BME CON 2013

The 6th Biomedical Engineering International Conference

BMEiCON 2013

October 23-25, 2013

Krabi, Thailand

IEEJ

IEEE Thailand Chapter EMB

Prince of Songkla University

BMEiCON-2013

The 6th Biomedical Engineering International Conference
23-24-25 October 2013
Krabi, Thailand

Sponsor: Patrons:

BMEiCON-2013

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Welcome Address by General Chair

It is my great pleasure to welcome you all, in the southern region of Thailand to the official opening of the 6th Biomedical Engineering International Conference.

This is an international annual conference series organized by Thai Biomedical Engineering Research Societies (ThaiBME) in cooperation with IEEJ Biomedical Engineering Japan Section that will foster the growth of biomedical engineering education and research collaborations. The BMEiCON is intended to provide an international forum where researchers, practitioners, and professionals interested in the advances and applications of biomedical engineering can exchange the latest research, results, and ideas in these areas through presentation and discussion.

This event is the culmination of an enormous collective effort which began in 2012 when Chiang Mai, Thailand was selected as the site of this 4th meeting. From that moment, many institutions and individuals from around the world was contributing in the conference. I would like to take this opportunity to express my appreciation to every person who involved in this conference including all organizing committees especially Dr. Adisorn Leelasantitham , BMEiCON 2013 publication chair, Dr. Surapong Chatpun , BMEiCON2013 secretary and Piyamas Suapeng , BMEiCON 2013 financial chairs.

In recent years, we witnessed a significant increase of the research in biomedical engineering among the developed country. For Asia region, we are at the very first start of a research in this multidisciplinary field. Even so, we still have a long way to go, to be a leading in biomedical engineering research production, joining an academic conference will be able to reach our fundamental goal.

Distinguished visitors, let me express, in the name of the Local Organizing Committee, our most sincere wish that the presentations and the discussions resulting from this couple days to come will positively contribute to the consolidation of the aims of the conference.

And we truly hope to see you all again in BMEiCON 2014 at Fukuoka, JAPAN, next year.

Thank you

Chuchart Pintavirooj
King Mongkut's Institute of
Technology Ladkrabang (KMITL)
Thailand

Welcome from the Technical Program Chair

On behalf of the Technical Program Committee, it is my pleasure to welcome you to an exciting technical program offered by the 6th Biomedical Engineering International Conference, BMEiCON 2013.

The technical program of BMEiCON 2013 consists of paper presentations, and keynote speeches addressing emerging in biomedical engineering and latest research.

This year's technical program starts on Wednesday, October 23, 2013, with two keynote speeches, six technical sessions in Biomedical Imaging, Biomedical signals, Biomedical instrument, Biomechanics and robotic, Biosensors and Healthcare Information System.

The day will conclude with a keynote speech by
Professor Dr.Kagayaki Kuroda, Department of Human and Information Sciences, School of Information Science and Technology, Tokai University, Tokyo, Japan. And Professor Dr.Michael Gelinsky, Joint and Soft Tissue Research, Medical Faculty and University Hospital of Dresden University of Technology, Dresden, Germany after the welcome reception.

On Thursday, October 23, 2013 the conference begins with an opening keynote by
Associate Professor Dr. Brad Reisfeld, Chemical and Biological Engineering, Colorado State University, Fort Collins, United States. And Associate Professor Dr. Masaki Sekino, Department of Electrical Engineering and Information Systems, Graduate School of Engineering, The University of Tokyo, Tokyo, Japan. And ends with seven technical sessions including Biomedical Imaging, Biomedical signals, Neural and rehabilitation engineering, Physiological Modeling, Cellular and Tissue Engineering, Cardiovascular and respiratory systems engineering and recent advancements in biomedical engineering.

In the evening of October 23rd, the winners of the Best Paper Award will also be announced at the banquet. As well as the introduction of BMEiCON 2014 by the host from Kyushu Unviersity, Japan.

Throughout the last days of the conference will be a research networking event providing opportunity for students who want to seek a higher degree scholarship from professors in many countries and for researchers who want to make a connection in their research field surrounding by a breath-taking scenic view with friendly environment.

This year, we received a total of over 121 regular submissions from 17 countries and 4 invited papers. Over 44 technical experts from all over the world participated in the peer review process. Based on the review results, the technical program committee accepted 102 general conference papers for presentation and publication. The accepting rate for BMEiCON 2013 is 84.30 percent. We would like to extend our deepest appreciation to the keynote speakers, technical sessions' organizers, panel organizers and panelists, and the entire technical program committee, organizing committee, steering committee teams and local arrangement chair. The success of the technical program would not have been possible without their tremendous volunteer effort. We are most grateful to the reviewers who have so diligently supported the peer review process.

Finally, we would like to express our sincere thanks to IEEE, EMB Thailand section, IEEJ and ThaiBME for their generous support of BMEiCON 2013.

Last but not least, we would like to extend our sincere thanks to over authors all around the world for their quality contributions, which resulted in an outstanding technical program. We look forward to welcoming you to Fukuoka, Japan and offering you a rewarding and exciting experience.

Sincerely,
Wongwit Senawong
BMEiCON 2013 Technical Program Chair

Opening Ceremony Speech by President

Let me therefore add a word of welcome to the overseas participants. Especially to our participants who have traveled long distances to be here. I wish you a pleasant stay in Krabi, Thailand where an area of outstanding natural beauty beaches in the world. It is my pleasure to have a good opportunity of addressing an opening ceremony speech in the 6th Biomedical Engineering International Conference or BMEiCON 2013 among distinguished biomedical engineering researchers.

The challenge of the BMEiCON is to focus on an international forum where researchers, practitioners, and professionals interested in the advances in, and applications of, biomedical engineering can exchange the latest research, results, and ideas in these areas through presentation and discussion.

Biomedical Engineer has become number one of the best jobs in America in 2012, and the next coming decades, biomedical engineering jobs are expected to grow a staggering 72 percent and the unlimited potential will be seen. Even with that growth, biomedical engineering is a young field and where we stand is just a beginning.

It has been said that, to be a distinguished researchers, you have to publish high amount of research papers in high impact factors journals. I am not against in that issue but when it comes to the future, working alone may not be the general way of conducting biomedical engineering research anymore. Making the connection among multidisciplinary researchers will be something more powerful advantages of producing a high quality research in this area. Healthcare professionals study the diseases and know how curable as it is but with engineers, this team will create the world that has never been.

Innovation is a heart of biomedical engineering research, it might be true that the research or the idea we brought here today are never built to last, but that doesn't mean it's not worth innovating it.

This conference will help us all to move through the future together and the challenges and opportunities it will undoubtedly bring.

I wish everyone involved in this event a stimulating and productive sharing and a happy stay in Krabi and hope that this year's Biomedical Engineering International Conference opens up great opportunities for all.

<div align="center">

Thank you.
Somkiat Wattanasirichaigoon
President of ThaiBME

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Welcome Address by President of PSU

It is my great honor and pleasure to extend a very warm welcome on behalf of the local committee to all honorable delegates, both from Thailand and abroad, to the 6th Biomedical Engineering International Conference (BMEiCON 2013).

BMEiCON 2013 is an annual international conference organized by the Thai Biomedical Engineering Research Association. As we know biomedical engineering field is a multidisciplinary conjugations which span from the molecular level to the systemic level in many spectrums. It causes a high impact in biomedical related fields such as health care and medicine.

BMEiCON 2013 offers us the occasion to create collaboration and share ideas for all researchers, also to update and discuss their works. It is also an opportunity for future research networking and technological partnership.

I would also like to express my deep appreciation to our distinguished guest speakers and all participants. I trust BMEiCON 2013 will be a great benefit for all participants. Finally, I want to mention we have arranged for our participants to experience Thai cuisine at its best, in southern Thailand. We have also scheduled an excursion to Phi Phi Islands, one of the most beautiful islands in Krabi that you will find enjoyable and relaxing. Again, thank you for your participation.

Sincerely,

Chusak Limsakul
President of Prince of Songkla University
Local Committee

Organizing Committee

Honorary Chairs

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Srinakharinwirot University

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Prince of Songkla University

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21. Prasong Tosranon, KMUTNB, Thailand	

Keynote Speaker 1

Title: Noninvasive Magnetic Resonance Temperature Imaging

Kagayaki Kuroda

Department of Human and Information Sciences, School of Information
Science and Technology, Tokai University

Abstract

Noninvasive thermometry is one of the most difficult techniques in the field of medical imaging. It is especially important for maintaining effectiveness and safety of various thermal therapies. Among several imaging modalities, magnetic resonance (MR) imaging has been the only practical tool for clinical use, since a method using signal phase difference caused by the thermal shift of water proton resonance frequency was proposed. In conjunction with the advanced technologies of thermal therapies such as high intensity focused ultrasound (HIFU), noninvasive MR temperature imaging has been steadily improved. Starting from the background and basic physical principles, this lecture will cover the recent progress, latest topics, and future prospect of MR temperature imaging.

Keynote Speaker 2

Title: FABRICATION OF COMPLEX SCAFFOLDS AND
TISSUE ENGINEERING CONSTRUCTS BY 3D PLOTTING
Prof. Dr. Michael Gelinsky

Centre for Translational Bone, Joint and Soft Tissue Research, Medical Faculty and University Hospital, Dresden University of Technology, Dresden, Germany

Abstarct

Many rapid prototyping technologies, originally developed for mechanical engineering, have been adapted to scaffold fabrication and manufacturing of tissue engineering constructs. The method of 3D plotting– layer by layer deposition of pasty biomaterials to create 3D objects of pre-defined inner and outer morphology – offers a variety of options for creating complex structures, composed of more than one (bio)material. Due to the mild manufacturing conditions also delicate components like biopolymers, growth factors and even live cells can be included in the 3D plotting process. In addition, this technique easily can be performed under sterile conditions because the necessary instrumentation is small compared to e.g. 3D powder printers or machines for selective laser sintering. This paper gives an overview of some recent developments in the field of 3D plotting, especially concerning manufacturing of calcium phosphate cement (CPC) scaffolds under mild conditions, combination of CPC and biopolymers within one object and direct plotting of blood capillarylike hollow strands. Finally, also the inclusion of living cells in the 3D plotting process will be discussed.

Keynote Speaker 3

Title: Optimizing Drug Regimens for Tuberculosis: An Integrated
Computational/Experimental Approach

Brad Reisfeld, Ph.D.

Associate Professor Chemical and Biological Engineering Colorado State University,
Fort Collins, CO, USA

Abstract

Tuberculosis (TB) is an infectious disease that continues to be a major cause of death in large parts of the world. The principal causative agent of TB is Mycobacterium tuberculosis, a slow growing, aerobic bacterium. While the current first-line therapy for drug-susceptible TB has been in clinical use for nearly thirty years, the emergence and spread of drug-resistant strains of M. tuberculosis has motivated the search for new, more effective combination regimens. Accordingly, there are many experimental studies underway to design and create better individual drugs to treat this contagious and widespread disease. Our interest, however, is in developing mathematical tools and targeted experiments to supplement the animal studies that are currently necessary to identify and test new multi-drug regimens. In this presentation, I'll describe our overall strategy for engineering and optimizing drug therapies, and detail some of the studies we have conducted so far in this program.

Keynote Speaker 4

Title: TRANSCRANIAL MAGNETIC STIMULATOR EQUIPPED WITH AN ECCENTRIC FIGURE-EIGHT COIL

Masaki Sekino

Department of Electrical Engineering and Information Systems, Graduate School of Engineering, The University of Tokyo

Abstract

Development of compact magnetic stimulators will enable the treatment of intractable neurological diseases at home. We proposed an eccentric figure-eight coil which induces sufficient currents in the brain at lower driving currents of stimulator. Three-dimensional numerical simulations based on the finite element method showed that the eccentric figure-eight coil induced higher eddy currents in the brain in comparison with an ordinary coil. A prototype stimulator coil was fabricated based on the proposed design for use in combination with an originally developed driving circuit. The coil generated a peak magnetic field of 1.4 T. The coil was used to deliver transcranial magnetic stimulation to healthy subjects. The current slew rate corresponding to motor threshold values for the ordinary and eccentric coils were 86 A/μs and 78 A/μs, respectively.

Programs & Abstracts

Technical Program

Wednesday, October 23, 2013 (Day-1)	
Room	Room I: Queen's bay hall
Session	D1R1ML-Imaging I
Chair	Wibool Piyawattanametha
11:00-11:30	BMEiCON2013-0001 W. Piyawat (Invited Paper)
11:30-11:45	1569798387 A. Markkongkeaw
11:45-12:00	1569798623 N. Khumdath
12:00-12:15	1569797161 A. L. Che Ani
12:15-12:30	1569804331 S. Yatsushiro

Session: D1R1ML-Imaging I
1569798387: Preliminary Results of Breast Cancer Cell Classifying Based on Gray-Level Co-occurrence Matrix

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Keywords:

Gray-level co-occurrence matrix, texture features, breast cancer, estrogen, immunohisto-chemistry, microscopic image

Abstract:

This study proposes and appraise a gray level cooccurrence matrix (GLCM) for extracting the feature of cell regions in microscopic image into four region types: positive cancer cell, negative cancer cell, lymphocyte and stromal cell. The classification task uses decision tree with cross validation. To give a high classification performance, the main focus of interest is feature extraction task. Twenty-two texture features of GLCM have used to analysis images at four directions and six scales of gray-level quantization. A set of these texture features is used in 2045 images for training and testing. The result shows that the classification accuracy obtained from decision tree is 95.21%. It is demonstrated that the proposed GLCM texture features and decision tree can classify the histological structures in microscopic image and can be applied to improve and to develop an accurate cell counting of computer-aided diagnosis system for breast cancer prognosis.

Session: D1R1ML-Imaging I
1569798623: Development of a Computer System for Strabismus Screening

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Abstract:

The Strabismus affects about 4% of the children population, causing amblyopia disease. However, this problem can be found by the Hirschberg test that is one of the exams used to detect this pathology. This work presents a methodology for automatic detection of strabismus in digital images through the Central corneal light reflex ratio (CCLRR) based on digital image processing. The proposed algorithm was organized into three stages: (1) skin detection was analyzed using the threshold of RGB color model (2) the locations of the eyes were detected using the morphological operation technique, position, threshold of gray level and shape. (3) The detection of the corneal light reflex were automatically detected by the grey levels in the range from histogram equation and locating of limbus. The methodology has produced results on the range 94.17% ofaccuracy, 97.23% of sensitivity and 73.08% of specificity.

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Keyword:

Fiber optic displacement sensor, Occlusal surface, Human tooth

Abstract:

In dentistry, often dental radiography is related to teeth occlusal surface, which can be used for diagnostic and treatment purposes. Nonetheless the exposure of X-Ray dose may limit the usage of this technique. This paper presents the image construction from the occlusal surface of human teeth. The principle of the surface construction is from the exploitation of

reflected light intensities along the occlusal surface of human teeth. The image of occlusal surface is constructing back using simple MatLab software. The measured diameter from the images of occlusal surface for molar A and molar B is to be 7.0 mm and 7.5 mm, respectively, which is exactly the same when measured with micrometer. The average surface roughness for each tooth sample namely molar A and molar B is obtained to be 742 μm and 975 μm, respectively. Such results are useful for detecting the occlusal topography and surface profile of human teeth.

Satoshi Yatsushiro

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Keywords:

Cerebrospinal Fluid, phase-contrast MR, Flow dynamics, correlation, time

Abstract:

A novel technique to analyze propagation of fluid flow pattern based on magnetic resonance (MR) velocimetry has been developed and applied to cerebrospinal fluid (CSF) dynamics in intracranial space. This technique evaluates spatialdistribution of the correlation time as well as correlation coefficient of velocity waveform with respect to an arbitrary reference waveform using quantitative velocity imaging with phase contrast (PC) method. Phantom ex-

periments demonstrated that the propagation of the flow had no delay time because saline was incompressible and the pipes used for the phantom was rigid. In contrast, the propagation of CSF flow in a healthy volunteer appeared to have particular distribution of correlation time indicating that there was delay in the flow. These preliminary results suggest that the technique may yield abundant information concerning on CSF dynamics and thus useful to analyze driving force as well as abnormality in CSF dynamics.

Technical Program

Wednesday, October 23, 2013 (Day-1)	
Room	Room II Pra Nang
Session	D1R2ML-Signal I
Chair	Sumet Umchit
11:00-11:15	1569794809 R. Duangsoithong
11:15-11:30	1569795677 T. Pothirat
11:30-11:45	1569802473 F.R. Hashim
11:45-12:00	1569797407 W. Boonleelakul
12:00-12:15	1569796217 T. Siritan
12:15-12:30	1569806779 A. Homton

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Keywords:
Causal feature selection, bootstrap, irrelevant features.

Abstract:
Irrelevant features may lead to degradation in accuracy and efficiency of classifier performance. In this paper, Bootstrap Causal Feature Selection (BCFS) algorithm is proposed. BCFS uses bootstrapping with a causal discovery algorithm to remove irrelevant features. The results are evaluated by the number of selected features and classification accuracy. According to the experimental results, BCFS is able to remove irrelevant features and provides slightly higher average accuracy than using the original features and causal feature selection. Moreover, BCFS also reduces complexity in causal graphs which provides more comprehensibility for the casual discovery system.

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Keywords:

Electromyography; oral motor muscle; timedomain features; feature extraction; oral movement; RES index

Abstract:

The optimal feature is necessary for the reach of electromyography (EMG) control or human-machine interface. This study aimed to find the optimal feature of time-domain features. Five oral muscles movements were performed in five volunteers. The oral activities were open mouth, protrude mouth, broad smile, straight tongue, and up tongue which were the parts of non-speech oral motor treatments. Sixteen time-domain features were selected to separate five oral muscles movements. The features were chosen using the RES index and evaluated using multilayer perception to confirm the results. The optimal features were different in each channel followed as: slope sign change feature for channel 2, myopulse percentage rate feature for channel 3 and channel 5. In addition, the average percentage of classification was 91.33%.

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Keywords:
ECG signal; adaptive filter; proportionate;improved proportionate; u-law.

Abstract:
In this study, improved normalized LMS adaptive filters are proposed to reduce the electromyogram (EMG) noise from ECG signals. The proposed technique mainly uses simple addition and shift operations and achieves considerable speed over other methods based on the LMS method. Simulation result gives by the improved versions of adaptive filter (NLMS, PNLMS, IPNLMS and MPNLS) show superior performance when compared to other technique such as wavelet and empirical mode decomposition.

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Abstract:

Beamforming the ultrasound radiofrequency (RF) data on the computer in stead of doing it on the hardware is currently developed in many research groups. This requires fast transfe ring of the large amount of data in real-time from the ultrasound scanner front end to the

computer. Despite of using an expensive hardware for fast data transfer, we are interested in compress the data before transferring. This paper presents a method to compress the RF data by applying quantization and decimation on the baseband signals of the RF data. Simulation and experimental RF data are tested. The number of bits and the number of samples remaining in the phase and amplitude data are reported. The signal to noise ratio (SNR) of the RF data after beamformed and the visual quality of the reconstructed images are compared.

Session: D1R2ML-Signal I
1569796217: Beamforming Complexity Reduction Methods for Low-Cost FPGA-based Implementation

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Keywords:

beamforming, FPGA, dynamic receive beamforming, ultrasound imaging system.

Abstract:

This paper presents two methods for reducing complexity of dynamic receive beamforming in order to be implemented on a single field-programmable gate array (FPGA) with 500K

gates. These methods apply windows to divide each scanline into segments and each segment has its own focus at the center. One method uses constant window size and the other applies dynamic window size that equalizes the off-focus beamforming delay errors among the windows at different depths. The frame rates and the axial and laterial beam profiles of a point scatterer are compared using simulated and experimental echo signals.

Session: D1R2ML-Signal I
1569806779: Development of the Hearing Aid Measurement System

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Keywords:
Hearing aid, Hearing aid meassurement, IEC 60118-7.

Abstract:
The characteristics of hearing aids should be determined and regulated to ensure patient safety and to optimize the performance of the hearing aids. The objectives of this work were to design and develop a hearing aid measurement system to obtain the performance cha

acteristics of the hearing aids. The implementation of this work is based on the method re commended in the International Electrotechnical Commission (IEC 60118-7). To verify the performance of the developed hearing aid measurement system, the hearing aid charac- teristics measured from our developed measurement system (such as Maximum OSPL90, Frequency of Maximum OSPL90, HFAOSPL90, Maximum Full-on Gain, Frequency of FOG Maximum, HFA-FOG, Lowest Frequency, Highest Frequency, RTG @ RTS/60 dB, THD 500 Hz, THD 800 Hz and THD 1600 Hz) were compared with those measured from the commercial hearing aid analyzer and those provided from the hearing aid manufacturer's specifications. The results show that the hearing aid characteristics measured from our developed measure- ment system were in good agreement with those measured from the commercial hearing aid analyzer and those provided by the hearing aid manufacturer's specifications.higher accuracy.

Technical Program

Wednesday, October 23, 2013 (Day-1)	
Room	Room III Benjarong
Session	D1R3ML- Biomedical Instrument I
Chair	Bumkyoo Choi
11:00-11:15	1569795471 J. Yang
11:15-11:30	1569795999 K.Keawkannate
11:30-11:45	1569797043 W.Senavongse
11:45-12:00	1569802157 J.Choi
12:00-12:15	1569808061 Q. Zhang
12:15-12:30	1569802773 M. L. Maksud

D1R3ML- Biomedical Instrument I
1569795471: An Endoscope Washer Using a Moving Brush Module

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Keywords:

endscope; endscope cleanner; brush endscope cleanner.

Abstract:

Endoscopy is a medical device used for examining organs or treating affected areas in side of body. However, there is the possibility a chance of infection by viruses and bacteria due to the direct contact with the mucous membrane and blood, so it is required high-intensive disinfection in order to prevent secondary infection. The conventional cleansers are inefficient and complicated to use because of reassembly of equipment. This research aimed at developing a cleanser which has a built-in drying function to overcome these inconveniences. In the results of experiments with colitis germs, sterilizing power was 67% when 0.4ppm ozone water was used as an antiseptic solution, 7% when 1.2ppm ozone water, and 99.5% when 70% EtOH. EtOH showed the most efficient method of sterilization.

D1R3ML- Biomedical Instrument I
1569795999: The Correlation Comparison Among Body Sway Parameters from the Gyroscope Data Sets

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Abstract:

In the postural analysis, body sway parameters have been used to assess the steadiness of posturography in standing subject. The aim of this study was to compare correlations among ten different body sway parameters. We hypothesized that stronger correlations would exist in our systemas corresponding to the conventional force plate method. The calibrated gyroscope sensor was attached to the subjects sHghtly under the naveL Of four healthy subjects, standing quietly on two legs with four different conditions (on a firm surface with opened eyes, on a ram surface with closed eyes, on a foam surface with opened eyes and on a foam surface with closed eyes), each condition was tested twice for 10 seconds. After calculating all parameters, we found the Pearson's correlation coetllclent among them. The ML (Medial-Lateral)amplitude showed the highest correlation coefficient ($r = 0.660$ at $p < 0.01$). It means our measurement method is reliable and proper because normal human has body sway in the roll direction. In case of the correlation among ten parameters, the correlation coefficient between the convex hull area and the ellipse area was the highest correlation value ($r = 0.986$ at $p < 0.01$). Therefore, the convex hull area is almost equal to the ellipse area."

D1R3ML- Biomedical Instrument I
1569797043: Automatic Fall Detection Sensor for Treadmill Rehabilitation

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Abstract:
Stroke patient rehabilitation by treadmill tends to increase in recent years. The rehabilitation on treadmill needs more than two staffs per patient to control the process and protect them from falling. As a result, it takes too much time and resource to operate. To resolve this problem, this paper proposes to develop an automatic sensor that is simple and easy to use by using ultrasonic sensor and the Arduino board. The system senses patient's body on treadmill to calculate the suitable distance for setting an automatic switch. When patient' body triggers the first position, the treadmill will start moving then patient's body triggers the second distance or fall position, the treadmill will stop immediately. Although it is a simple concept, the commercial treadmill does not have this function which is necessary for looking after patients. The control system uses Arduino and C# languages. The findings suggest that

the performance of the system is very satisfactory having accuracy which are measured in 2 states, on and off, at 94.32% and 94.83% respectively.

D1R3ML- Biomedical Instrument I
1569802157: Fabrication and Experiment of the Hemodialysis Unit Device

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Keywords :

hemodialysis, membrane, channel

Abstract:

This study presents the hemodialysis unit device that can effectively separate waste urea from the human blood. This device is composed of donor and acceptor channels separated by a membrane. The mixture of albumin, urea, and glucose used to replace simple human blood is fractionated by different particle sizes and diffusion distances across the cross section of the channels. !n this study, E"" simulation and experimental study are used to verify the proposed device and show good agreement. The experimental results illustrate the clearance of urea with respect to the flow rate, the length of the channel, and the depth of the channel. This wor# demonstrates around &%$ of the urea clearance efficiency can be obtained.

D1R3ML- Biomedical Instrument I
1569808061: Development of a Small Animal SPECT Imager with LYSO Scintillator Arrays and PSPMTs

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Keywords :

animal imaging, image correction, single photon emission computed tomography, 99mTc-3PRG2, tumor.

Abstract:

We describe a small animal SPECT imager based on scintillation crystal arrays and position sensitive photomultiplier tube (PSPMT). This SPECT detector consists of a cerium doped lutetium-yttrium oxyorthosilicate (LYSO)scintillation crystal (22 × 22 pixel array, 2 mm × 2 mm × 3 mm pixel size), a H8500c PSPMT (Hamamatsu Photonics Co., Ltd., Shizuoka Prefecture,

Japan), and a parallel hole collimator (Nuclear Fields Pty. Ltd, St. Marys, Australia). The detector design, electronic setup and image correction method are presented. Conical phantom study and animal experiment (BALB/C male nude mice, 16 week, 20g) were performed for the uniformity correction evaluation and imaging performance test respectively. The preliminary results demonstrate that this SPECT imager can achieve the small animal whole body imaging effectively and thus be one of the modalities of our future multimodality imaging system. The feasibility that LYSO crystal can substitute NaI(TI) for SPECT imager development is also validated.

D1R3ML- Biomedical Instrument I
1569802773: An Investigation of Parameter Effect on Microcontact Printing and Feasibility Study for Application in Microelectronic and Biomedical

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Keywords:

Microcontact printing, Polydimethylsiloxane(PDMS), Micro-electronics, Printed Electronics. omponent;

Abstract:

Microcontact printing (µCP) has been developed about 17 years ago and it is an outstanding surface patterning technique in micron scale and, even in nanoscale. Surface science communities like engineers and biologists have been promoting attention in µCP; therefore they have been rich in improvement to the µCP process itself. However, in order to aim at minimizing some drawbacks of µCP such as a parameter affects, ink-transfer issues and stamp deformation, many studies have been performed recently. In this paper we describe the parameter that affects the performance of printing multiple micro scale lines experimentally, in which are applied load force, uniformity of applied force area, wetness of ink before stamping, ink viscosity and stamp deformation. In this study, we will exhibit the result of graphic inks used for µCP as preliminary study and non-engineered live cells before using functional materials and engineered live cells for the study of cell growth. This is vital prior to enhance

the possibility of patterning micrometer or nanometer scale structures with high precision using conductive ink for electronic application.

Technical Program

Wednesday, October 23, 2013 (Day-1)	
Room	Room I: Queen's bay hall
Session	D1R1AE-Biomechanic and Robotic
Chair	Jamaluddin Mahmud
13:30-14:00	BMEiCON2013-0002 J. Mahmud Invited Paper
14:00-14:15	1569795563 A. Ali mechanic
14:15-14:30	1569802589 W. Kaewboon
14:30-14:45	1569796885 Z. Htet

D1R1AE-Biomechanic and Robotic
1569795563: Biomechatronics Design of a Novel Artificial Arm

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Abstract:

This paper presents a biomechatronic approach to the design and fabrication of an artificial arm, focusing on designing artificial shoulder, biceps, wrist and hand. The proposed design provides a novel tool towards upper limb amputee rehabilitation process. Detail 3D designs of the artificial arm are described including an elbow powered by a car's power window motor, DC motor powered wrist and a string actuated Artificial Hand Gripper (AHG) with 5 artificialfingers which acts as slave controlled by a Smart Glove (master). The AHG incorporates a master-slave system which proven suitable for Mirror Visual Feedback (MVF) therapy experimented on subject towards the completion of this research. There are many hand prostheses which is commercially available, however, due to the disadvantages such as weight, expensive and complex mechanism, this paper proposed new ideas on problem solving by providing an artificial arm which gives good cosmetic appearance, functional, low-cost and users friendly

D1R1AE-Biomechanic and Robotic
1569802589: Upper Limbs Rehabilitation System for Stroke Patient with Biofeedback and Force

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Abstract:
We have designed and investigated the system of upper limbs rehabilitation. The measurement parameters in the system are Electromyography (EMG), the angle of arm, and weight. These parameters are useful as an indication of rehabilitation performance in terms of both quantity and quality. The performance of the proposed system is evaluated with CPM training on triceps and infraspinatus muscles, which is important for patients with paralysis from stroke. Results show that the system can function correctly and their measuring parameters are appropriate for rehabilitation.

D1R1AE-Biomechanic and Robotic
1569796885: Hemodynamic Simulation of Cardiovascular System During Rotary Blood Pump Support

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Keywords:

left ventricular assist device, simulation, rotary blood pump, computer model

Abstract :

Rotary blood pumps are increasingly used for supporting blood circulation in heart failure patients. For the simulation of an abstract model of a cardiovascular system, a computer simulation which is a lumped parameter model can be used. Computer simulations are essential in mathematical modeling to estimate the hemodynamic parameters. In this research, a computer model is implemented to study the possibilities for indirect estimation of hemodynamic parameters and pump control of the heart. The model parameters are grossly estimated in terms of the physiological range or the order of magnitude for the parameter value and fine turned in the dynamic situations. The model parameters are iteratively adjusted within their physiological ranges while the resulting pressure waveforms in the entire system are monitored. Aortic pressure, left ventricular pressure and central venous pressure are measured. Identification of the model parameter values are derived from the literatures. Nowadays, medical simulations are widely and currently used in research, development of tools for new therapies, treatments and early diagnosis in medical fields. The models of this research will be useful not only in teaching of therapeutic and diagnostic procedures but also in obtaining medical concepts and decision making of health professionals.

Technical Program

Wednesday, October 23, 2013 (Day-1)	
Room	Room II Pra Nang
Session	D1R2AE-Biomedical Instrument II
Chair	Arthon Sunpanich
13:30-13:45	1569795907 N.Thongpance
13:45-14:00	1569804477 M. N. Adon
14:00-14:15	1569793739 A. Cruz
14:15-14:30	1569799443 P. Chotikasemsri
14:30-14:45	1569796981 A. Jantanukul
14:45-15:00	1569793355 N.A. Yunus

D1R2AE-Biomedical Instrument II
1569795907: Design and construction The Low – Cost Defibrillator Analyzer

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Abstract:

The objective of this research was to design and construct of the low – cost defibrillator analyzer. This research has adopted the principle of voltage divider and standard calibration curves of the relationship between the set of standard output energy, the standard maximum voltage and the standard maximum current versus the digital output of them. The designed and constructed the low – cost defibrillator analyzer was composed of 3 main parts: 1) the input part consisting of the paddle electrodes receptacle, 2) the signal conditioner and processing part including voltage attenuator circuit , surge protection circuit, and microcontroller ARM Cortex M3 ,STM32F107VCT 6 for processing of energy, peak voltage, peak current, pulse period and plotting the both monophasic and biphasic waveforms and 3) the display part consisting of LCD touch screen display for displaying the energy value in Joule unit , peak voltage in Volt unit, peak current in Ampere unit , period in millisecond unit and the waveform of the unit under test.The testing results were compared with standard defibrillator analyzer FLUKE Model Impulse 6000D showed the waveform, accuracy and to value measure can be highly related with the comparative devices. The results of standard

calibration for accuracy of the load resistance and energy measuring by the laboratory of Calibration Services and Environmental Analysis Department ,Technology Promotion Association (Thailand – Japan) that has been certified by the international ISO – 17025 shown that the average uncertainties of the 95 percent confidence level are ± 0.0053 Ohm and ± 1.2 joules respectively. The result of the user satisfaction of 13 people found that the mean satisfaction score was 3.8 out of 4. The production cost of the prototype is 25,000 baht.

D1R2AE-Biomedical Instrument II
1569804477: Electrofustion Effect of Induced Transmembrane Potential under a Live-Cell Microscopy System

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Keywords:

Pulsed electric field (PEF); electrofusion; electroporation; cell membrane; HeLa cell

Abstract:

Pulsed electric field (PEF) application development substantially affected the development of research process including controlling cell functions by using pulses of electrical fields to create pores through a cellular membrane causes cell lysis and apoptosis commonly known as electroporation or electrofusion. Here we demonstrate the influence of the PEF on the threshold area (TA) of human cervical cancer cells (HeLa) membrane. The electric

field for PEF is 2.7kV/cm while the pulse length and the number of pulses were fixed at 30micros and 1, respectively. While the cultured Hela cells are placed in 9 mm-Platinum electrode gap for allowing real time observation of membrane permeability changes and cellular physiology. In order to initiate higher cell viability rate, high transfection efficiency, lower sample contamination and smaller Joule heating effect the modification of chamber need to be done which can be controlled by pH scale, temperature and humidity. the experiment using high pulsed electrical field with single pulses shows the perfusion area of cell membrane was increasing gradually under live-cell microscopy system, and is settled with time lapsed technique within 30 minute. We found that the intensity profile of cells membrane decrease gradually to 82%. This situation will not change until the whole of these cells merge and form a condition called hybrid cells. Was affected when exposed to high voltage pulse electric field. The dependence of the electrofusion area on the HeLa cell membrane might be associated with the electrical impedance of the plasma membrane the begins to fluctuate after the application of a certain level of PEF.

D1R2AE-Biomedical Instrument II
1569793739: Bone Density Measurement Through Electromagnetic Waves

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Abstract:
This article presents a proposal to measure the Bone Mineral Density (BMD) as a backup in the diagnosis of osteoporosis. An antenna arrangement, tuned to a frequency of general and medical use, is used to measure the relative attenuation of the signal on several samples of bovine bone, silica and bone powder. By implementing a Support Vector Machine (SVM) it is possible to establish patterns to classify the BMD as high or low.

D1R2AE-Biomedical Instrument II
1569799443: PHOTOTHERAPY AND LED TREATMENT OPTIMIZATION ON GUM FIBRO-BLAST AND OSTEOBLAST CELL LINE

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Keyword:

Phototherapy, LED ligh, fibroblast

Abstract:

The effects of LED light at 635 nm in fibroblast and osteoblast were investigate in fundamental changes as preliminary experiment. In this study, primary gum fibroblast cells and osteoblast cell line were cultured. After LED light irradiation, we found that fibroblast growth rate and cell proliferation are increased after irradiated by 630nm LED light. Optimum energy for wound healing is 0.34 J/cm2 at 630 nm. Optimum energy for proliferation is 0.67 J/cm2 at 630 nm. However, osteoblasts do not significantly and effectively response to LED light at 630 nm.

D1R2AE-Biomedical Instrument II
1569796981: Suppression of Autonomic Drive Determined by HRV analysis in Therapeutic Hypothermia after Cardiac Arrest

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Keywords:

Heart rate variability, Autonomic suppression, Therapeutic hypothermia

Abstract:

Therapeutic hypothermia is recommended as a cardiac arrest treatment for neuroprotection. In this study, we aimed to explore nonlinear heart rate variability (HRV) with other domains to clearify and setting up the significant index for survival. All patients were divided into two groups by 7 days survival outcome (n = 9 vs. 9). The limb lead II ECG signals are collected (10 minutes, sampling rate: 1000 Hz) for all phases; 6, 18 hours after induction (A and B), during rewarming (C) and recover (D). Fluctuation of heart rate (HR) was presented in both groups especially in C and D phases. Standard deviation of RR intervals (SDNN) was significantly decreased from phase A to C in survivors ($p<0.05$). Abrupt increase in SDNN was observed in non survivors and caused a significant difference compared to survivors in C phase. During A-C, low-frequency to high-frequency power ratio (LF/HF) and SD2 of Poincare's plot were suppressed in survivors and they slightly increased in D phases. Less suppression of those LF/HF ratio and SD2 was evident in non survivors. Gradual increase in sample entropy (SampEn) was consistent with prolong suppression of LF/HF ratio and SD2 in survivors. Significant difference of SampEN in both groups was presented at C phase. Prominent SampEn at rewarm of sur-

vivors was consistent with large and more scatter signals in Poincare's plot that may explain the rebound response after autonomic suppression. Contrast to survivors, less and ineffective autonomic suppression from hypothermia lead to a crisis in rewarming phase. Also, we notice significant difference of SDNN, SD2 and SampEN in non survivors. In conclusion,nonlinear HRV with SDNN and LF/HF ratio are able to determine successful, effective and rebound responses of hypothermia through autonomic suppression during A-C periods even though HR of both groups is displayed in C and D periods.

D1R2AE-Biomedical Instrument II
1569793355: Optics Experimental Unit and Analysis Housing for Maximum Dielectrophoresis (DEP) and AC Electrokinetics Operations

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Keywords:
Lab on a chip (LoC), Dielectrophoresis (DEP), Optics Experimental Setup

Abstract:
We have developed a straightforward optics system for lab on chip applications. This system can be used to handle a continuous micro fluid flow, submicron and nano-sized particles. The device that is investigated under this system can be used to fields such as bioseparation, biosensors for diagnostic and prognostic purposes. In our advance, the system is formed for dielectrophoretic (DEP) colloidal particle deflection application. Such device has been fabri-

cated using glass substrates with microelectrode arrays on it and a microchannel made from Dry Film Resist (DFR). The fabrication ensures the easiness of its usage under the experimental unit. The system introduced can reduce cost, sophisticated hardware usage and power consumption. Separation via deflection (DEP) method was performed using test particles over a wide range of applied field frequencies, confirming the good deflection within the optics experimental unit setup.

Technical Program

Wednesday, October 23, 2013 (Day-1)	
Room	Room III Benjarong
Session	D1R3AE-Biosensor
Chair	Suzuki Seiichi
13:30-13:45	1569795721 S. Seiichi
13:45-14:00	1569797291 Haoxu Wang
14:00-14:15	1569801859 Y. Ogura
14:15-14:30	1569797807 N. Tohluebaji
14:30-14:45	1569802153 Seokbeom Kim
14:45-15:00	1569798681 S. Hasegawa

D1R3AE-Biosensor
1569795721: Fluorescence Anisotropy Measurement of Green Fluorescent Protein for Nano-environment Probing

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Abstract:

This paper proposes a robust method to detect involuntary blinks for visual display terminal (VDT) users usingWeb camera, even if the Web-camera's frame rate dynamically changes and becomes slow. Conventional methods which are widely used for drivers and paralyzed person with higher performance camera, calculates correlation between an open eye template and cureent eye image at each frame, and judge the blink to have occurred when the correlation score falled below a pre-defined threshold value. In our proposal aimed to use for Web camera build-in personal devices and widely used inexpensive Web camera for the threshold value is dynamically controlled according to varying frame rate and effective value of the correlation score. We implemented a blink detection system into laptop PC with build-in Web camera. The experimental result show that the proposed method imporved blink detection accuracy at low frame rate.

D1R3AE-Biosensor
1569797291: Interdigitated Microelectrodes Biosensor for Thyroid Stimulating Hormone

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Abstract:

The detection of thyroid stimulating hormone (TSH) is critical for disease early intervention and the prevention of pandemics. However the low detection sensitivity and the high cost limit further application of TSH biosensor. In order to improve the sensitivity and reduce the cost, interdigitated microelectrodes (IDμE) biosensor was prepared for the sensitive and low cost detection of TSH. The IDμE used as the sensing structure of biosensor are fabricated by micro-electromechanical systems (MEMS) technology, which can be used in the large scale production. The IDμE biosensor made use of enzyme-linked immuno sorbent assays (ELISA) and enzymatic silver deposition reaction to get a high sensitivity. The biosensor based on IDμE was capable of detecting TSH as low as 0.014 mIU/L ranged from 0.02 mIU/L to 100 mIU/L and has a strong specificity to TSH. The proposed IDμE biosensor can also be used in the detection of other hormones, which are critical for disease early diagnosis.

D1R3AE-Biosensor
1569801859: Amplification and encoding of biomolecular signals with designed reactions of DNA

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Keywords: -

Abstract:

This paper focuses on a biomolecular detection method based on amplification and encoding with DNA reactions. For proof of the concept, we demonstrate that encoding of molecular signal with amplification is achievable using a hybridization chain reaction with fluorescence resonance energy transfer.

D1R3AE-Biosensor
1569797807: Piezoelectric polyvinylidene fluoride thin film as monitoring sensor

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Keywords:

PVDF, piezoelectric, EMG, elastomer, BB muscle.

Abstract:

This study proposes a piezoelectric polyvinylidene fluoride (PVDF) patch for detecting the movement of the biceps brachii muscle. The polyurethane (PU) elastomer was chosen to perform as an artificial muscle. The PVDF patch rigidly glued onto the stretching PU strip could generate the charge linearly with its applied force. The large strain of 1-4 % of the PU at a low driving voltage has led to the determination of the piezoelectric charge coefficient (d_{31}) of 30 pC/N for the PVDF. The sensing PVDF-PU patch in this study is promising for detecting the electromyography of the biceps brachii muscle movements which can be repeatable used with ease.

D1R3AE-Biosensor
1569802153: Fabrication and Experiment of Polymeric Diaphragm Pressure Sensors

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Keyword:

Polydimethysiloxane(PDMS), Polyethyleneterephthalate(PET), Polymeric diaphragm pressure sensor, Strain gauge

Abstract:

This study presents a simple fabrication of polymeric diaphragm pressure sensors by embedding a commercial thin-film strain gauge in a polymeric diaphragm. Two different polymer materials, polydimethylsiloxane (PDMS) and polyethylene terephthalate (PET), were employed for fabrication. Performance of pressure sensors fabricated with two different polymers including sensitivity, linearity, and long-term stability was throughly compared using a characterization setup operating in either compressed air or water. Pressure sensitivities were similar to air and water environments regardless of the polymer material. However, the sensitivity and resolution of PET pressure sensors were about 2.5 times better than those of PDMS pressure sensors. PET is better suited for making liquid pressure sensors than PDMS

D1R3AE-Biosensor
1569798681: Development of POC Optical Immunosensor Based Upon The Fluorescence Anisotropy Measurement

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Abstract:

The blood test is a routine procedure in medical diagnosis. However it takes a couple of days to get the results because blood samples are analyzed by sending to the specialized facility because the operation of the blood test instrument is costly for a hospital or clinic. So development of a novel low cost blood test device is an important issue considering the burden of the patient. To developing a low cost and instant diagnosis system, various immunosensor have been studied because of it's quick response and application of micro fabrication. But background noise by the surface adsorption reduces the S/N ratio, and practical use of the immunosensor isn't possible for now. So we tried to detect antigen-antibody reaction by fluorescence anisotropy in this study. Fluorescence anisotropy retains the information of the rotational motion of antibody molecules. As the antigen bounds to the antibody, the degrees of rotational freedom are reduced and the antigen-antibody reaction can be detected by the shift of fluorescence anisotropy. In principle fluorescence anisotropy is not affected by the nonspecific surface adsorption. A micro optical immunosensor was fabricated. Detection of anisotropy change by the antigenantibody reaction was demonstrated with the device. For higher S/N ratio observation, evanescent excitation system was also developed.

Technical Program

Wednesday, October 23, 2013 (Day-1)	
Room	Room I: Queen's bay hall
Session	D1R1AL-Signal II
Chair	Supan Tungjitkusolmun
15:30-15:45	1569810247 L. Khong
15:45-16:00	1569807799 O.Fathabadi
16:00-16:15	1569809323 M. Shahbakhti
16:15-16:30	1569808465 P. Panavaranan
16:30-16:45	1569807855 I. Aarya

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Abstract:

A challenge in using myoelectric signals in control of motorised prostheses is achieving effective signal pattern recognition and robust classification of intended motions. In this paper, the performance of Matlab's Multi-layer Perceptron (MLP) backpropogation training algorithms in motion classification were assessed. The test and evaluation platform used was "BioPatRec", a Matlab-based open-source prosthetic control development environment, together with algorithms sourced from Matlab's neural network toolbox. The algorithms were used to interpret multielectrode myoelectric signals for motion classification, with the aim of finding the best performing algorithm and network model. The results showed that Matlab's trainlm and trainrp algorithms could achieve a higher accuracy than other tested MLP training

algorithms (94.13 ± 0.037% and 91.09 ± 0.047%, respectively). Discussion of these results investigates significant features to obtain the highest performance.

D1R1AL - Signal II
1569807799: Binary search for time-constant estimation in first order systems, FiO_2–SpO_2 case study

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Keywords: –

Abstract:

A binary search method for fast identification of the time-constant in first order systems is proposed. The unimodality of the Root Mean Square Error (RMSE) is exploited to achieve fast convergence. As an application example, the method is applied to the oxygen transport system of a preterm infant. Performance of the proposed binary algorithm is compared with a direct search method for two di-erent selections of primary range and estimation precision. The results verify convergence, accuracy, and speed of the proposed algorithm in a practi-

cal identification appli- cation with noisy recorded signals. The algorithm is also shown to be successful in following the correct trajectory even when the best value of the time constant is out of the primary search space. This method can be applied to any one-dimensional optimization problem where the parameter of interest is a unimodal function of the unknown variable.

D1R1AL - Signal II
1569809323: Linear and Non-linear Speech Features for Detection of Parkinson's Disease

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Keywords:

Parkinson's disease, Speech analysis, Genetic algorithms, ANFC, SVM

Abstract:

Parkinson's disease (PD) was described by James Parkinson first time and it is now recognized as the second common neurological disorder after Alzheimer. Since most of the people with PD suffer form speech disorder, it is believed that speech analysis can be considered as the easiest way for PD detection. In this research, we try to use extracted features by genetic algorithm and ANFC for classifying between healthy and people with PD. Support vector machines (SVM) is applied as the classifier. Results show higher network accuracy of ANFC features compared to genetic algorithm features.

D1R1AL - Signal II
1569808465: EEG-based Pain Estimation via Fuzzy logic and polynomial kernel Support Vector Machine

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Keywords:

Pain Estimation, Electroencephalogram (EEG), Support Vector Machine (SVM), Acute Pain

Abstract:

A pain is a human phenomenon when sensory receptors are stimulated by the injury. It can be caused from accident or intention. Everybody have this kind of sensation because the pain is a natural warning for react in order to protect a whole body. However, the reaction from the pain sometimes have to be avoid because the overreaction causes some damages to near-by tissue. An acute thermal pain is one of the most severe pain for patient which has also difficulty treatment for therapist. Consequently, the system that can be indicate pain level need to be achieve. This study purposed a use of intelligent system which is fuzzy logic algorithm and kernel support vector machine (SVM) in order to estimate pain level and classifies a state of pain. Accordingly, the results of pain estimation via fuzzy logic can be roughly indicate the pain state of EEG. The polynomial kernel support vector machine classifier for pain classification has high accuracy.

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Keywords:

Adaptive filtering, Denoising, MRI, Rayleigh noise, Rician noise.

Abstract:

MRI images are affected by Rician noise due to the magnitude image formation. Presence of Rician noise can significantly affect the image quality and contrast ratio of an image. In this paper we propose an adaptive filtering technique for Rician noise. Rician noise displays varying distribution characteristic depending on the SNR of the image. Based on the probability distribution function of noise and SNR information obtained from the image, the proposed filter uses local statistics of the neighborhood within the mask to perform denoising. The filter thus performs adaptive denoising based on the regional SNR of the neighborhood. The proposed filtering technique has been implemented on synthetic image and T2 weighted magnitude MRI images. The efficiency of the proposed filtering technique is verified with a study of the PSNR, MSSIM and RMSE characteristic of the denoised and noisy image with respect to the true image. The proposed denoising technique shows an improvement in the contrast ratio and PSNR of the noisy image

Technical Program

Wednesday, October 23, 2013 (Day-1)	
Room	Room II Pra Nang
Session	D1R2AL- Medical Image II
Chair	Theekapun Charoenpong
15:30-15:45	1569794099 T.Charoenpong
15:45-16:00	1569795441 T.Charoenpong
16:00-16:15	1569796093 R. Uttamatanin
16:15-16:30	1569795399 S. Jitaree
16:30-16:45	1569797077 F. Khan
16:45-17:00	1569796457 K. Tsuruoka

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Abstract:

To study rat behavior have been playing an important role in psychology, medical science and brain science. Open-field test such as holeboard model is a popular experiment to analyze rat behavior. Rat behaviors such as walking, rearing and head dip are usually considered. These behaviors are observed and recorded by human that, obviously, included human errors. Commercial products have limitation for identifying rat behaviors. In this paper, we proposed a new method for classifying a walking behavior in Holeboard model test based on

length of rat's body. Webcam is used to record data. The camera is installed over the models. The proposed method consists of three main processes. The first step is a background modeling; K-mean clustering technique is adapted to reconstruct the background. Second step, rat is extracted by means of background subtraction. Third step is an ellipse fitting by least square method. Then a length of rat's body is calculated for classifying rat behaviors. To test performance of the proposed method, classification accuracy is considered. 500 frames from five image sequence data sets are used. Based on pilot test, criterion of rat's body length for classifying walking behavior is 31 pixels. If the length of rat's body is greater than 31, it is indicated as rat's walking behavior, in the other hand, it is others behaviors. Accuracy of the proposed method is 72.52%. The result shows that the proposed method is satisfactory and able to be improved for higher performance. An advantage of the proposed method is that it is developed for recording rat behavior from a distance and classifying rat's walking behavior which decreases effect to rat.

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Abstract:

The existing problem of current nose tip detection research is to extract the nose from any viewpoint. In this paper, we propose a new method for localizing the nose tip by using an ellipsoid fitting technique. A 2.5D partial face dataset which contains partial face data, captured from any viewpoint between +/-45 degrees, is used for the experiments. This proposed method consists of three steps. First, the 2.5D facial data is fitted to an ellipsoid. Second, each point on the facial surface is projected onto a major axis to define the nose region on the facial surface. Based on its Euclidean distance from the estimated center of the ellipse to the projected point on the major axis, the nose region is defined. In the final step, the Mahalanobis distance is used to search for the nose tip according to the point which is farthest from the estimated ellipse center. To evaluate the performance of the proposed method, the face of each subject is captured in five different viewpoints between -45 degree and +45

degree. In total, 22 subjects take part and 486 samples are collected. From the experiments, it is found that the nose tip is correctly detected with 65.02% accuracy. The results show that the proposed method should be improved for higher performance and ellipsoid method is satisfactory for primary nose detection. Advantages of this method are that it is stable to face rotation and avoids constant parameter setting as a method used in Ref. [7].

D1R2AL- Medical Image II
1569796093: Band Classification based on Chromosome Shapes

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Abstract:

IFor an automatic chromosome classification, band resolution information is required in order to perform diagnosis on numerical and structural abnormalities. Metaphases with low band resolution are normal used for numerical abnormality analysis while metaphases with high band resolution are used for structural abnormality analysis. In our work, we classify metaphases into low and high band resolution groups using chromosome shape. This band classification task can automatically perform without human intervention leading to faster the diagnosis process. The results showed that chromosome shape information is able to

classify metaphases into low and high band resolution groups with the accuracy of 73.08% and 95.24%, respectively.

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Keywords :
Correlation, fractal dimension, breast cancer diagnosis, estrogen, immunohistochemistry, back propagation, multilayer perceptron, feature extraction, classification.

Abstract:
This study proposes and evaluates a neural network (NN) classifier for dividing the histological structures (HS) in breast cancer (BC) microscopic image into two region types: cancer or normal. Cancer region included positive cells and negative cells while normal region included stromal cells and lymphocyte. The classification task using a back propagation learning al-

gorithm is applied to the multilayer perceptron architecture of NN classifiers. To yield a high classification performance, the main focus of interests is feature extraction task using four texture features: correlation, autocorrelation, the information measure of correlation and fractal dimension. A combination of these texture features is used in 60 images for training data set and 104 images for testing data set. The comparison of performances between each texture feature and the combination of them has been reported. The results show that the best classification accuracy obtained from the all features is 94.23%. This indicated that the texture analysis and NN classifier are feasible for dividing the HS in BC microscopic images and can be applied to improve and to develop an accurate cell counting of computer-aided systems for BC diagnosis.

D1R2AL- Medical Image II
1569797077: Detection of Glaucoma Using Retinal Fundus Images

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Keywords: –

Abstract:

This paper proposes image processing technique for the early detection of glaucoma. Glaucoma is one of the major causes which cause blindness but it was hard to diagnose it in early stages. In this paper glaucoma is classified by extracting two features using retinal fundus images. (i) Cup to Disc Ratio (CDR). (ii) Ratio of Neuroretinal Rim in inferior, superior, temporal and nasal quadrants i.e. (ISNT quadrants) to check whether it obeys or violates the ISNT rule. The novel technique is implemented on 50 retinal images and an accuracy of 94% is achieved taking an average computational time of 1.42 seconds.

D1R2AL- Medical Image II
1569796457: Patients-Pharmacists Interactive Communication System for Remote Medication Support

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Abstract:

Telecommunication systems for the pharmacists to support the outpatient medical treatment have been gaining attention. However in the conventional systems, low usability and interactivity of the system became key problems to support medication. In this research, we developed a patients- pharmacists interactive communication system and investigated it's benefit through a 2-month field trial. We carried out the trial for thirty-five outpatients plus their family, and four pharmacists in a dispensing pharmacy in Yokohama. The result showed high effectiveness of the proposed user-interface to the medication compliance and adherence.

Technical Program

Wednesday, October 23, 2013 (Day-1)	
Room	Room III Benjarong
Session	D1R3AL- Healthcare Information
Chair	Eakarat Boonchaing
15:30-15:45	1569804249 Bo Liu
15:45-16:00	1569802053 U. Muangna
16:00-16:15	1569802285 K. Duangchaemkarn
16:15-16:30	1569795551 K. Intharakham
16:30-16:45	1569796473 J. Ma
16:45-17:00	1569795991 T. Hanawa

D1R3AL - Healthcare Information
1569804249: Building Biomedical Pipelines for Large-scale Sequencing Analysis Based on Galaxy and Cloud

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Keywords:

Bioinformatics, Sequencing analysis, Cloud computing, Galaxy

Abstract:

With the widespread adoption of increasing and high-throughput sequencing data, the need for easy access to biomedical analysis tools, efficient data sharing and retrieval has presented significant challenges. Galaxy helps to address this problem by providing an open, Web-based platform for performing accessible and reproducible genomic analysis. To meet the needs for variable computing and storage resources, this paper deploys Galaxy on Cloud infrastructure for on-demand resources allocation, auto-scaling and pay-as-you-go pricing. We further extend Galaxy by complementing user-specific analysis functions, providing reliable and high-performance data transfer capabilities, and realizing Cloud-based distributed computing for Galaxy jobs. A biomedical pipeline and performance evaluation are presented to validate the effectiveness of our proposed approach.

D1R3AL - Healthcare Information
1569802053: Social Network for Thailand Medical Tourism

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Abstract:

The growth of medical tourism in Thailand attracted many organizations to develop applications for assisting traveler information. However, these applications may not satisfy all traveler's requirements in term of medical, tourism and social network. In consequence, this study has been proposed a new prototype of the mobile social network application to support medical tourist's requirement. The proposed application was designed to improve the quality of information by integrating three types of data: social networks, tourism and medical data from reliable resources such as Tourism Authority of Thailand (TAT), Facebook, Twitter and Google. The prototype of the application created to run on Windows Phone 7.5 which provides all travelers required information via Restful web services. The prototype test results of three cases in Bangkok area work well.

D1R3AL - Healthcare Information
1569802285: Application of Cloud Computing in the Hospital Drug Information Center in Thailand

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Keyword:

drug information service, drug information center, hospital information system, pharmacoinformatic, cloud-based, pharmacist,

Abstract:

The Hospital Drug Information Center (DIC) is an essential unit in a hospital, providing critical information to support clinical services for virtually every department in the facility. Current hospital information systems (HIS) have not provided adequate functionality to support the services of the DIC, which are primarily focused on documentation and reporting. The software described here represents an important step forward to fill this gap. This cloud-based software platform using ASP.NET, SQL server as a database management system (DBMS) and a model-view-controller as an interface architecture, consists of five major components covering each of the elements of the DIC report form. Using cloud-based technologies enables the software to be easily accessible, have adequate and easily expandable space for information storage, and facilitate sharing information in the medical community. By utilizing this software, pharmacists can substantially reduce the amount of time needed to assemble and manage reporting, save resources by reducing the amount of paper used, and significantly improve the level of service to their internal customers.

D1R3AL - Healthcare Information
1569795551: Complexity of Autonomic Control during Cerebrovascular Reactivity

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Keywords:

Heart rate variability, Cerebrovascular reactivity

Abstract:

Complexity of autonomic regulation affects the systemic vascular, but little is known about its influence on cerebrovascular regulation. In this study, we examine the complexity of neuromodulation by frequency and nonlinear heart rate variability (HRV) to cerebral reserve function during cerebrovascular reactivity (CVR) by breath holding induced - hypercapnia and subsequently, cerebral vasodilatation. Method: 16 healthy controls were monitored during CVR for arterial blood pressure (ABP), electrocardiography (EKG) and mean cerebral blood flow velocity (mCBFV) of middle cerebral arteries (MCA) with transcranial Doppler. Short term-one minute HRV was analyzed for LF/HF ratio, nonlinear of SD1/SD2 and SampEn. Result: An increase in LF/HF ratio   from 0.79 ± 0.85 to 2.05 ± 1.38 ($p<0.05$) was evident. Significant decrease of SD1/SD2 and SampEn during the experiment phase indicates predominant of parasympathetic activity associated with less irregularity. Less scatter signals of SD1 and SD2 with low value was illustrated from Poincaré plot. Significant increase in mCBFV during breath holding and recovery compared with baseline suggests hypercapnia induced-vasodilatation. Moreover, significant negative correlation between SD1/SD2 vs mCBFV suggests complexity of ANS control and cerebral blood flow. This is first report that nonlinear HRV is applied to physiological mechanism of vasodilatation triggered by hypercapnia from CVR. In conclusion, best fit of nonlinear HRV with frequency domain is proposed in CVR assessment which it will be applied to small artery stroke.

D1R3AL - Healthcare Information
1569796473: Kinematics features of gait in older women

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Key words:

rural women, kinematics, gait, walking

Abstract:

The purpose of this study was to compare kinematics during walking for rural and urban healthy older women. Twelve subjects participated in this study, and foot biomechanical data during walking were quantified using motion analysis system. The study found that rural elderly women demonstrated significantly less than the urban elderly women on the stride length, stride speed and ankle plantar flexion, and in the knee range of motion, stride time and foot-off time were significant greater than urban elderly. The results indicate that lower extremity muscle strength in rural older women is less urban elderly women of the same age.

D1R3AL - Healthcare Information
1569795991: A Prototype of Simple Image Database System for Dermatological Clinics

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Abstract:

Electronic health record systems are gradually coming into use at large hospitals, but are not yet implemented at clinics. This is due to both expensive costs and a lack of interest in checking electronic health records on the part of patients. And doctors also do not want to show patients their health records, as it then may require a doctor to let patients observe images to check for improvement of symptoms at follow-up. In this paper, we propose a simple web based database system of affected part images that both doctors and patients can check. In the prototype system, doctors can photograph affected part areas and tagging keywords such as patient's ID, patient's name, affected part name and prescription. The system is implemented on smartphone and tablet for both doctors and patients quickly and easily use during medical examination in the clinic.

Technical Program

Thursday, October 24, 2013 (Day-2)	
Room	Room I: Queen's bay hall
Session	D2R1ML-Imaging III
Chair	Pornchai Phukpattaranont
10:30-10:45	1569797379 A. Tuntakurn
10:45-11:00	1569797743 S. Pongyupinp anich
11:00-11:15	1569803993 W. Aruntammanak
11:15-11:30	1569801837 S. Adhan
11:30-11:45	1569799017 S. Suwanmanee
11:45-12:00	1569797153 W. Sittiprapaporn

D2R1ML-Imaging III
1569797379: Natural Interactive 3D Medical Image Viewer Based on Finger and Arm Gestures

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Abstract:

In this research, we propose a natural interaction on 3D medical image viewer software. The goal is to replace the windows, icon, mouse and pointer (WIMP) paradigm which might not be convenient in an operating room as sterilization becomes an issue. The Kinect sensor was used as a controllerfree input. The fingertip tracking algorithm was implemented and, combined with existing skeletons from the Kinect sensor. Both finger and arm gestures are used for controlling the 3D medical viewer software. Suitable gestures were designed. We

tested our proposed technique in terms of accuracy and performance using 10 subjects. The average accuracy for gesture classification is 93%, and the total time required to cover all controls of 3D medical viewer is about 2.25 minutes on average. The results also show that the proposed technique is applicable for controlling 3D medical image viewer software without the WIMP system.

D2R1ML-Imaging III
1569797743: Framework and Estimation of Ear Biometrics Detection for Digital Forensic Applications

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Keywords: –

Abstract:

Currently, forensic electronics and computers become an attractive scientific and engineering application area. They are applied to determine and identify accused or evidences used in court. However, the determination, verification and identification processes have been manually executed by experts, where they take time to come out conclusions and results. With rapidly increment of illegal cases, reducing the processing time or verifying step to identify possible suspects is significantly importance to increase efficiency. This paper first introduces a framework to identify possible suspects purpose to primary screening in forensic application. The identification of human ears in several degrees based on edge detection techniques is second considered. With the edge detection techniques corresponding to their suitable input parameters, our experimental results, with a 0.3 threshold and a 0.75 factor k, have reported that the human's ear identities can be detected and extracted.

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Abstract:

Normally, there have been many methods to diagnosis of flat foot. Each method is different to use indicators e.g. Staheli arch index, Clark's angle and Chippaux-Smirak index. However, the results from such indicators are still varied in each method. Therefore, this paper proposes a classification of the flat foot by combining of multiple indicators with neural network process. It can improve an accuracy of classification more than the use of only one indicator. There are 132 images of footprints (left and right foot) consisting of normal foot or flatfoot. The experimental results using a combination of indicators show that an accuracy of the result is up to 93% more than the single index i.e. Staheli arch index 43%, Clark's angle 68%,Chippaux-Smirak index 80 %. It can make more precisely diagnose of flat foot.

D2R1ML-Imaging III
1569801837: 3D Extraction Using DLT with One Camera

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Abstract:

This paper proposes a method for accurate measurement of a three-dimensional of an eye's pupil by combining local stereo images which are acquired from multiway. A calibrated mini CCD camera is used to capture the side-by-side image of one eye by two plane mirrors to create a reflection of the two directions of the eye at a time. The center of mass is used for two-dimensional coordinates of the center of the pupil. The new and simple technique to solve the problem of geometric distortion is proposed by taking advantage of the Direct Linear Transformation (DLT), which requires only a single step in the refinement stage without changing or reinstalling a camera. The DLT algorithm was used for the threedimensional co-ordinates of the center of the pupils from the previous two-dimensional coordinates for the three-dimensional position of the eyes is detected. The results are the statistical errors only slight, mean = 0.16, S.D. = 0.15, which shows that the system is suitable for high-precision medical applications for the movement of the human eye.

D2R1ML-Imaging III

1569799017: Comparison of Video Image Edge Detection Operators on Red Blood Cells in Microvasculature

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Keyword:

edge detection; red blood cell; video image processing; gradient based edge detection; zerocrossing based edge detection

Abstract :

This study focused on the step of preprocessing in the part of edge detection techniques to detect red blood cells (RBCs) boundaries. The objectives of the study were to make a comparison between gradient based edge detection and zerocrossing based edge detection and to find out the appropriate operator to use for edge detection of RBCs in capillary. Sobel, Robert, Prewitt and Canny were used as gradient based edge detectors whereas Laplacian of Gaussian was used as zerocrossing based egde detector. Our study used two criteria to consider the quality of edge detector by eye judgment: the probability of a false positive and the probability of a false negative. It was found that Canny and LOG are suitable to use as edge detectors for RBCs in microvasculature.

D2R1ML-Imaging III
1569797153: Increased Oscillatory Activity as Evidenced by a Cumulative Dose of Alcohol

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Keyword:

Electroencephalogram (EEG); Standardized Lowresolution Electromagnetic Tomography (sLORETA); Brian; Accumulative consumption; Alcohol

Abstract:

Background EEG power effects of a cumulative dose of alcohol were investigated as subjects drank three glasses of alcoholic, 1 h apart. Subjects completed a task battery composed of digit span tests, 3 min each of eyes-open and eyesclosed resting EEG, and two blocks of an auditory N-back working memory task for measuring brain function of different segmental features in monosyllabic Thai words. The changes in cognitive effort caused by the difficulty manipulation in the Nback task were reflected in specific EEG signals. Measuring EEG activity before and after alcohol consumption, during the performance of difficulty manipulation in N-back task of working memory indicate that neuronal populations needed for working memory processing were less available after alcohol consumption because of increased background oscillatory activity as evidenced by increased background EEG power.

Technical Program

Thursday, October 24, 2013 (Day-2)	
Room	Room II Pra Nang
Session	D2R2ML-Signal III
Chair	Caillin Eastwood-Sutherland
10:30-10:45	1569807865 E.S. Caillin
10:45-11:00	1569804199 E. Thammasat
11:00-11:15	1569803515 Y. Pimtongngam
11:15-11:30	1569803035 R. Hussein
11:30-11:45	1569802977 F. Philipp
11:45-12:00	1569802761 M. Kampong

D2R1ML-Signal III
1569807865: Comparing the Incomparable: Ranking Motion Recordings when Accuracy Data is not Availabl

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Website: http://www.caillin.id.au

Keyword: -

Abstract:

Many different types of biomedical data can be recorded, however not every method of interpreting this is equally applicable for comparison within or between test groups. When comparing related but dissimilar group members sometimes it is necessary to use alternative methods of analysis, potentially with data derived from the originally recorded data. This paper outlines one such method that was used to compare a biological arm to a prosthetic arm, without relying on values of accuracy. By deriving data that represents the reliability of both the prosthetic and biological arm, it was possible to determine a rating of how function-ally "good" each arm is individually. These ratings were compared to allow a comparison of arm function, rather than the actual arms themselves. It was determined that of the arms tested, the prosthetic arm was less reliable than the biological arm. This method can be used to further compare these two arms to other arms. Future research could include the addition of multiple prosthetic arms, larger data sets and other methods of comparison.

D2R1ML-Signal III
1569804199: The Statistical Recognition of Walking, Jogging, and Running Using Smartphone Accelerometers

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Keywords:

Accelerometer, walking, jogging, running.

Abstract:

This study was conducted to statistically recognize the walking, jogging, and running activities by using accelerometers build-in a smartphone. Using the smartphone causes the user need not to carry another device more. The advantage of the study is to observe remotely any movement of an interested person at all time so the observer can manage appropriate program for exercise, monitor energy consumption, or evaluate calorie compensation. The method used for the recognition applied the statistical analysis: descriptive statistics, analysis of variance, F-test, and t-test.

D2R1ML-Signal III
1569803515: Classification of Nitric Oxide Assessed by Hybrid Kernel Function in Lacunar Stroke

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Abstract:

Nitric oxide (NO) is a key oxidative stress marker. Real time NO measurement in pA/nM by electrochemistry is the powerful tool explores pathophysiological process of many disease including stroke subtypes, especially, lacunar stroke. In this study, we investigate the performance of classification models by hybrid nonlinear kernel function of NO obtained from healthy control and lacunar stroke. The results show that hybrid kernel function classifier has higher performance than those of linear, polynomial, radial basis function (RBF) and sigmoid kernel functions and also gives the best classification of NO in normal and lacunar stroke. In conclusion, hybrid kernel function will be applied and further studied in acute lacunar stroke, chronic hypertension and hyperlipidemia..

D2R1ML-Signal III
1569803035: Adaptive Compression and Optimization for Real-Time Energy-Efficient Wireless EEG Monitoring Systems

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Abstract:

Recent technological advances in wireless body sensor networks (WBSN) have made it possible for the development of innovative medical applications to improve health care and the quality of life. Electroencephalography (EEG)-based applications lie at the heart of this promising technologies. However, excessive power consumption may render some of these applications inapplicable. Hence, intelligent energy efficient methods are needed to improve such applications. In this work, such improved efficiency can be obtained by utilizing smart compression techniques, which reduce airtime over energy-hungry wireless channels; In particular, discrete wavelet transform (DWT) and compressive sensing (CS) are used for EEG signals acquisition and compression. To achieve low-complexity energy-efficient system, the proposed technique makes use of the receiver feedback signals in order to switch between both algorithms based on the application needs. Experimental study has shown that the proposed algorithm effectively reconfigures the utilized compression algorithm parameters based on a channel feed back signal.

D2R1ML-Signal III
1569802977: A Reconfigurable Wireless Platform for Biomedical Signal Processing

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Keywords: -

Abstract:

This works introduces a wireless signal processing platform based on a low-power FPGA. The architecture of the circuit is customized for the processing of sensor data used in biomedical applications such as ECG, EEG, or activity recognition using wearable computing. Hardware accelerators can be dynamically reconfigured to implement multiple signal processing tasks in a time-multiplexed manner. This approach allows reducing the size of the computing hardware while enabling energy-efficient operation. The functionality of the system is demonstrated for feature extractions in activity recognition applications.

D2R1ML-Signal III
1569802761: An Investigation on Parasympathetic Nervous System in Obstructive Sleep Apnea Syndrome

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Keywords:

Obstructive sleep apnea syndrome (OSAS), The RSA impulse response magnitude, parasympathetic autonomic function

Abstract:

The parasympathetic nervous function in obstructive sleep apnea syndrome (OSAS) patients were quantified by using the respiratory sinus arrhythmia (RSA) impulse response magnitude. Ten participants were recruited and classified into three groups; mild (four participants), moderate (four participants) and severe (two participants) groups. Autoregressive with exogenous input (ARX) model was used to precisely separate the effect of respiration and systolic blood pressure to heart rate variability (HRV). The RSA impulse response magnitude, the parasympathetic autonomic function index, was estimated during supine and standing conditions. We found that the RSA impulse response magnitude during supine and standing, orthostatic stress, remained unchanged. Therefore, parasympathetic autonomic function impair in OSAS.

Technical Program

Thursday, October 24, 2013 (Day-2)	
Room	Room III Benjarong
Session	D2R3ML-Physiological Modeling
Chair	Brad Reiseld
10:30-10:45	BMEiCON2013-0004 S. Taertulakarn
10:45-11:00	1569802463 A. Wongkamhang
11:00-11:15	1569804411 Kittipan Roongprasert
11:15-11:30	1569801631 A. Kiang-ia
11:30-11:45	1569802259 C. Phairoh
11:45-12:00	1569802267 P. Phasukkit

D2R3ML-Physiological Modeling
1569802463: Design and Simulation of Air Flow Inside Double Wall Infant Incubator By Using 3D FEM; Case Study for Multi Inflow and Outflow Slot.

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Abstract:

This paper presents a concept of the design and development of an infant incubator by increasing a number of an air flow slot for air-inlet and air-outlet inside a double wall infant incubator. The number of airflow inlet slot is increase to 2 while an airflow outlet slot is to 4 at the lateral side. The study is done by using FEM simulation to compare between single air

flow slot and multi air flow slot. The simulation results show that air temperature in multi-slot provides more distribution that the single wall obviously and no air layer exist in the air hood. In term of rising temperature, 4 temperature monitoring points was located around an infant area then be averaged during simulation process, multi-slot show a shorter time than single-slotto reach a setting temperature at 35 C. These simulations provides a useful basic information to prepare a real validation in the near future

D2R3ML-Physiological Modeling
1569804411: Heat and Mass transfer of infant radiant warmer by Computer simulation

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Keywords:

Heat and Mass Transfer, Infant Radiant Warmer, Computer Simulation

Abstract:

This paper presents an analysis of heat transfer from the surrounding area skin of newborn under using infant radiant warmer (IRW) by finite element three-dimensional software. And to compare the results of heat transfer measurements from experiments on the IRW in used everywhere. In this study, results are obtained for a simplified model. It is equipped with. Systems design, the properties of materials and processing methods using finite element threedimensional software. The results of the simulation using COMSOL Multiphysics 3.5a programs will be compared with the experimental results of heat transfer in newborn skin mounted on the IRW. The criteria are in the form of a temperature graph that is installed in a location that is designed to provide a virtual environment as far as possible. To ensure the accuracy of the experimental verification of the simulation method, the finite element model at 3 D. In order to make the research more easily add features in the future.

D2R3ML-Physiological Modeling
1569801631: Mechanical Analysis of Mechanical Aortic Heart Valve : Trileaflet versus Bileaflet

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Keywords:

trileaflet valve; bileaflet valve; stress distribution; strain; finite element method

Abstract:

Valvular heart disease is considered as an important problem of heart. The mechanical heart valve replacement is one of the methods used to treat valvular heart disease. There are many designs of mechanical heart valves including bileaflet and trileaflet valves. As the heart valve operates under the blood pressure conditions, it might be damaged or impaired. We aimed to design a trileaflet mechanical heart valve and compare with a bileaflet mechanical heart valve using mechanical analysis. Stress and strain on mechanical aortic heart valve, during opening and closing, were determined with a finite element analysis including deformation. Our simulation results showed that the maximum stress and strain, when valve opened, occurred at the hinge joint of leaflet in both trileaflet and bileaflet valves. But the stress concentration on the hinge joint in our designed trileaflet valve was less than that in the bileaflet valve. The leaflet deformation in trileaflet valve was lower compared to bileaflet valve. Our study suggested that geometryof leaflets and hinge joint play an important role in the stress and strain distributions occurred on heart valve including leaflets.

D2R3ML-Physiological Modeling
1569802259: Bone drilling by using microwave ablation; FEM investigation

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Keywords:

Microwave bone drilling, thermal ablation, FEM

Abstract:

Bone drilling by using heat energy from microwave is a promising research issue and has been proposed by some researcher. However, there are still some interesting topics remaining to be investigated especially in term of a temperature variation during burning or drilling process and a prediction of an extreme burning size or drilling diameter. In this paper, we propose an FEM investigation of bone drilling by using microwave thermal ablation emphasizing on a temperature distribution pattern and temperature variation at a hot spot of a cutting-end antenna. Bone phantom was modeled as two solid layers as cortical and bone marrow part. Simulation was implemented in three different applicator positions in bone model as a top surface, middle and near marrow. The obtained simulation results give us useful information to design more suitable and practicable applicator for heat pattern focusing in a compact bone tissue and also encourage us to validate with a bovine bone in near future.

D2R3ML-Physiological Modeling
1569802267: Airflow Analysis of Radiofrequency Ablation for Asthma Therapy by using 3D Finite Element Method

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Keywords:

Radiofrequency Ablation, Asthma Therapy, Finite Element Method, Temperature, Airflow.

Abstract:

The research aimed to present airflow analysis of radiofrequency ablation for asthma therapy by using threedimensional finite element method. We study a solution for asthma therapy by using radiofrequency ablation method. Airflow is main factor for asthma therapy. Asthma patients have shortness of breath, coughing, wheezing, and chest tightness that influence a daily life of patients. All symptoms cause to die, especially in severe symptom patients. Asthma therapy by using radiofrequency ablation is a new alternative maneuver to the patient and hopefully may extend his lifetime, reduce using of medicines in asthma treatment and also save money on medical care. The simulation results obtained from our three-dimensional

Technical Program

Thursday, October 24, 2013 (Day-2)	
Room	Room I: Queen's bay hall
Session	D2R1AE--Signal IV
Chair	Yagi Tohru
13:30-13:45	1569801891 T. Sone
13:45-14:00	1569801923 A. Hattori
14:00-14:15	1569797111 P. Gatkine
14:15-14:30	1569796855 T. Matsuura
14:30-14:45	1569798041 T. Leauhatong
14:45-15:00	1569796009 T. Miyakawa

D2R1AE—Signal IV
1569801891: Drowsiness Detection by Skin Potential Activity

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Abstract:

Conventional drowsiness detection devices are usually equipped with infrared LEDs and CCD cameras; however, they are adversely affected by factors such as ambient light and the use of eyewear. Drowsiness detection by other methods would thus improve such devices. This study examines skin potential activity, which is not affected by the aforementioned factors. Response performance during monotonous work using visual stimuli was quantified as drowsiness and compared with skin potential activity.

D2R1AE--Signal IV
1569801923: Permeability of Tubular Membrane Protein

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Yoshitaka MIYAMOTO

National Center for Child Health and Development Tokyo, Japan

keywords:

Membrane protein, optical measurement, membrane potential, simultaneous measurement

Abstract:

Electrical stimulation is an important technology for medical devices; however, safely limiting the electric current injection is an issue that remains to be solved. To improve the electrical properties of electrodes, we have proposed the use of tubular membrane proteins for achieving intracellular stimulation. This electrode, called "proteoelectrode", is designed to control membrane potential across the pores of tubular membrane proteins. In this study, we evaluated the ion transport capability of tubular membrane proteins by using two different methods: electrical measurement and optical recording. Both experimental techniques indicated a similar ion transport capability. In addition, adequate calibration of optical recording, which is a relatively simple technique, required less recording time than electrical measurement for an equivalent accuracy.

D2R1AE—Signal IV
1569797111: Development of Piezo-electric Sensor Based Noninvasive Low Cost Arterial Pulse Analyzer

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Dr. Santosh Noronha

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Abstract:

Recent researches have demonstrated implications of Arterial Pulse analysis from Radial and Brachial artery on cardiovascular, renal and autonomic nervous system, as early indicator of major ailments. We have developed a low-cost Arterial Pulse Analyzer which provides run-time display of Arterial Pulse waveforms during the test as well as provides analysis of the waveforms in digitally storable format. The dynamic pressure waves at radial and brachial arteries are recorded non-invasively using piezoelectric ceramic plate sensors. The parameters analyzed are: S-P-T-C-D points, Augmentation index, pulse wave velocity, 2nd derivative analysis for arterial ageing index, Pulse rate variability and Power Spectrum of Pulse rate variability. The setup is portable and consists of 2 straps, one each for Radial and Brachial artery, with sensors mounted on them. Signal Processing and Analysis is done using Python

on a Tablet PC. It is aimed to become a potential automatic cardiovascular screening device for public health centers in developing countries as they typically lack medical expertise and access to diagnostic devices for cardiovascular diseases. Commercially available arterial pulse analyzers are not portable and have an average cost of around 4000USD. This

system is portable, requires minimal power and cost 100USD, several of the technologies employed being free or open-source.

D2R1AE—Signal IV
1569796855: Gait Identification based on FIR system Characterizing Motion of Leg

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Abstract:

This paper presents gait identification method based on Finite Impulse Response (FIR) system characterizing motion of leg. First, the four gait features, area of footstep, angle of footstep, height and width of the human silhouette image, are calculated from the human silhouette image. Then they are expanded into Fourier series to reduce the fluctuation of human body motion. The motion of leg can be characterized by two FIR gait identification systems. For the first FIR system, the Fourier coefficients of the width of human silhouette image and the area of footstep are used as input and output of the system, respectively. For the second FIR system, the Fourier coefficients of the height of the human silhouette image and the angle of footstep are used as input and output of the system, respectively. The obtained impulse responses of the two FIR systems are used as the individual feature for gait identification. The gait identification experiments were performed on CASIA GAIT Dataset B [6], which contains 8,184 gait data for 11 view angles from 124 persons. The average of error rates obtained from 90° view angle was 3.48%.

D2R1AE--Signal IV
1569798041: ECG Analysis for Person Identification

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Keywords:

ECG Biometrics; Single Beat ECG features extraction; ECG Identifications

Abstract:

Electrocardiogram (ECG) has been actively proposed as aliveness biometric. In this paper, the study which concern to a realistic application is proposed. Firstly, a single lead normal ECG signal is acquired from individuals of 10 subjects. Then, each single beat ECG is segmented and analyzed in Continuous Wavelet Transform (CWT) domain. Total energy of wavelet coefficients for each P, QRS, and T segment is calculated. Next, the Fisher Linear Discriminant Analysis (FLDA) is applied. Finally, normalized Euclidean distance is implemented as a classifier. In experimental results, 97% of classification accuracy is achieved in case of a normal ECG (with non-variation of heart rate).

D2R1AE--Signal IV
1569796009: Involuntary-Blink Detection Method Robust Against Dynamically Change of Frame Rate

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Abstract:

This paper proposes a robust method to detect involuntary blinks for visual display terminal (VDT) users using Web camera, even if the Web-camera's frame rate dynamically changes and becomes slow. Conventional methods which are widely used for drivers and paralyzed person with higherperformance camera, calculates correlation between an open eye template and cureent eye image at each frame, and judge the blink to have occurred when the correlation score falled below a pre-defined threshold value. In our proposal aimed to use for Web camera build-in personal devices and widely used inexpensive Web camera for the threshold value is dynamically controlled according to varying frame rate and effective value of the correlation score. We implemented a blink detection system into laptop PC with build-in Web camera. The experimental result show that the proposed method imporved blink detection accuracy at low frame rate.

Technical Program

Thursday, October 24, 2013 (Day-2)	
Room	Room II Pra Nang
Session	D2R2AE-Rehabitation
Chair	Warakorn Chareornsuk
13:30-13:45	1569802299 T. Prasertsakul
13:45-14:00	1569802325 P. Klaynin
14:00-14:15	1569804329 J. Pinitlertsakun
14:15-14:30	1569797041 S. Jirayucharoensak
14:30-14:45	1569797209 K.A. Rahman
14:45-15:00	1569796985 T. Maruyama

D2R2AE-Rehabitation
1569802299: Virtual Pattern Classification of Upper Limbs Motion Using Artificial Neural Networks

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Keywords:

Virtual reality, video capture motion, neural network, pattern classification

Abstract:

Virtual reality technology is common used to entertain people as movies or games. At present, this technology applies to medical field for training surgeon on operating simulation or patients with either neurological disease or psychiatric disorder. The study focused on the algorithm of pattern classification. The artificial neural network was considered to achieve this classification. The multilayer perceptron with four input nodes, thirty nodes in hidden layer and five output nodes were designed for this classification algorithm. The virtual reality showed the animator who acted as the trainer. The movement of trainer was used to be the supervised data of the neural network. The users moved their arms along with the animator and recorded the motion. These data were the testing data set of network. The results showed that the neural network could classify all motion patterns. It was difficult to classify the patterns in the same side Pattern 5 was correctly classified by this neural network model.

D2R2AE-Rehabitation
1569802325: An electrocardiogram classification method based on neural network

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Keywords:

Variable Selection, classify the ECG, Electrocardiogram, Neural Network, wavelet transformation,wavelet filter, DC offset, feedforward backpropergation

Abstract:

The ECG is a method for the detection of cardiovascular disease is simple and effective. The ECG. Check that the electricity produced on the heart muscle, cardiac compression. At the point where the heart muscle cells that can create a special type of electricity itself. We call this point that Sinus node electrical current to run through the muscles of the head room on the power that we have called the P wave flow to stop the connection between the atria and ventricles called the AV Node, then electricity will ran down the left and right atria, and the resulting current is called the QRS complex of normal myocardial preview graph. This paper illustrates the classification of electrocardiogram (ECG beats) are proposed trained by feedforward backpropergation method and logistic

regression variable selection method. The objective of variable selection is reduce a variable of ECG beat ,it will be improving classification , providing faster and avoid over fitting situation. We tested both methods so variable selection method. The ECG Data from MIT-BIH arrhythmia database for classify 5 types. These are atrial premature contraction, Normal, left bundle branch block, right bundle branch block and Premature ventricular contraction. The ECG signal model of cardiac cycle are included P wave, QRS complex, T wave and U wave. A U wave will be invisible by the T wave. So we selected and present the classification and results that make us interested in system design for find new solution for ECG Classification.

D2R2AE-Rehabitation
1569804329: Design of the Prosthetic Knee Component to Assist Stair Ascending Gait

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Abstract:

For trans-femoral (TF) amputee, the prosthetic knee component performs important roles to assist the motion of prosthetic leg during gait. Even though the variety prosthetic knee component can perform variety functions, the stair ascending gait still be the challenge mode of gait for TF amputee as the unexpected environmental had to be faced daily. This study is aiming to establish the design of the prosthetic knee component to assist stair ascending gait and to provide the control device by the microcontroller. The device from this project will be later applied to the indicated subject to perform real stair ascending gait.

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Abstract:

Online EEG artifact suppression system is a crucial function of real-time Brain Computer Interface (BCI) applications. EEG artifacts significantly affect the accuracy of feature extraction and data classification for estimating cognitive states in Neurofeedback Training (NFT) systems. The EEG artifacts derived from ocular and muscular activities are inevitable and unpredictable due to subject's physical conditions. One of the most prominent techniques employed to suppress the EEG artifacts is Independent Component Analysis (ICA). This technique separates EEG signals into Independent Components (ICs) and then discriminates EEG artifacts from neutrally generated brain signals. Nevertheless, the source separation of ICA algorithm is imperfect. The IC identified to be an artifact can include brain wave activities useful for state classification. The proposed method will elaborate on the ICs with a lowcom

plexity wavelet transform to extract the useful neural signals from the artifact component in real-time. This suppression technique implemented in NECTEC's Neurofeedback System for Attention Training was tested in pre-trial sessions with 10 healthy subjects and 5 MCI patients at Chulalongkorn Hospital. Experimental results prove the performance and accuracy of the proposed suppression algorithm of light and strong eye-blink artifacts.

D2R2AE-Rehabitation
1569797209: Relationship Between Brainwave Signal and Human Activity of Knee Joint Movement for Paraplegic

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Keywords: –

Abstract:

Function impairment in chronic gait can be caused by abnormal neurological conditions, such as stroke, spinal cord injury, and traumatic brain injury. Only a limited degree of motor function recovery can be provided by using current physiotherapy techniques. Brain-computer interface (BCI) is a modern novel technology with a potential to substitute or restore lost motor behaviors in patients with neurological injuries. Therefore, this paper will discuss about the relation between brainwave signal and human body part activities. The International

10 - 20 Electrode Placement System has been used in this experiment. This method has been selected due to the number of electrodes used in this experiment which are about 3 electrodes in order to record the brainwave signal of the subjects. The subjects have been asked to perform two specific tasks in 30 seconds. The tasks must be performed while the subjects close their eyes because this will give maximum concentration during the experiment and the data was recorded every 2 seconds. The performance of the two subjects has been assessed. The highest feedback for this experiment came from the alpha type signal compared to others signal. From this experiment, it is shows that the brain wave signals have effect on the thinking activities. Also noticed that the concentration or focus aspect during the experiment is important and must not be ignored

D2R2AE-Rehabitation
1569796985: Deloment of A Novel Co-culture Device of Neuronal Cells for Construction of in vitro Alzheimer's Disease Model Pathogeniety Analysis of Amyloid ß-(1-42) Peptide

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Abstract:

A novel co-culture device of neuronal cells was developed for analysis of cell interaction between a normal cell and an Alzheimer's disease infected cell. The device consisted of co-culture chamber system and a microelectrode arrays(MEA). The chamber system has a central chamber and three peripheral compartment chambers, connected by micro-channels. Rat hippocampal neurons were cultured separately in each of the peripheral compartment chamber. Neurites of the hippocampal neurons grow through the micro-channels to reach the central chamber and make connection. Formation of synaptic junction of the neuritis was confirmed by the imuunohistochemical staining. Electrical activities generated by hip

pocampal neurons network were recorded by the MEA, placed on the bottom of the three compartments. The results demonstrated the capability of this device for the analysis of pathogenic mechanism of Alzheimer's disease.

Technical Program

Thursday, October 24, 2013 (Day-2)	
Room	Room III Benjarong
Session	D2R3AE-Biomaterial and Tissue
Chair	Jirut Meesane
13:30-13:45	1569802173 W. Yeelack
13:45-14:00	1569802445 B. Methachan
14:00-14:15	1569802171 Antje Pohl
14:15-14:30	1569802571 M. Zaltum
14:30-14:45	1569801899 M. I. Maksud
14:45-15:00	BMEiCON2013-003 T. Wangkam

D2R3AE-Biomaterial and Tissue
1569802173: Preparation and Characterization of Coated Silk Fibroin Films with Mimicked Re-self Assembly Type I Collagen

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Keywords:

silk;collagen;self-assembly; biomimetic; scaffold.

Abstract:

The study aimed to investigate and compare characteristics of Bombyx mori silk film coated with mimicked re-self assembly collagen type I under various conditions concentration [0.25,0.5,1.0,2.0 mg/ml]. The thin films consist of collagen fibrils and result from the selfassembly of collagen. The morphological characteristics observed by scanning electron micro copy (SEM) showed that when increased in collagen concentration, collagen became increase the size of the fibrils. The structure and thermal behavior all kind of silk coated with collagen were determined by FT-IR and DSC instrument. FT-IR spectra showed both spectra of silk and collagens are assigned to -sheet conformation of silk fibroin and collagen type I. The stability thermal peak shifted to slightly higher temperature increasing collagen concentration content. Mechanical properties of silk film coated collagen demonstrated that coating collagen at concentration 1-2 mg/ml resulted in modification of mechanical features, with increased maximum load, stress, strain, and Young's modulus .

D2R3AE-Biomaterial and Tissue
1569802445: Photocurable Poly(Lactic Acid) for Use as Tissue Engineering Scaffold

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Keywords:

poly(lactic acid), photopolymer, tissue engineering scaffolds.

Abstract:

Polymers and polymer composites are one of the most interested biomaterials to replace the using of metals and ceramics. The main advantages of the polymer are that they are easier to custom made and they are bioresorbable. Their mechanical properties are unmatched when considered to replace metals or ceramics. A photocurable poly(lactic acid) (PLA) resin was developed in our laboratory for use as a tissue engineering scaffold by means of stereolithography (SLA) technique. The main goal of this work is to improve the mechanical properties of the samples made from the PLA resin. First, PLA resins are synthesized from two different isomers; L-Lactide and D,L- Lactide. Maximum flexural stress of the samples made from both resins is not statically significant but is almost double when compared with commercial bone cements. When L-Lactide resin is sterilized by gamma ray, the sterilization slightly increases both maximum flexural stress and flexural modulus. The degradation of the sterilized samples in 1X PBS at 37oC also improves in terms of mechanical properties. Adding of carbon nanotube functionalized with carboxyl group decreased the mechanical properties of the samples by 35%. From these results, the carbon nanotubes needed to be modified before adding to improve mechanical properties of the photocurable PLA.

D2R3AE-Biomaterial and Tissue
1569802171: Electrical Neurostimulation of Isolated Sympathetic Nervous Rat Cells of the Superior Cervical Ganglia

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Abstract:

The electrical neuromodulation of the autonomous nervous system is a relatively new field of research with targets such as relief of pain by spinal cord stimulation or deep brain stimulation for Parkinsons disease. Regarding the prevention of cardiovascular diseases, one idea is to electrically stimulate e.g. the sympathetic nervous system, which can typically only be influenced by release of medication, increasing the force of the contraction and efficiency of the heart. This would benefit patients suffering from heart failure according to reduced pumping function. For a detailed investigation and functional characterization of the intra-cardiac nervous system, sympathetic cardiac cells from neonatal rats have been isolated and preprocessed with preparation medium, enzyme solution, incubation medium and final medium. Divided in stimulation and control groups (n = 27), the cells were kept in a culture cabinet at 37 oC and the stimulation group additionally has been stimulated for 48 h in culture dishes with two graphite electrodes in each well. We show the design and realization of the neurostimulation system based on a microcontroller, offering independent control of various stimulation patterns and adjustable frequencies, voltage amplitudes and burst durations for a deeper knowledge of stimulation results and most effective parameters.

D2R3AE-Biomaterial and Tissue
1569802571: Electroporation Effect on Growth of HeLa Cells

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Keywords:

electroporation; HeLa cell; proliferation; cell culture and electroporation

Abstract:

Electroporation is a process of the biophysical effect on cells exposed to an external electrical field is gaining applications in medical treatments, especially to create pores through a cell membrane and allow uptake of DNA into a cell. Therefore, in the theoretical evaluation of electroporation, transmembrane potential and characteristics of the cells growth is the target of the analysis. In this study, we used cervical cancer cells (HeLa cells) to be sample for electroporation, because HeLa cells is one of the most well-known cell lines, and easy to researched by continuous harvesting of large numbers of HeLa cells for in-vitro experimental tests. In this study we demonstrate the activity of HeLa cells induced with high voltage of 2700V/cm via a pulse length of 10μs. As a summary, it was found that the HeLa cell growth rate increased up to 50% faster when applied EP incomparison to the cell without EP treatment.

D2R3AE-Biomaterial and Tissue
1569801899: Optimizing a Polydimethylsiloxone(PDMS) into Flexographic Printing Process for RFID Biomedical Devices and Cell Cultures

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Keywords:
PDMS; Flexographic; RFID; Biomedical

Abstract:
It is demonstrated that cell culture can be printed into flexible polymer substrates for biosensor making by flexographic, utilizing a PDMS stamp. And addition multiple micro-scale fine solid line was successfully printed as fundamental work toward development of micron scale and low cost mass production of UHF passive RFID sensor for biomedical such monitoring the movement of healing limbs, to warn about too large movement or for monitoring chest breathing movements. In term of cell culture printing, acknowledge that it is very important to stop and detects are biological pathogens such as bacteria and viruses in order to control diseases apparition and to insure the environmental reliability of air, water or food. The flexible substrates like a thin polymer films is ideal to be used due to their flexibility, low cost and ease of fabrication, to support bio-medical sensors.

Technical Program

Thursday, October 24, 2013 (Day-2)	
Room	Room I: Queen's bay hall
Session	D2R1AL-Signal V
Chair	Kohji Masuda
15:30-15:45	1569804139 K. Masuda
15:45-16:00	1569797417 C. Jinjakam
16:00-16:15	1569797037 T. Phanprasit
16:15-16:30	1569796155 A. Masdar
16:30-16:45	1569796523 C. Panyindee

D2R1AL-Signal V
1569804139: Three-dimensional behavior reproduction of microbubbles in flow under local ultrasound exposure

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Takumi Ito

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Naoto Hosaka

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Takashi Mochizuki

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Abstract:

We have researched to control microbubbles in blood vessel by use of the acoustic radiation force for efficient and lower adverse effects medical treatments. However, behavior of microbubbles under the ultrasound exposure is complicated because of many kinds of parameters. In addition blood vessel network in human body is not simple. From these reasons,

it is important to estimate emission condition of ultrasound. Therefore, numerical simulation model of microbubbles in flow is introduced. By concerning flow and ultrasound conditions, we have constructed a three-dimensional simulation to reproduce behavior of microbubbles using finite element method (FEM). As the results, the simulation showed good coincidences to the result of experiments in lower frequency, however, radius change of microbubbles and acoustic force perpendicular to the propagation direction should be considered in higher frequency.

D2R1AL-Signal V
1569797417: Parallax, Position and Height Difference effects on Simulator Sickness in Immersive Virtual Environment

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Abstract:

Immersive virtual environment in multiple large flat-screened influences simulator sickness to the subjects is different from the other non-immersive virtual environment as one-large projection screen, monitor screen, and head mounted display. This system provides an immersive experience in two different positions as the "driver" and the "passenger". Therefore, this research study parallax, position, and height difference (between driver and passenger) effects on simulator sickness in immersive virtual environment. Furthermore, the safety guidelines for immersive virtual environment are proposed.

D2R1AL-Signal V
1569797037: Compression of Medical Image Using Vector Quantization

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Keywords:

Vector Quantization, Discrete Wavelet Transform, Fuzzy C-Means, Curvelet Transform, Support Vector Machine

Abstract:

Medical image compression is necessary to store the huge database in Medical Centres and medical data transfer for the purpose of diagnosis. This paper attempts to improve the higher peak signal to noise ratio (PSNR) by using the system error compensation (SEC) method. The SEC design is based on quantization and curvelet transform (CT) decomposes the system error (E) to six scales. Only the scale 1 and scale 6 are constructed to error compensation. The simulation results are shown that the proposed method can improve 40.48 %, 9.69 % both in terms of bit rate and PSNR when compared to the conventional method.

D2R1AL-Signal V

1569796155: Knee Joint Angle Measurement System Using Gyroscope and Flex-Sensors for Rehabilitation

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Abstract:

This paper focuses on developing a novel approach for measuring body joint angles, mainly the knee angles, for surface electrical stimulator system. In this work, we only focus on the sensing mechanism for measuring the knee joint angle using wearable sensors. Our system consists of multiple flex-sensors mounted on a supportive cloth and microelectromechanical systems (MEMS) vibratory gyroscope. In Body Sensor Network (BSN) field for medical purpose,

body joint angle measurement system is quite important and useful for continuous monitoring in rehabilitation activities especially for Spinal Cord Injury (SCI) patients. Body joint angle measurement system is sensory type systems that provide information about angle movement of body joint. It is usually used at knee and arm joint to monitor the movement while patients do some exercises. This very important and helpful for the therapists and physicians in order to see the effectiveness of rehabilitations training. For knee angle movement evaluation, lower limb joint angles and segment angles were estimated by the Kalman filter from the data measured with wireless MEMS vibratory gyroscope and flex-sensors. Electrical stimulation was applied to the common peroneal nerve or the tibialis anterior muscle by detecting stimulus timing automatically from the data of wireless sensor attached at the back of knee which known as popliteal fossa and shank of the paraplegic side. The developed system performed well in monitoring the effectiveness of rehabilitations training with the knee joint angle measurement average error rate of 6.92°. The comparison between measured data of the gyroscope and flex-sensors for knee joint angle measurement system were also demonstrated.

D2R1AL-Signal V
1569796523: QR Codes Application for Reversible Watermarking Algorithm in Biomedical Images

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Abstract:

This paper presents an algorithm in reversible watermarking or lossless data hiding, the application associated with the quick response codes (or call QR codes) and the biomedical images. QR code is random patterns, looks like random noise which can be commonly found on the webpages. We can use the smartphone camera to capture the QR code at the webpage, and then the hyperlink corresponding to the QR code can be accessed instantly. The biomedical imaging plays a significant role in diagnosing at the present time. The diagnose information given by biomedical images is important for designing the proper treatment for each patient, this information is personal and cannot be disclosed according to ethics. We have applied the QR code with data embedding in biomedical image in order to retain the confidential information. Our algorithm uses prediction errors to embed the QR codes into different biomedical images models which are diverse in the nature structure. A sorting technique is used to record the prediction errors based on magnitude of its local variance. Using sorted prediction errors reduce location map size and allow us to embed more data into the biomedical image with low distortion. Experimental results also demonstrate the applicability of the proposed algorithm.

Technical Program

Thursday, October 24, 2013 (Day-2)	
Room	Room II Pra Nang
Session	D2R2AL- Miscellaneous
Chair	Chanchai Thaijiam
15:30-15:45	1569795775 C. Thaijiam
15:45-16:00	1569802289 M. Yokoyama
16:00-16:15	1569802151 J. Eom
16:15-16:30	1569802395 D. Siriphot
16:30-16:45	1569804285 W. Tangsuksant
16:45-17:00	1569796413 S. Janjarasjittt

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Abstract:

Conductance catheterisation can be used to measure intraventicular volume during the cardiac cycle in continuous real time. However, for pressure-volume loop analysis in cardiology, the conductance catheterisation needs more to be developed. This paper presents use of a microelectronic pressure sensor to develop the conductance catheterisation. Results show

how possible to use the developed conductance catheter, called pressure-volume (PV) catheter, to estimate cardiac function.

D2R2AL- Miscellaneous
1569802289: Proposal of estimation method for drug concentration in blood by Raman spectroscopy of tear fluids

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Keywords: -

Abstract:

Drug concentrations in blood are good indexes for drug thearpy. This study proposed an approach based on Raman spectroscopy of tears for a rapid and minimally invasive monitoring of the concentration. Tear fluid reflects the drug concentration in blood and its collection can be performed easily and noninvasively in comparison to blood drawing. Raman spectroscopy is a rapid and sensitive analytical technique, which is suitable for measurement of small volume samples such as human tears. As a first step, we measured the Raman spectra of 2 μL solutions of valproic acid to reveal the sensitivity toward a small amount of drug in tears. The measurement was performed with hydrophobic silicon substrates to concentrate fluid samples. The experimental result demonstrates that the method has sufficient sensitivity to monitor concentration of valproic acid in blood.

D2R2AL- Miscellaneous
1569802151: Energy Harvesting for Bladder Pressure Sensor using Parametric Amplification Phenomenon of PVDF Bimorph Cantilever

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Keywords: Energy Harvesting, Parametric Amplification

Abstract:

In this paper, we identify feasibility of energy harvesting using parametric amplification phenomenon of piezoelectric bimorph cantilevers for bladder pressure sensing. We simply fabricated piezoelectric bimorph cantilevers by bonding 110 µm thick polyvinylidene fluoride (PVDF) and 500 µm thick polycarbonate (PC) using an epoxy. The piezoelectric bimorph cantilever was 34.8 mm long, 10 mm wide, and 0.8 mm thick and exhibited resonance frequency of ~150 Hz. By applying twice the fundamental frequency excitation, we obtained the voltage generated in the piezoelectric bimorph cantilevers at the fundamental frequency. Maximum voltage was generated when the direction of excitation is parallel to the vibration of the cantilever. Maximum power harvested using the parametric amplification phenomenon was measured to be 6.05 nW.

D2R2AL- Miscellaneous
1569802395: Single Active Element Based Electronically Controllable Grounded Inductance Simulator

David Siriphot

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Winai Jaikla

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Abstract:

This article presents grounded inductance simulator using single current controlled current follower transconductance amplifier (CCCFTA) as active element. The simulated inductance value can be controlled electronically by adjusting the bias current of the CCCFTA. The grounded inductance simulator comprises one CCCFTA and one grounded capacitor without any external resistors and component matching requirements. The circuit performances are depicted through PSpice simulations, they show good agreement to theoretical anticipation. An application as second-order low-pass filter is included to confirm the usability of proposed circuit. It is very suitable to realize the proposed filter in monolithic chip to use in biomedical signal processing.

D2R2AL- Miscellaneous
1569804285: Development Algorithm to Count Blood Cells in Urine Sediment using ANN and Hough Transform

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Keywords:

urine sediment; Artificial neural network ; Feedforward backpropagation; circular Hough Tranform.

Abstract:

Nowadays, microscopic is used in several laboratories for detect cells or parasite by technician. Especially testing in urine sediment is important for the patients who are abnormal about urinary tract. Constantly, the appearance of red blood cells, white blood cells, crystals, bacteria and other microorganisms in urine sediment's patients is more important information for diagnosis. This paper proposes the segmentation and detection of RBCs and WBCs in urine sediment images. The process of algorithm consists of three main parts. First step is segmentation by using feedforward backpropagation of Artificial Neural Network applied on the HSV color model image of urine sediment examination. The next step is eliminating noise by morphology operations. The last step is detection RBCs and WBCs by using Circle Hough Transform. Experimental results show the average percentage of error of RBCs and WBCs detection, 5.28 and 8.35 respectively.

D2R2AL- Miscellaneous
1569796413: Characteristics of Local Min-Max Amplitude of Wavelet Subbands of Scalp Epileptic EEG

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Abstract:

An epileptic EEG exhibits various temporal characteristics corresponding to different states of the brain. In this paper, the temporal characteristics of wavelet subbands of scalp epileptic EEG associated with different states of the brain is examined based on an average amplitude of local minima and maxima, referred to as the average local min-max amplitude. The computational results show there are significant differences in the average local min-max amplitudes of the epileptic EEG during the epileptic seizure event compared to the other brain states in all wavelet subbands. The average local min-max amplitude remarkably increases during the epileptic seizure in all wavelet subbands. This therefore suggest that the average local min-max amplitude may be used as a useful feature for epileptic seizure detection.

Technical Program

Thursday, October 24, 2013 (Day-2)	
Room	Room III Benjarong
Session	D2R3AL- Cardio-Respiratory Engineer
Chair	Phornphop Naiyanetr
15:30-15:45	1569802621 S. Trihirun
15:45-16:00	1569796703 T. Aye
16:00-16:15	1569797311 C. Rungsirikunnan
16:15-16:30	1569797433 Y. Chusri
16:30-16:45	1569801901 A. Prakobkarn
16:45-17:00	1569802309 P. Diloksumpan

D2R3AL- Cardio-Respiratory Engineer
1569802621: Modeling Nanorobot Control for Blood Vessel Repair: A Non-Newtonian Blood Model

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Boonserm Kaewkamnerdpong

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Keywords:

Artificial platelets, particle swarm optimization, nanomedicine, nanorobot, swarm intelligence, non-Newtonian Blood.

Abstract:

Using nanorobots for medical diagnostics and treatment has been an intriguing idea since the concept of nanotechnology was introduced. This study investigated the control mechanism for locomotion of nanorobots in blood vessel repair application. Each nanorobot operating as artificial platelets has only essential characteristics for self-assembling into a mass at the injured blood vessel wall to reduce blood loss. This follows the idea of the early stage nanorobots that could be realized in the near future based on examples seen in biological systems and current development in nanotechnology. Canonical Particle Swarm Optimization (PSO) that are inspired by social insects was employed for controlling the nanorobots as they are similar in the way that individuals have simple characteristics but can robustly work in dynamic environment. In simulation, this study used Herschel–Bulkley fluid model to simulate non-Newtonian blood flow in a rigid tube. The performance of canonical PSO-based control mechanism was demonstrated and investigated to provide guidelines for the realization of nanorobots in the future.

D2R3AL- Cardio-Respiratory Engineer
1569796703: Modelling and Simulation of Cardiovascular system with Intra-aortic Balloon Pump

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Abstract:

The intra-aortic balloon pump (IABP) is a mechanical device to be useful in assisting the heart failure patients. The computer simulation of the cardiovascular system with intra-aortic balloon pump has been not only used for research but also improved and deployed for teaching therapeutic technique and diagnostic procedures. This study is showed the mathematical model of cardiovascular with assisting the pump model under both normal heart and disease conditions. The results of this work are verified with other previous study found in literature.

D2R3AL- Cardio-Respiratory Engineer
1569797311: Analysis of backflow within an external centrifugal blood pump for ventricular assist device

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Abstract:

During left ventricular support by rotary blood pumps (RBPs), pump speed plays an impor-
tant role in the amount of heart support. The reducing of pump speed seems important in
order to prevent some adverse events in the heart valve. However, when pump speed was
reduced, the backflow which is the flow that has the reverse direction to blood pumping
direction may occur more easily. This is due to the amount of pressure at an outlet of pump.
Head pressure and pump flow curve (HQ-curve) is the graph that shows the performance
of speed, head pressure and flow rate in the blood pump. In this study, two impellers from
MUAD-VAD02 were used; 90-degree-angle straight blade (90SB) and 130 degrees straight blade
(130BSB). The backflow of two impellers were investigated at three pump speeds (1000, 1400
and 1800 rpm) using HQcurve, negative flow rate vs. time, and pressure vs. time. The experi-
mental study uses in vitro testing by simulating the natural circulatory system with RBPs in
the mock circulation loop system. The back flow of 90SB had more negative flow than BSB
at all three speeds. In conclusion, BSB- impeller was chosen over the 90SB-impeller because
at the same head pressure and speed in HQ-curve, the BSB impeller has less negative flow.

D2R3AL- Cardio-Respiratory Engineer
1569797433: Current Left Ventricular Assist Device

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Abstract:

Left ventricular assist devices (LVADs) have confident in treatment for end-stage heart failure. The mainly development of LVADs design based on a rotary blood pump (RBP) technology for both long-term and short-term supports. The first generation of LVADs was the pulsatile system based on volume displacement technology. For the second generation of LVADs, novel LVADs were developed to be a non-pulsatile system that was called continuous flow LVADs. Normally, this system can generate low pulsatile-pressure during high support ratio. Continuous flow LVADs can apply for other advance application. In comparison with the first generation LVADs, second generation devices show more advantageous than pulsatile pumps such as speed, size and sound. To verify of pump safety, the generally of certification for LVADs should be evaluate by United State of America –Food and Drug Administration (US-FDA) or Conformite Europeenne mark (CE mark) approval. Jarvik-2000, HeartMate II, Synergy and HeartWare are the commercial products which have been certified by both US-FDA and CE mark. Exception for the Incor LVAD, it applied for CE mark only. In this review, the difference of each manufacturer (shape, size, type of flow and type of bearing) were explained.

D2R3AL- Cardio-Respiratory Engineer
1569801901: Influences of Vascular Geometry and Blood Property on Carotid Artery Hemodynamics

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Keywords:

Computational fluid dynamic model; wall shear stress; carotid abnormality; realistic model.

Abstract:

Computational fluid dynamic (CFD) model is used to evaluate cardiovascular hemodynamics and the model is useful to predict the blood flow pattern and the wall shear stress (WSS) in various conditions. This study used the CFD model to assessment the influence of varied blood conditions and geometries on changing of velocity ratio at the internal carotid artery (ICA) and the external carotid artery (ECA). The realistic model of two-dimensional carotid artery was acquired from four normal male subjects with a magnetic resonance angiography.

Then, the geometries were reconstructed and blood was assumed to be incompressible and Newtonian fluid. The artery was assumed to be a rigid wall. Four conditions simulated in this study were normal, 50% stenosis, hyperglycemia and hyperglycemia with 50% stenosis. The ICA velocity ratio was calculated from ICA velocity to inlet velocity and the ECA velocity ratio was calculated from ECA velocity to inlet velocity. The WSS was determined at inner and outer walls of ICA. The results showed that the trends of the velocity ratio increased in stenosis condition. The results also indicated that the velocity in ICA and ECA can be influenced by the geometries of carotid artery such as curvature and vascular stenosis. Moreover, the increase of velocity correlated with the WSS value.

D2R3AL- Cardio-Respiratory Engineer
1569802309: Development of Pressure Estimation for External Rotary Blood Pump

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Keywords:

pressure estimation; cardiac function assessment, external rotary blood pumps; parameter identification

Abstract:

The improvement of heart function are the important consideration for heart failure patient with rotary blood pump (RBP). The capable of function evaluation depend on good monitoring system, which facilitate the physician for diagnosis. In this study, pressure estimation from measured flow rate for the patients with external RBP support is implemented with the non-invasive technique for cardiac function assessment. Measured flow rate from our mock circulation experiment at difference rotational speeds were used to apply with a notable RBP models. Our purpose is to find the optimal parameter values for pressure estimation from our RBP prototype. MUPD-VAD02 that is the external rotary blood pump for pediatric patients was used in this study. The suitable model for our pump prototype is the linear pressure – flow characteristics relationship with speed dependent resistant (Rp), which appeared linear correlations between estimated and measured pressure in a slope of 0.96 ($R2 = 0.9603$). In conclusion, the parameters and modified RBP model for pressure estimation of MUPD-VAD02 is developed.

Session: D1R1ML-Imaging I (Invited Paper)
BMEiCON2013-0001: Advance in Light Microendoscopy

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Keywords: -

Abstract:

Biomedical research truly needs new advances in imaging. Existing modalities of in vivo imaging, such as magnetic resonance imaging or ultrasound, lack the spatiotemporal resolution required to image the fundamental building block of living tissue. By contrast, existing high-resolution techniques for imaging cells and their sub-cellular features are technologies that are best suited for in vitro experiments in tissue slices. Yet, the ability to make direct connections between human pathological symptoms/behavior and the underlying cells and molecules responsible for such behavior requires in vivo techniques that can image cellular constituents. Our research aim is divided into two main projects. The first project is to develop high-resolution and portable optical endoscopes to satisfy unmet clinical diagnostic needs in vivo. These differ from medical endoscopes, which are generally larger and designed to image macroscopic abnormalities or ex vivo tissues. The microendoscopes are miniaturized into two form factors (5-mm and 10-mm diameter). The second project is on the development of a new probe for early detecting cervical cancer deriving from phage display peptide libraries. Therefore, the focus of my talk will be on the development of both the portable confocal microendoscope coupled with targeted peptide probes to improve early detection of cervical cancer in human patients. With combination in cancer screening, it might suggest new approaches to cancer disease diagnosis and treatment. The imaging demonstrations of the endoscopes were on both ex vivo and in vivo from mice and human.

D1R1AE-Biomechanic and Robotic (Invited Paper)
BMEiCON2013-0002: Biomechanics of Synthetic Skin

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Abstract:

Skin in essence is a vital organ as it provides protection apart from offering outward appearance to a person. Burn injuries are unquestionably amongst the most complex physical injuries to be assessed and overseen as it affects both physical and psychological level of survivors. A number of study has been carried out to understand skin's basic functions and behaviour which in turn, leads to the study of artificial skins as a feasible form of skin substitutes. This paper reviews and proposes a framework on synthesising potential materials that mimics skin deformation behaviour, its fabrication as well as its test procedures. The present study is significant and has contributed to the body of knowledge in the area of skin mechanics as it draws the route in synthesising potential artificial skin substitute materials

D2R3AE-Biomaterial and Tissue (Invited Paper)

BMEiCON2013-003: Design and fabrication of polymeric thin film and ultra thin film sensorchip for biomolecules capturing by Surface plasmon resonance technique

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Toemsak Srikhirin

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Keyworts:

Surface Plasmon resonance; thin film; bimolecular capturing

Abstract:

Development of sensor chip to be high specificity and fitted in each application is important. This work, we designed and fabricated the sensor chips to be model of biomedical chip in form of polymethyl metacrylate(PMMA) thin film and Self-assembled monolayer (SAM) thin film which were coated on gold substrate with physisorption and chemisorption method, respectively. The detection of bimolecular interaction such as protein and collagen were tested by Surface Plasmon resonance (SPR) technique. SPR is an optical technique, which is highly sensitive on the change of the optical properties of the biomolecules in nanoscale. The suitable condition for protein and collagen adsorption on these two thin film were studied. It was found that the different types of surfaces on various pH condition has effect on the biomolecule adsorption. The fabricated sensor chips can be used to be the model chip for bimolecular capturing and capable to develop in medical application further.

D2R3ML-Physiological Modeling (Invited Paper)
Bmeicon2013-0004: Evaluation of the advanced electrodes for NADH electrochemical sensor

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Keywords:

NADH oxidation; Conducting polymers; Biosensor; dehydrogenase- based sensor

Abstract:

This study describes the evaluation of the modified electrodes among screen print carbon, gold and platinum electrode for -Nicotinamide adenine dinucleotide (NADH) detection. The common technique of the electrode fabrication was used in this measurement. The screen print carbon electrode modified with the conducting polymer poly (3.4-ethyelenedioxythiphene) poly(styrene sulfonate) (PEDOT:PSS) showed the best candidate for linear in the range 0 to 11.9 mM with sensitivity 120.0 nA/mM and a correlation coefficient of 0.934. Based on all result, the proposed electrode can be applied to detect for advanced electrochemical detection.

Conference Banquet and Research Networking Event

BMEiCON 2013 organizing committees are glad to announce that the BMEiCON 2013 banquet will be held at Pavilion Queen's Bay Krabi (http://www.pavilionhotels.com/Krabi/index.html) at the evening of October 24th, 2013. The Banquet dress dode is white and blue. So, wear blue if you are a kindness professor. Stay white if are a student who wanna have fun!

On the next day, October 25th, 2013, the participants will join in the research networking event at Phi Phi Island (Koh Phi Phi pronounced Ko PP) You will have an opportunity to visit nature at it's finest, observe the clear water with a snorkeling trip.

Phi Phi Islands are a main attraction to Krabi and Phuket Island, and are widely considered to be amongst the most beautiful islands in the world. Despite the high number of visitors here, the island is still quite stunning, and the surrounding ocean and islands are still spectacular.
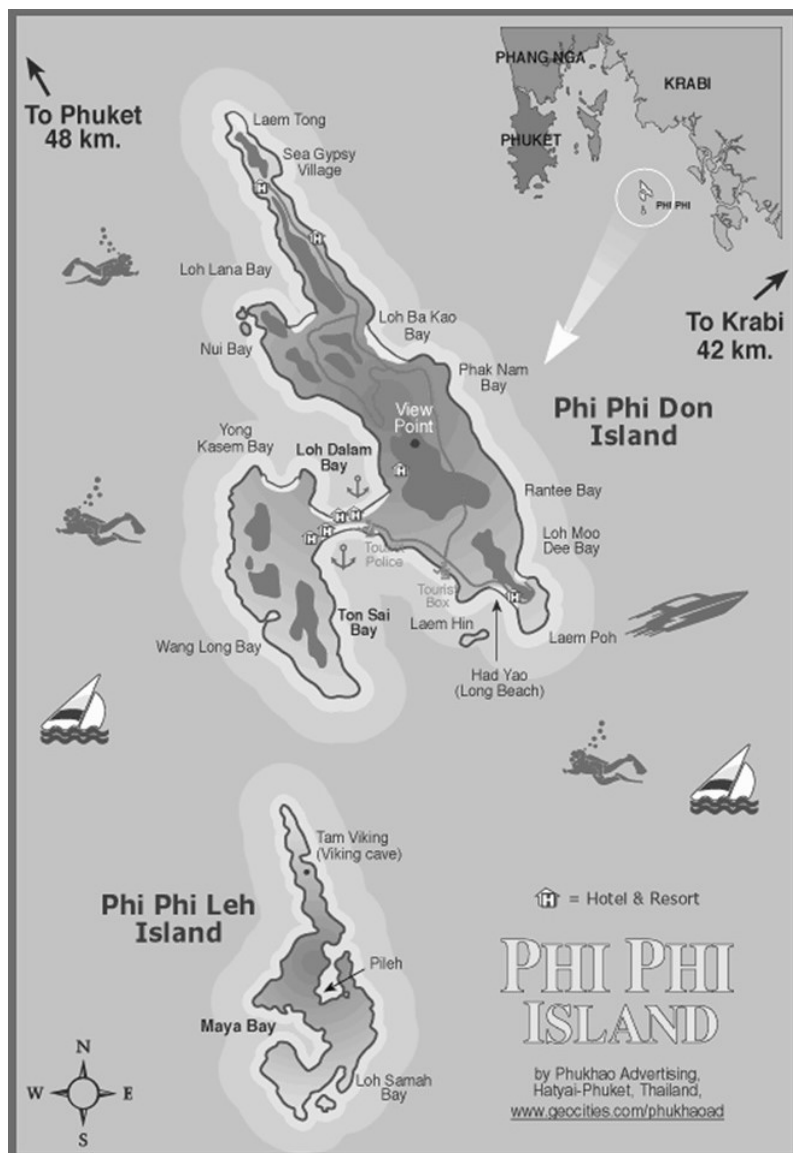
Phi Phi Island Map

For those who attend research networking event, here something to be prepare;

1. Swimsuit, Bikini ALLOW!
2. Towel (You may borrow one from the hotel.)
3. Sunscreen, SPF 50 and water-proof
4. For girls, you may need comb and anti-frizz hair spray after diving.
5. A bottle of dinking water or if you willingly to pay 2x more expensive on the ferry.
6. Snorkel, if you have one please carry it with! You may rent one on the boat with 80-100 THB, but please bring antiseptic tissue with you!
7. Dry clean clothes to change after diving.

8. Ocean pack or water-resistance bag to put everything you don't want it to get wet.
9. Hat and chick sunglasses.

Now, you will be ready to rock!

BMECON 2013, 23-25 October 2013, Krabi, Thailand			
Wednesday, October 23, 2013 (Day-1)			
08:30-09:00	Registration		
09:00-9:30	Opening ceremony , Queen's bay Hall, Pavilion Hotel		
9:30-10:00	Keynote speaker 1 : Prof. Dr. Michael Gelinsky		
10:00-10:30	Keynote speaker 2 : Prof. Brad Reisfeld		
10:30-11:00	Coffee Break		
Session	Room I: Queen's bay hall	Room II Pra Nang	Room III Benjarong
Session Topic	D1R1ML-Imaging I	D1R2ML-Signal I	D1R3ML- Biomedical Instrument I
Chair	Wibool Piyawattanametha	Sumet Umchit	Bumkyoo Choi
11:00-11:15	BMEICON2013-0001 W. Piyawat	1569794809 R. Duangsoithong	1569795471 J. Yang
11:15-11:30	Invited Paper	1569795677 T. Pothirat	1569795999 K.Keawkannate
11:30-11:45	1569798387 A. Markkongkeaw	1569802473 F.R. Hashim	1569797043 W.Senavongse
11:45-12:00	1569798623 N. Khumdath	1569797407 W. Boonleelakul	1569802157 J.Choi
12:00-12:15	1569797161 A. L. Che Ani	1569796217 T. Siritan	1569808061 Q. Zhang
12:15-12:30	1569804331 S. Yatsushiro	1569806779 A. Horton	1569802773 M. L. Maksud
12:30-13:30	Lunch		
Session	Room I: Queen's bay hall	Room II Pra Nang	Room III Benjarong
Session Topic	D1R1AE-Biomechanic and Robotic	D1R2AE-Biomedical Instrument II	D1R3AE-Biosensor
Chair	Jamaluddin Mahmud	Arthon Sunpanich	Suzuki Seiichi
13:30-13:45	BMEICON2013-0002 J. Mahmud	1569795907 N.Thongpance	1569795721 S. Seiichi
13:45-14:00	Invited Paper	1569804477 M. N. Adon	1569797291 Haoxu Wang
14:00-14:15	1569795563 A. Ali mechanic	1569793739 A. Cruz	1569801859 Y. Ogura
14:15-14:30	1569802589 W. Kaewboon	1569799443 P. Chotikasemsri	1569797807 N. Tohluebaji
14:30-14:45	1569796885 Z. Htet	1569796981 A. Jantanukul	1569802153 Seokbeom Kim
14:45-15:00		1569793355 N.A. Yunus	1569798681 S. Hasegawa
15:00-15:30	Coffee Break		
Session	Room I: Queen's bay hall	Room II Pra Nang	Room III Benjarong
Session Topic	D1R1AL-Signal II	D1R2AL- Medical Image II	D1R3AL- Healthcare Information
Chair	Supan Tungjitkusolmun	Theekapun Charoenpong	Eakarat Boonchaing
15:30-15:45	1569810247 L. Khong	1569794909 T.Charoenpong	1569804249 Bo Liu
15:45-16:00	1569807799 O.Fathabadi	1569795441 T.Charoenpong	1569802053 U. Muangna
16:00-16:15	1569809323 M. Shahbakhti	1569796093 R. Uttamatanin	1569802285 K. Duangchaemkarn
16:15-16:30	1569808465 P. Panavaranan	1569795399 S. Jitaree	1569795551 K. Intharakham
16:30-16:45	1569807855 I. Aarya	1569797077 F. Khan	1569796473 J. Ma
16:45-17:00		1569796457 K. Tsuruoka	1569795991 T. Hanawa
17:15-18:00	Free time		
18:00-20:00	Welcome Party		

Thursday, October 24, 2013 (Day-2)			
08:00-09:00	Registration		
09:00-09:30	Keynote speaker 3 : Prof. Dr. Prof. Kagayaki Kuroda		
09:30-10:00	Keynote speaker 4 : Masaki Sekino		
10:00-10:30	Coffee Break		
Session	Room I: Queen's bay hall	Room II Pra Nang	Room III Benjarong
Session Topic	D2R1ML-Imaging III	D2R2ML-Signal III	D2R3ML-Physiological Modeling
Chair	Pornchai Phukpattaranont	Caillin Eastwood-Sutherland	Brad Reiseld
10:30-10:45	1569797379 A. Tuntakum	1569807865 E.S. Caillin	BMEICON2013-0004 S. Taertulakarn
10:45-11:00	1569797743 S. Pongyupinpanich	1569804199 E. Thammasat	1569802463 A. Wongkamhang
11:00-11:15	1569803993 W. Aruntammanak	1569803515 Y. Pimtongngam	1569804411 Kittipan Roongprasert
11:15-11:30	1569801837 S. Adhan	1569803035 R. Hussein	1569801631 A. Kiang-ia
11:30-11:45	1569799017 S. Suwanmanee	1569802977 F. Philipp	1569802259 C. Phairoh
11:45-12:00	1569797153 W. Sittiprapaporn	1569802761 M. Kampong	1569802267 P. Phasukkit
12:00-13:00	Lunch		
Session	Room I: Queen's bay hall	Room II Pra Nang	Room III Benjarong
Session Topic	D2R1AE--Signal IV	D2R2AE-Rehabilitation	D2R3AE-Biomaterial and Tissue
Chair	Yagi Tohru	Warakorn Chareornsuk	Jirut Meesane
13:30-13:45	1569801891 T. Sone	1569802299 T. Prasertsakul	1569802173 W. Yeelack
13:45-14:00	1569801923 A. Hattori	1569802325 P. Klaynin	1569802445 B. Methachan
14:00-14:15	1569797111 P. Gatkine	1569804329 J. Pinitkertsakun	1569802171 Antje Pohl
14:15-14:30	1569796855 T. Matsuura	1569797041 S. Jirayucharoensak	1569802571 M. Zaltum
14:30-14:45	1569798041 T. Leauhatong	1569797209 K.A. Rahman	1569801899 M. I. Maksud
14:45-15:00	1569796009 T. Miyakawa	1569796985 T. Maruyama	BMEICON2013-003 T. Wangkam
15:00-15:30	Coffee Break		
Session	Room I: Queen's bay hall	Room II Pra Nang	Room III Benjarong
Session Topic	D2R1AL-Signal V	D2R2AL- Miscellaneous	D2R3AL- Cardio-Respiratory Engineer
Chair	Kohji Masuda	Chanchai Thaijiam	Phornphop Naiyanetr
15:30-15:45	1569804139 K. Masuda	1569795775 C. Thaijiam	1569802621 S. Trihirun
15:45-16:00	1569797417 C. Jinjakam	1569802289 M. Yokoyama	1569796703 T. Aye
16:00-16:15	1569797037 T. Phanprasit	1569802151 J. Eom	1569797311 C. Rungsirikunnan
16:15-16:30	1569796155 A. Masdar	1569802395 D. Siriphot	1569797433 Y. Chusri
16:30-16:45	1569796523 C. Panyindee	1569804285 W. Tangsuksant	1569801901 A. Prakobkarn
16:45-17:00		1569796413 S. Janjarasjitt	1569802309 P. Diloksumpan
18:00-21:00	Conference Banquet (Pavilion Hotel)		
Friday, October 25, 2013 (Day-3)			
8:00-12:00	Research networking event		
12:00-13:00	Lunch		
13:00-17:00	Research networking event		
End of Conference, Have a good weekend Thailand			

ENTRANCE

LADY TOILET

MEN TOILET

STAGE

Queen's Bay Hall

(Main Hall)
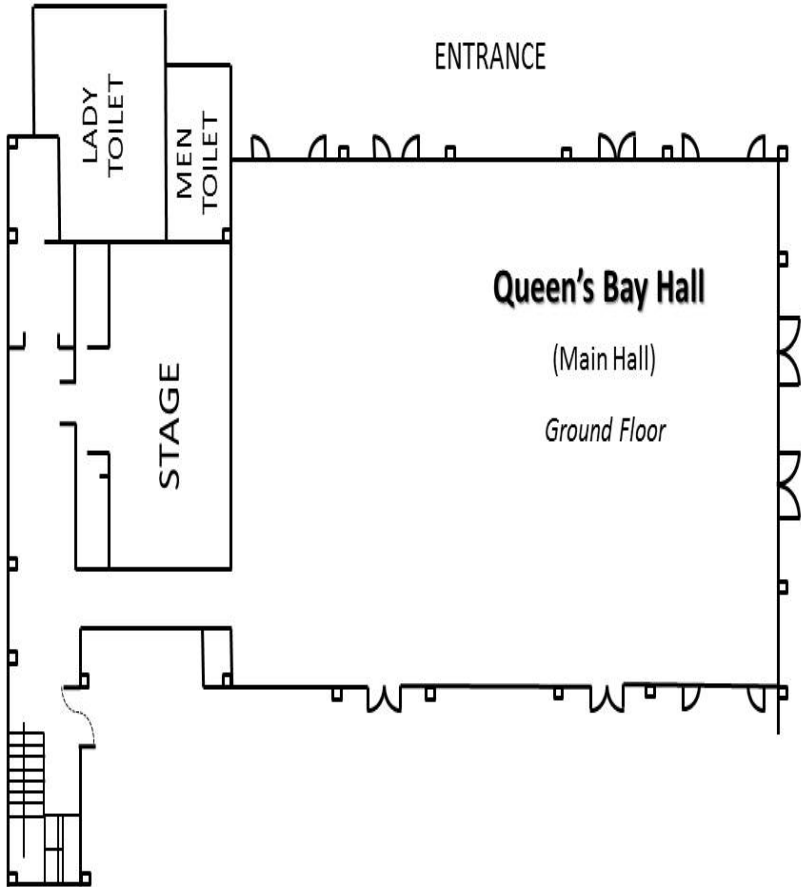
Ground Floor

Queen's Bay Hall
(Ground Floor)

Pranang Room
(5th Floor)

TOILET

Benjarong Room

6th Floor

ENTRANCE

STAGE
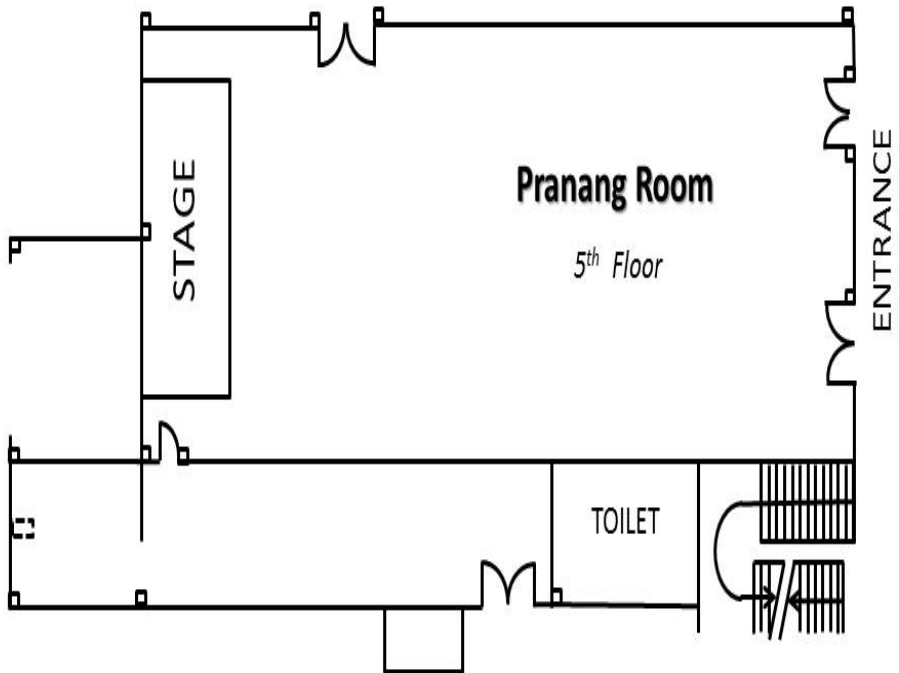
COUNTER
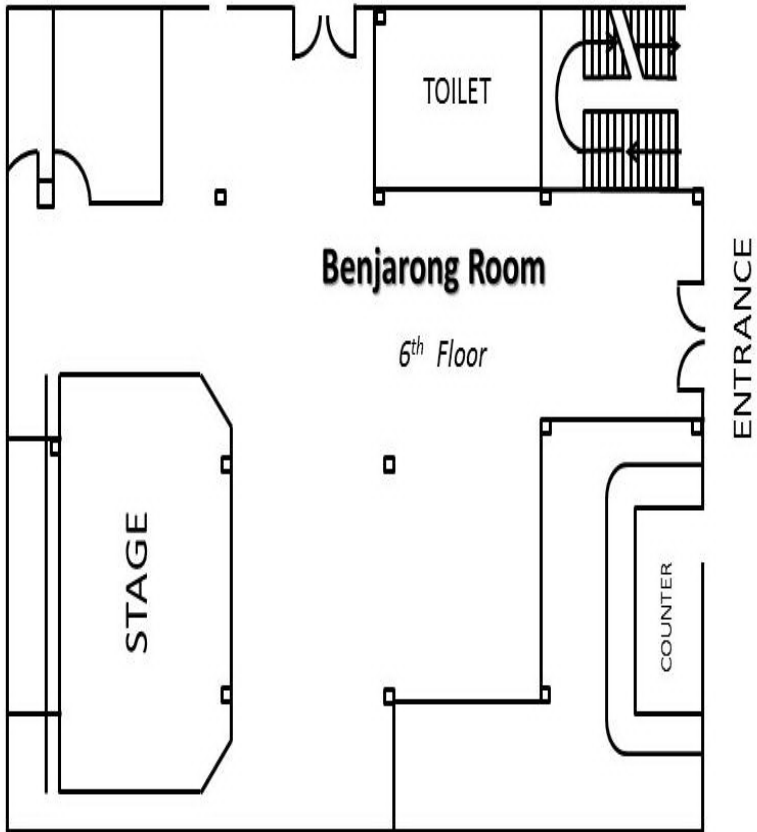
**Benjarong Room
(6th Floor)**

Author Index

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