding enough to overcome it. Ms. Nithya had selected three intelligent, diligent, and friendly fourth year students, Naresh, Nissy, and Jerome, to work with me on the project. I look forward to assisting this project as much as possible before the end of my research program." he said.

"The experience so far has been fantastic. I look forward to assisting this project as much as possible before the end of my research program."

-Amin Nadim

PLACEMENT TRAINING

A six day training program for the final year students of BME was conducted at the Department of BME. The students were given hands on training and demonstration on various medical devices. This training aimed at bridging the gap between Education and Industry. They were taught about the debugging techniques for various medical devices, thus providing a practical approach to deal with the current issues in the Biomedical industry.

DAY-1

Vital sign monitor

A talk on vital sign monitor covering the three major category of the VSM was given, namely

- Low end parameter monitor (LEP) for measuring ECG ,SPo_2, BP, Temperature.
- Medium end parameter monitor (MEP) for measuring LEP, IBP, $ETCO_2$.
- High end parameter monitor (MEP) for measuring MEP, CO, glucose, Hemodynamic.

DAY-2

ECG recorder

This session covered the various problem associated with the ECG recorders namely better gel clearance and multimeter continuity checking. The working demo of the ECG recorder was also shown.

Endoscopy

Endoscopy was explained. It was dismantled and the types such as flexible, rigid, etc were kept for display. It's application with component level explanation was given.

DAY-3

Alen Diathermy machine

Demo of two major modes of diathermy such as monopolar and bipolar configuration was given. Various modes of operation- High spray mode, low - High - Auto desiccate mode, Fulguration, Soft - Auto soft mode was included in the demo.

PLACEMENT TRAINING

Bed head panel

The parts of a bed head panel were explained. Bed head panel system included a panel wall mounted over the bed containing major parts for Multi -functional equipment such as ventilator, flow meter, vacuum pump and Plug-in for other devices as well.

DAY-4

Trans health care company - Ventilator

Various generation of ventilators were explained right from Iron lung, Servo 900, till the current version Servo I (2001). The operation and major activities were described in detail, with other measurable parameters like SPo2, IBP, NIBP. A brief overview of all the previous days' training was offered.

DAY-5

Ultrasound Imaging System

Basic imaging modulations such as Grey - scale, Colour types were explained along with the ultrasound piezo electrical crystal properties and specifications. Various types of probes were kept for display namely linear, phase array probe, Trans-vaginal and endo-rectum and numerous applications were discussed. Stomach activities were shown through live mode of ultrasound scan B. Other modes such as A and M modes were also presented.

DAY-6

Surgical equipment and Laparoscopy

High quality surgical equipment needles, Knife were shown with few examples of application such as urology, surgical oncology and other surgical processes. Rigid type laparoscopy scopes were kept for display with the following packs of camera head, CCD and CMOS. Lecture on surgical preparation before a laparoscopic process was delivered. Finally the day ended with a demo of the laparoscopy equipment.

PLACEMENT TRAINING

Date	Equipment	Make	Model	Demonstration
18-Jun-18	Multiparameter Monitor	Nihon Kohden	Vismo PVM 2703	MM Medical Systems
	Syringe Infusion Pump	Smiths Medical	Graseby 2000	
19-Jun-18	Defibrillator	Schiller	Defigard 400	Synergy Bio-med Services
	Ventilator	Carefusion	Vela	Trans Health-care
20-Jun-18	Electrosurgial Unit	Alan	ELSY 360LPlus	JBS Mediitec
	ECG	Bionet	Cardiocare2000 Plus	JK Medical Systems
21-Jun-18	Ultrasonograph	Sonoray	DS-100 Plus	Ultraserve Systems
	Endoscope	Pentax/ Olympus		Renmed

The demonstration of Ultrasonography

Training on Ultrasonography

Demonstration of ECG acquisition

Training on ECG

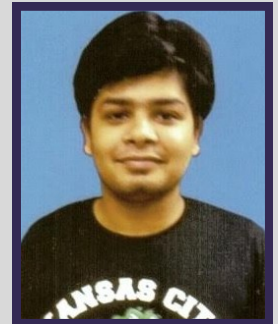# ANNA UNIVERSITY RANK HOLDERS

Sushmitha S

Rank 2

Tanushree Devi B

Rank 4

Atul Taneja

Rank 5

Vishnu Priya K

M.E Rank 1

Abirama R

Rank 10

Vishal S B

Rank 28

Madhumitra S K

Rank 28

Lavanya Krishna

Rank 24

Keerthana M

Rank 30

Monica A

Rank 35

STUDENT INTERNSHIP

Students from the Department of BME , to enhance their research aptitude and indulge in current research activities had done internships at various colleges and research centres during the months of April to June.

Janani Aishwarya Aiyer

IV Year, BME

This summer, I was offered an internship at the University of California at Davis. I worked in the field of Computed Tomographic Imaging at the UC Davis Medical Centre (UCDMC). I worked at the breast CT lab of the Department of Radiology under the guidance of Dr. John M. Boone. The main objective of this research venture is to develop an alternate modality to the widely used mammography. Mammography, though convenient, has a number of disadvantages which breast CT aims to overcome through their unique 3D imaging. The current scanner used at Boone Lab was constructed from nut and bolt and has now successfully scanned hundreds of patients . The main aim of my research was to overcome a disadvantage associated with breast CT scanners, which is the detection of micro-calcifications. Using various Image Processing techniques. During my time at Boone Lab, I learned a lot about breast cancer therapy, the different modalities of breast imaging, image processing and so much more!

Sucharitha S Prakash

IV Year, BME

I underwent a two month Summer Research Fellowship Programme in neuroscience department under the guidance of Dr. James P. C. Chelliah at Jawaharlal Nehru Center for Advanced Scientific Research (JNCASR), Bangalore. I worked along with the PhD students in the lab with their projects related to neurodegenerative diseases such as Huntington and alzheimers disease. The model organism they were working on was mice. So they trained me in animal maintenance and mice brain dissection. I was trained to scruff and sacrifice the animal, dissect its brain and separate different regions of the brain. I was given an opportunity to explore and work on all the projects that were going on in the lab. I learnt various molecular biology techniques such as genotyping, DNA Isolation, primer designing, polymerase chain reaction (pcr) and western blotting. I also worked on computational aspects involving image processing for analysis of mice behavior. This two month internship over there gave me great experience and a glimpse about research works

STUDENT INTERNSHIP

Aparna B

IV Year, BME

Breast cancer is a widespread deadly disease and it is essential that localized treatment is carried out in order to protect the surrounding healthy tissues from destruction. In order to test for the success of any treatment or visualization of the patient breasts, 3D modeling plays a very vital role.

I worked at Engineering Design Department at IIT Madras under the guidance of Dr. Kavitha Arunachalam .The task I was given at my internship programme was to develop Anatomically realistic 3D Breast models using MR Images for hyperthermia treatment planning for breast cancer. The work involved performing Segmentation of MR images of the breast.

The models would be used in a simulation environment to evaluate the performance and accuracy of the treatment before actually treating the patient.

Harshni.V

IV Year, BME

I underwent an industrial training program at Siemens Healthcare Technologies, Goa. The training lasted for 3 weeks and during that period, I learnt about the various x-ray and fluoroscopy machines that they manufacture in the plant. They have 2 stationary x-ray units that can deliver up to 32kW power and 3 mobile units with a rotating C arm, mostly used for live image capture of organs/bones during surgeries, done with the help of fluoroscopy technique. I was in three departments during my training period – production, research and development and repairs. In the production department, I was thought how to assemble and test new products. It included the calibration of the unit to match the desired values. In the research department, I learnt about all the parameters that have to be taken into consideration for the machine to work and improvisations in current circuits was done. In the repairs department. I also learnt about the various safety codes and standards to be followed inside a plant and safety measures taken to protect people from radiation exposure. It was a valuable experience and gave me a first-hand idea about the work experience in a manufacturing plant.

Faculty Activtites

Project Proposal

- Dr.A.Kavitha Prof & HoD/BME and Dr.S.Bagyaraj Asso.Prof/BME presented project proposal titled "Design and development of Biosignal control hand Exoskeleton" at DEBEL, Bengaluru on 4th April 2018.

- Dr. L. Suganthi Asso.Prof/BME and Dr. J. Vijay Asso.Prof/BME discussed the project proposal titled "Non-invasive cardiac measurement for armed soldiers" with Mr. S. N. Karthick, Scientist, DEBEL, DRDO at IIT Madras on 25th May 2018.

Discussion for MoU

- Dr. J. Vijay Asso.Prof/BME has met Mr. Sankara Narayanan, Deputy Registrar. NIEPMD to discuss signing of MoU between SSN and NIEPMD on 11 June 2018

- Dr. J. Vijay Asso.Prof/BME has attended Andhra Health Festival at Vizag and also met Shri Nitin Bharadwaj, Director, Andhra Med Tech Zone (AMTZ) to initiate collaborative research work and MoU on 18, June2018.

Journal Publications

- Vishnu Priya K, Kavitha A, "Investigations on the Brain Connectivity Parameters for Co-morbidities of Autism Using EEG", International Journal of Software Science and Computational Intelligence, 10, 50-64, April 2018

- Mallampalli Kapardi, Kavitha A, "Functional Connectivity Assessment for Episodic Memory by Decoding Theta Wave", International Journal of Cognitive Informatics and Natural Intelligence, 12, 17-31, April 2018.

Journal Publications

- Menon S., Geethanjali B., Guhan Seshadri N.P., Muthumeenakshi S., Nair S. (2018) Evaluating the Induced Emotions on Physiological Response. In: Nandi A., Sujatha N., Menaka R., Alex J. (eds) Computational Signal Processing and Analysis. Lecture Notes in Electrical Engineering, vol 490. pp 211-220 ,Springer, Singapore
- Sugirtha K.P.S.G., Dhanalakshmi M. (2018) Transliteration of Braille Code into Text in English Language. In: Nandi A., Sujatha N., Menaka R., Alex J. (eds) Computational Signal Processing and Analysis. Lecture Notes in Electrical Engineering, vol 490. pp 373-381,Springer, Singapore
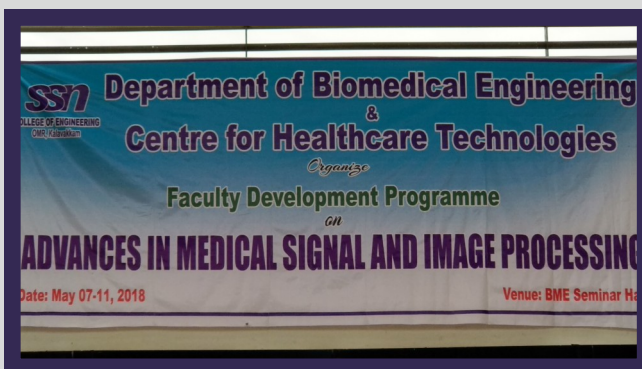
Paper Presentation– International Conference

- Karthiga Nagaraj and Vijay Jeyakumar presented a paper titled "A Study on Comparative Analysis of Automated and Semiautomated Segmentation Techniques on Knee Osteoarthritis X-Ray radiographs" in Springer International Conference on ISMAC in Computational Vision and BioEngineering, Coimbatore on 17th May 2018.
- Heima A. J., Arun Karthick S. and Suganthi L. presented a paper titled "Detection of sleep apnea based on HRV analysis of ECG signal" in Springer International Conference on ISMAC in Computational Vision and Bio-Engineering, Coimbatore on 17th May 2018.
- Geetha S, Divya B, Nirmala K Presented a paper titled " DETECTION OF ABDOMINAL AND MEDIASTINAL LYMPH NODES USING CT IMAGES " in 2018 3rd IEEE International Conference on Recent Trends in Electronics, Information & Communication Technology (RTEICT-2018), at Sri Venkateshwara College of Engineering, Bengaluru, India from 18th to 19th May 2018.
- Anuradha Lakshmanan, Gayathri Devi.S, Meena Nisha.M, Dhanalakshmi. M presented a paper titled "Outdoor Obstacle Detection Module To Assist Visually Challenged" in Springer International Conference on Communication, Devices and Networking (ICCDN 2018), Sikkim from 2nd to 3rd June 2018.

Faculty development programme

ORGANISED

- Dr. J. Vijay Asso.Prof/BME and Ms. K. Nirmala AP/BME organized Five Day Faculty Development programme from 7th May to 11th May 2018 on "Advances in Medical Signal and Image Processing" at BME seminar Hall, SSNCE.

ATTENDED

- Dr. J. Vijay Asso.Prof/BME has participated in Faculty Development Programme on AutoDesk Fusion 360 at IIT Madras during 13-15, June 2018.

Other Activities

♦ **Dr. J. Vijay Asso.Prof/BME** has reviewed a manuscript titled ""A medical image enhancement algorithm based on the combination of PLIP and adaptive nonlinear gain in NSST domain," submitted to the Journal of Medical Imaging and Health Informatics.

♦ **Dr. J. Vijay Asso.Prof/BME** has reviewed a manuscript titled "Cybertherapogy"", International Journal of E-Health and Medical Communications (IJEHMC), IGI global publisher.

♦ **Dr. S. Bagyaraj, Asso.Prof/BME** visited Department of Biomedical Engineering, North East Hill University Shillong as Examiner on 9th June 2018 to conduct Project Work Vivavoce examination and also had discussion in possible Research and Development activities.

Dr. S. Bhagyaraj, Asso. Prof /BME, SSN and Dr. Dinesh Bhatia, Asso/ BME dept, North east Hill University

Smart India Hackathon

♦ **Dr. S. Bagyaraj, Asso.Prof/BME** participated in Smart India Hackathon - Hardware (SIH 2018) as an academic mentor for Illuminati team from Department of Biomedical Engineering held at CSIR-CSIO Chandigarh. The Illuminati team with Ms. Sreeja Prabhakar (Final year BME) as lead member presented project titled "An early non-invasive diagnostic approach for retinal ischemia" at SIH conducted during 18th– 22nd , June

♦ **Dr. L. Suganthi Asso.Prof/BME** mentored six EEE students (Tech EEE1 team) who won First runner-up with cash prize of Rs.75,000 in Smart India Hackathon 2018 hardware edition

Dr. L. Suganthi with her mentees

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Articles

Electronic Aspirin - A phenomenal invention

Headaches are one of the most common discomforts, ranking in the top 20 causes of disability worldwide. They have always been associated with a facial nerve bundle, called the sphenopalatine ganglion(SPG), but there was little to no knowledge on manipulating the SPG as a method for a lasting headache treatment.

Popping pills has been the quickest way of suppressing headaches, but recently, the Autonomic Technologies, California came up with an extraordinary technology to tackle frequent headaches. This innovation allows the patient to minimise and nullify their headaches using a remote control.

How does this work? The Electronic Aspirin technology involves a permanent implant of a device in the upper gum area, above the second molar, on the side the patient most frequently feels pain during headaches. It is placed behind the nasal passage since the SPG is outside the brain. The lead tip from here is linked to the SPG bundle of nerves, which can be triggered to relieve pain. When the patient experiences a headache, all they need to do is to press the hand-held remote to the cheek area closest to the implant. When they do this, a radio signal is transmitted to the implanted device, and an electrical charge of small magnitude stimulates the SPG nerves. This stimulation has the SPG blocking the pain signal that is being sent out. SPG blockade is the fundamental idea involved in Electronic Aspirin.

ATI Neurostimulator from Autonomic Technologies

implant procedure is minimally invasive and is very simple, and the implant is only about the size of an almond.

Remote from Autonomic Technologies

Fortunately, the device has no health-related restrictions and can be implanted into people with allergies or other disorders like high blood pressure and heart diseases. But, they should be careful with the intake of analgesics and the like, as side-effects like an increase in blood pressure, weight gain and allergies may develop.

Clinical studies show that 68% of the patients using this technology experienced significant improvement. Weekly average headaches were reduced by a good 31%. In fact, for more than two-thirds of the patients, their headache disorders resolved within three months. This has led to an outstanding betterment in the quality of life of these patients.

This device is currently undergoing clinical investigation. This innovative design could ease the lives of so many out there and enhance people's lifestyles by becoming a permanent solution for headaches.

Hybrid Closed-Loop Insulin Delivery System for the Treatment of Type 1 Diabetes

ISSUE

In people with type 1 diabetes, the pancreas either does not produce any insulin, or it does not produce enough insulin. People with type 1 diabetes need to take insulin daily to maintain blood glucose — or blood sugar — levels within the target range. They must frequently check glucose levels using a finger-stick test or a continuous glucose monitor and then determine the correct insulin dose to administer. Taking too much insulin can lead to hypoglycemia, or low blood sugar — a particular risk when this occurs overnight. Taking too little insulin can lead to hyperglycemia, or high blood sugar, and diabetic ketoacidosis — a build-up of chemicals called ketones that are produced when the body uses fat instead of sugar to make energy.These conditions, as well as high and low swings in blood glucose levels, are associated with increased morbidity and mortality.

Wearable systems are available for the continuous management of type 1 diabetes. These systems are intended to control blood glucose during particularly challenging times, such as overnight, at meal times, and when exercising.

Automating the delivery of insulin in wearable systems combines three functions:

- continuous glucose monitoring

- insulin delivery via a pump

- control of insulin using specific algorithms (a set of rules used by a computer program to make calculations).

The continuous glucose monitor sends glucose values to the insulin pump, and an algorithm determines the amount of insulin needed based on the sensor values and the amount of active insulin in the individual.Integrating these three functions creates a closed-loop system, without any intervention from the user — in other words, an artificial pancreas.In contrast, a hybrid closed-loop system still needs user interventions (for example, fast-acting bolus insulin doses taken at meal times).

THE TECHNOLOGY

The MiniMed 670G is a hybrid, closed-loop, insulin delivery system made up of various components that perform different functions:

The Guardian Sensor, which is inserted under the skin using a small insertion device and taped in place for a single-use, seven-day period. It measures glucose levels in the fluid surrounding the cells below the skin (interstitial fluid). The sensor does not replace finger-stick tests for determining insulin requirements for meals and activities. It also requires a minimum of two finger-stick calibrations against the system's glucose metre every day; four calibrations are recommended.

The CONTOUR NEXT LINK 2.4 glucose metre, with test strips, for finger-prick capillary blood sampling to calibrate the system. Glucose values are automatically transmitted to the insulin pump.

The MiniMed 670G insulin pump — a waterproof, battery-operated, rate-programmable, micro-infusion pump that delivers insulin from a reservoir.

The Guardian Link Transmitter, in conjunction with the glucose sensor, which collects and wirelessly transmits interstitial glucose values to the insulin pump. The MiniMed 670G system can store up to 90 days of pump and glucose sensor data.

The system can be used in either automatic or manual mode, but in both modes the user must manually enter the estimated carbohydrates to be consumed at meals and accept mealtime insulin boluses suggested by the system. In automatic mode, the system uses an algorithm to automatically adjust basal insulin (insulin that keeps your blood sugar stable between meals or during sleep) delivery in response to fluctuations in interstitial glucose levels. In manual mode, the user can set the pump to suspend activity at or before low glucose values. Insulin delivery will automatically suspend activity when the glucose level drops or is predicted to drop to a selected threshold (e.g., low blood glucose in the 2.8 mmol/L to 5.0 mmol/L

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range). Remote transmission of data from the system and monitoring via telemedicine is possible.

AVAILABILITY

The MiniMed 670G system is not yet licensed by Health Canada, but has received approval in

In the US, the MiniMed 670G system received FDA approval in September 2016

In Canada, although the purchase costs of the system are not yet known, Medtronic estimates that the annual operating costs will be in the C$8,500 to C$9,500 range, excluding the cost of insulin, and will be comparable to the operating costs of existing insulin pump technologies with continuous glucose monitoring.

WHO MIGHT BENEFIT?

Currently, the MiniMed 670G is intended for use by people older than 14 who have type 1 diabetes and require at least eight units of insulin daily. At this time, it is not intended for use by children under the age of seven because they usually require less than this amount of insulin. However, there are efforts underway in the US to expand the age range to children younger than 14 years of age. People with significant nocturnal hypoglycemia, or hypoglycemia unawareness, could particularly benefit from this type of technology. Because the system requires finger-stick tests for calibration, and before meals and activities, it is not suitable for patients unwilling or unable to do frequent finger-stick glucose measurements.

CURRENT PRACTICE

The Diabetes Control and Complications Trial (1983 to 1993) revolutionized the treatment of type 1 diabetes by showing that intensive glycemic control,

beginning as soon as possible after diagnosis, prevents or delays diabetes-related complications of the eyes, kidneys, and nerves. A large, more recent study found that higher average blood glucose levels and increased proteinuria, which is abnormally high levels of protein in the urine, were major risk factors for death, demonstrating how important glycemic control is for contributing to longer and healthier lives for people with type 1 diabetes.

The current approach to managing diabetes is for a multidisciplinary team, using a patient-centred approach, to set glycemic targets according to individual circumstances (e.g., diet, age, weight, hypoglycemia awareness

SAFETY

status, ability for self-management, patient preferences), and to offer structured educational programs to promote patient empowerment. Long-acting and ultra-long-acting insulins can be combined with rapid-acting insulins to provide effective basal bolus therapy to reflect physiological insulin secretion.

According to the FDA safety summary, two potential device-related serious

COST-EFFECTIVENESS

adverse events are: diabetic ketoacidosis from high blood glucose due to inadequate or suspended insulin delivery, and severe hypoglycemia from over-delivery of insulin. Potential device-related, non-serious events include: skin irritation or redness, infection, pain or discomfort, bruising, swelling, rash, bleeding, induration (hardening) of the skin, and allergic reactions to the skin adhesives.

A recent cost-effectiveness analysis performed from a UK National Health Service perspective, used technologies that combined sensor-augmented insulin pump therapy with continuous glucose monitoring (referred to as "the newer paradigm") compared with insulin pump therapy with patient

self-monitoring. Results showed the newer paradigm was associated with higher average quality-adjusted life expectancy (18 quality-adjusted life-years versus 15 quality-adjusted life-years), and higher life expectancy (24 years versus 22 years). But there were also higher average lifetime direct costs equivalent to C$206,000 versus C$145,000, leading to an incremental cost-effectiveness ratio equivalent to C$20,000 per quality-adjusted life-year gained (all figures rounded).

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AN ARTICLE ON THE FUTURE OF HEALTHINEERS

The Earth's energy sources are draining day by day, so as the human's. Reviving the Earth with its own sources is impossible, so the humans decided to revive themselves; there arose the beginning of Healthcare Division. It is basically where a human help a human, which is a rare event that is happening all over the earth. But, how come it'll be a helping service, if the currency is running on its nerves. Several other industries shared a great importance in the International Market. When people realised that no such industry will exist if the human become extinct or go into a short of supply for the respective works for the so called development of their own kind. Now, in parallel, the milestone for healthcare industry was set by discovery of many devices in late 60's for diagnosing, treating and preventing the human diseases. The Doctors still play the major role because they do the diagnosing part which is personified with the Earth's core for its working. Here comes the part of the engineers who design machines or devices which take part in diagnosing too. The baseline to save a person's life solely depends on the machine that he creates. So, the spectrum of healthcare has many fields pinned inside it. This article briefs you all about that in the forthcoming heads.

LANDSCAPE:

The landscape of the future of Healthineers is widening in a great rate. It is becoming one of the largest economic drivers of the country with increased revenue generation and man power. According to the data, healthcare market is about to grow 3 times the current value by 2022. The landscape of this industry totally depends on the satisfaction of the patient or user which brings in the development of necessarily cost effective, non-invasive, patient-doctor friendly, renewable and updatable devices.In the recent years, many entrepreneurs came out and showed their heads out fighting the country's reliability on import devices. In India, people are far more talented than people of other countries, but opportunity is never given in the name of influence. Facing all those challenges, many successful entrepreneurs showed up; like, Trivitron Healthcare, India Medtronic etc., which have developed products with recent technologies that meet the needs of the patients and the needs of the physicians with simpler and quicker procedures.

DELIVERY:

As the landscape is widening at a great rate, the way of delivering should be organised and emphasized in an ordered way. The three D's – Doctor, Drugs, Devices has brought an advancement of technology and increasing sophistication of delivering medical devices, which brought down the incidence of disease and improvising the overall healthcare system across the globe. The third 'D'-devices, being third, doesn't make it less important. The devices are the core sector of the healthcare industry being developed by the professional of the respective, which delivers an apparatus for monitoring or treatment of any disease in human body.

The medical technology has evolved by leaps and bounds by providing a perfect thrust for treatment and surgical process with advanced technologies which in turn helps the Doctors to be more precise and accurate. Development of Diagnostic equipments from visual representation to viewing of internal analytics of the body with connected care, digitisation of the record and indigenous innovation not only in diagnosing but also in treatment by advanced medical technologies are the appetising aspects that have the potential to push boundaries of healthcare in India.

GROWTH:

Medical Devices Industry is highly innovative and technology driven constantly changing the face of healthcare in the areas of diagnosis and treatment and delivery. The Per Capita spending on healthcare in India is significantly lower than China or Russia or USA. The Indian Healthcare system is inadequate, insufficient and unevenly distributed mostly focussing the urban areas. As the rate of Non Communicable Diseases in urban areas is at a higher rate, most of the heads turn towards the urban areas than the rural parts. . Most of the rural people travel a long distance to take treatment from urban hospitals, which reduces the probability of survival in case of mortality conditions. The Government can concentrate providing sufficient devices and augment the healthcare awareness among the rural people so that they can also be fed with the ripening techs of the medical world.

The growth is purely based on the up-gradation of technology. Techs such as virtual reality and augmented reality can be used to simulate real time healthcare environment to provide training of physicians, technicians and doctors thus eliminating the vague real time experience. The important ingredients for the growth of health industry are IoT, cloud computing, mobile services.

IoT – the milestone of the technical world, Internet of Things has made a great influence over almost all industries in the world. A good example can be said that, the monitoring of a mother who is in a labour ward from outside the operation theatre is only because of the development of IoT. It has made and is making an ease for development in all industries and mainly the medical devices industry. Using IoT, robots are made with Artificial Intelligence which help the doctors to pursue a precise surgery on the patients, which is the most recent invention of a healthineer.

Cloud Computing – the cloud computing technology was developed with the help of IoT, which is basically a digital Record note. This method helps the organisation (i.e.) the Hospitals to maintain a record of the visiting frequency of patients and the details of their purpose of visit. It makes the job very easy and reliable, so that any data can be shared over any distance with respect to the convenience of the patient. The doctors no need to carry a file each for a patient to analyse the previous records before undertaking any surgery of the respective, it can just be a handy, portable digital device like a tablet or a laptop or a mobile phone. Thus cloud computing has a good percentage in the growth of the healthcare industry.

Mobile Services – the service is mobile so as the name. Meaning, the patient don't have to travel a long distance to the hospitals for their check up or any diagnosis; a van or a pod will be sent to their location for the respective procedures. As said, most of the rural areas are not concentrated by the industry; many entrepreneurship companies took initiative to provide such service to their kind of their own cities.

Thus the growth is based on the satisfaction of the patient over the service that is being provided. Being a human, getting satisfied with what we are provided is like doing injustice to the mankind; we expect more, that is being human; so, as our expectation never stops, the growth also is not going to stop as the gross income of any industry depends on the satisfaction of the consuming people.

Apart from the technical growth, a commercial growth is also needed which should be provided by the Government. Most of the devices are imported which descends the rate of growth in our country. Majority of the impressive devices indigenously developed are lurking on the sidelines for lack of market maturity and adoption pathways.

The lack of compliance standards and coherent policy framework are jeopardising the growth is this device industry. The Government is trying to overcome this situation by inducing a policy called "Make in India", which may bring out the pseudo manufacturing industries in the country, but the importing standards of economy which is providing the country with more tax and recruitments is lurking out as an obstacle for the Government to concentrate on such developmental policies like 'Make in India'.
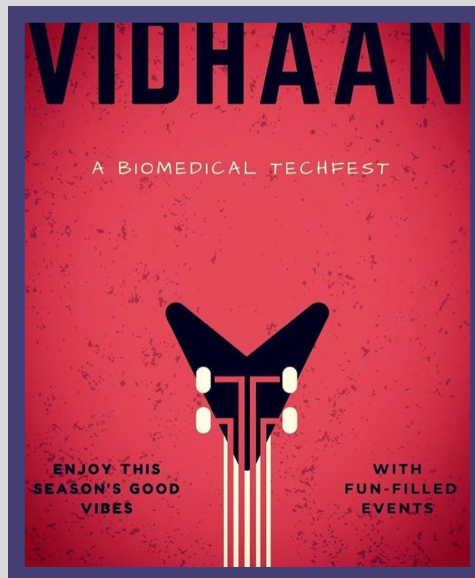
Everything has its own boon and bane sides, it's up to the Government and the people to bring out the flourishing field into at least the binoculars of other countries like US, Japan, china, Russia etc., while they are very much developed that they are visible even from a distance of 2000kms.

THE FUTURE:

It cannot be considered as a conclusion of this article because there isn't going to be an end to this prosperous and caring field. And which is one of the field which is favourable for the people or at least not giving harm to anyone or anything. Serving a field which is thriving at its best to sustain the livelihood of the most superior living kind is a great honour. The Future is literally in the hands of the most sparking, resourceful and restless minds of the young upcoming Healthineers who are called by their industry as the "*BIOMEDICAL ENGINEERS*".

UPCOMING EVENTS

Vidhaan'18— BME Technical Event

Seminar– Medical Textiles For Healthcare

DEPARTMENT OF BIOMEDICAL ENGINEERING

Organizes

One Day Seminar

on

Medical Textiles for Healthcare

– The Promising Future

31 August 2018

Co-ordinators

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