

# **2013 29th Southern Biomedical Engineering Conference**

**(SBEC 2013)**

**Miami, Florida, USA  
3 – 5 May 2013**



**IEEE Catalog Number: CFP13SBE-PRT  
ISBN: 978-1-4799-0624-6**

# 2013 29th Southern Biomedical Engineering Conference

## SBEC 2013

### Table of Contents

Foreword.....	xiv
About the Conference.....	xv
Scientific Program Committee.....	xvii
Reviewers.....	xviii
Dinner Keynote Speaker.....	xxi
Lunch Keynote Speaker.....	xxii

---

#### **S1-1 –Bioinstrumentation I**

Microfluidic Biosensing Device for Controlled Trapping and Detection of Magnetic Microparticles .....	1
<i>Ioanna Giouroudi, Georgios Kokkinis, Chinthaka Gooneratne, and Jurgen Kosel</i>	
Wireless Electroencephalogram Acquisition System for Recordings in Small Animal Models .....	3
<i>Juan M. López, Juan C. Bohórquez, Jorge Bohórquez, Mario A. Valderrama, and Fredy Segura-Quijano</i>	
Integrated Transimpedance Amplifiers Dedicated to Low-Noise and Low-Power Biomedical Applications .....	5
<i>Ehsan Kamrani, A. Chaddad, Frederic Lesage, and Mohamad Sawan</i>	

#### **S1-2 – Biosignal Processing I**

Feasibility of Evoked Potentials as a Probe for Exploring Sleep .....	7
<i>Alexander Castro-Llanos, Jorge Bohórquez, Richard R. McNeer, and Özcan Özdamar</i>	
A Neural Stimulation System Model to Enhance Neural Integrated Circuit Design .....	9
<i>Hailey DiSpirito, John Lachapelle, Bryan McLaughlin, and Yitzhak Mendelson</i>	
Adaptation Dynamics Measures in Simultaneously Recorded Pattern Electroretinograms and Visual Evoked Responses .....	11
<i>Özcan Özdamar, Bahar D. Yilmaz, Oscar Villalon, and Jorge Bohórquez</i>	

Discriminative Capacity of Impulse Oscillometry in Diagnosis and Treatment of Asthmatic Children .....	13
<i>Liza Rodriguez, Homer Nazeran, Erika Meraz, Elias Estrada, Carlos Rodriguez, and Roya Edalatpour</i>	

### **S1-3 – Biomaterials & Tissue Engineering I**

Novel Pluripotent Adult Stem Cell Source for Neurogenesis .....	15
<i>Veronica R. Fortino, Devon Pawley, Daniel Pelaez, and Herman S. Cheung</i>	

### **S1-4 –Drug Delivery & Nanotechnology I**

Use Microsphere to Measure Refractive Index/Concentration/Temperature in Micro-regions of Inhomogeneous Media .....	17
<i>Yao-Xiong Huang and Wen-Cheng Ma</i>	

Multifunctional Covalent Nanoconjugate for Near-Infrared Imaging and Hyperthermia .....	19
<i>Alicia Fernandez-Fernandez, Romila Manchanda, Denny A. Carvajal, Tingjun Lei, and Anthony J. McGoron</i>	

Theranostic Nanoparticles for Imaging and Therapy and Cellular Response after Laser-induced Heating .....	21
<i>Tingjun Lei, Romila Manchanda, Alicia Fernandez-Fernandez, Yen-Chih Huang, and Anthony J. McGoron</i>	

### **S2-1 –Bioinstrumentation II**

Low-Cost, Thermistor Based Respiration Monitor .....	23
<i>Hana Qudsi and Maneesh Gupta</i>	

Development of a System for the Assessment of Heart Rate Variability in the NICU .....	25
<i>Martin Schiavenato, Carlos Oliu, Edward Bello, Jorge Bohórquez, and Nelson Claire</i>	

Power/Area Efficient Low Noise Amplifier for Ultra-Low Amplitude Recording from Amputee Intrafascicular Nerve .....	27
<i>A. Zbrzeski and R. Jung</i>	

Instrumentation to Record Evoked Ankle Movements in Anesthetized Rats .....	29
<i>Katie Gant, Jorge Bohorquez, Yang Liu, Robert M. Grumbles, and Christine K. Thomas</i>	

## **S2-2 – Biosignal Processing II**

Deconvolution and Modeling of Overlapping Visual Evoked Potentials .....	31
<i>Jorge Bohórquez, Sebastian Lozano, Alexander Kao, Jonathon Toft-Nielsen, and Özcan Özdamar</i>	
Denoising fNIRS Signals to Enhance Brain Imaging Diagnosis .....	33
<i>A. Chaddad, E. Kamrani, J. Le Lan, and M. Sawan</i>	
A Robust Algorithm for Derivation of Heart Rate Variability Spectra from ECG and PPG Signals .....	35
<i>Ajay Verma, Sergio Cabrera, Allan Mayorga, and Homer Nazeran</i>	
Wheeze Detection and Location using Spectro-temporal Analysis of Lung Sounds .....	37
<i>Saba Emrani and Hamid Krim</i>	

## **S2-3 – Biomaterials & Tissue Engineering II**

Developing Engineered Cardiac Tissue Models from HL-1 Cardiomyocytes and Mouse Embryonic Fibroblasts .....	39
<i>Zenith Acosta-Torres, Noortje A.M. Bax, Ariane C.C. van Spreeuwel, and Carlijn V.C. Bouten</i>	
Verification of Measurements of Cartilaginous Tissue Constructs in the Online Characterizing Bioreactor System .....	41
<i>Christina T. Echagarruga, Christopher M. Scanlon, Tai-Yi Yuan, C.-Y. Charles Huang, and Wei Yong Gu</i>	
Micro- and Nano-mechanical Properties of a CoCrMo Medical Implant Alloy and the Carbide-CoCrMo Surfaces .....	43
<i>G.A. Ettienne-Modeste</i>	

## **S2-4 –Drug Delivery & Nanotechnology II**

N-Butyltriphenylphosphonium Bromide-linear PEI Polymers Mediated Efficient Gene Transfection .....	45
<i>R. Bansal, K.C. Gupta, and P. Kumar</i>	
Oral Administration of Eudragit Coated Bromelain Encapsulated PLGA Nanoparticles for Effective Delivery of Bromelain for Chemotherapy <i>in vivo</i> .....	47
<i>Priyanka Bhatnagar and Kailash Chand Gupta</i>	

## **S2-5 – Computational Neuroscience**

Simulating Recordings from Intrafascicular Electrodes to Facilitate Decoding Algorithm Development .....	49
<i>Mohamed Abdelghani, James J. Abbas, Kenneth W. Horch, and Ranu Jung</i>	
Adaptive Processes of the <i>Limulus</i> Lateral Eye .....	51
<i>Tchoudomira M. Valtcheva and Christopher L. Passaglia</i>	
A Family of Mechanisms Controlling Bursting Activity and Pulse-triggered Responses of a Neuron Model .....	53
<i>William Barnett, Gabrielle O'Brien, and Gennady Cymbalyuk</i>	
Scalp Topography of Auditory Evoked Responses Elicited by Binaural Beat Illusions .....	55
<i>Todor Mihajloski, Jorge Bohorquez, and Ozcan Ozdamar</i>	
Advanced MEG Source Analysis for Epileptogenic Focus Localization in Patients with Non-Lesional MRI .....	57
<i>B. Krishnan, I. Vlachos, Z.I. Wang, J. Mosher, L. Iasemidis, R. Burgess, and A.V. Alexopoulos</i>	

## **S3-1 – Bioinstrumentation III**

Development of a Cell-Chip Array for Single Cell Capturing Using Dielectrophoresis .....	59
<i>Pratikkumar Shah, Xuena Zhu, and Chenzhong Li</i>	
On-Chip Single Photon Counting Electronic Circuitry Dedicated to Real-Time Brain Imaging Applications .....	61
<i>Ehsan Kamrani, Frederic Lesage, and Mohamad Sawan</i>	
Design of a Portable Wireless EEG System Using a Fully Integrated Analog Front End .....	63
<i>Patrick J. Davies and Jorge Bohórquez</i>	

## **S3-2 – Rehabilitation**

Stress Distribution at the Bone-cement Interface Changes during Kyphoplasty Rehabilitation .....	65
<i>Philip Purcell, Magdalena Tyndyk, Fiona McEvoy, Stephen Tiernan, and Seamus Morris</i>	
Analysis of Neuromuscular Control in Young and Older Individuals During Lateral Stepping .....	67
<i>Tatiana Bejarano, Dinesh Bhatia, Denis Brunt, and Ranu Jung</i>	
Glenohumeral Biomechanics of Physical Therapy Mobilization Techniques .....	69
<i>Hunter Smith, Daniel M. Wido, Richard J. Kasser, Jon Rose, and Denis J. DiAngelo</i>	

Robotic Exoskeleton System Controlled by Kinect and Haptic Sensors for Physical Therapy .....	71
<i>Daniela Chavez Guevara, Giuseppe Vietri, Mangai Prabakar, and Jong-Hoon Kim</i>	

### **S3-3 – Biomaterials & Tissue engineering III**

Qualitative and Quantitative Analysis of Cell Proliferation Restriction Due to Metal Trace Elements Released from Oxidized Ti Alloys .....	73
<i>Mario Soto Jr., Carlos M. Sanchez, Rey Y. Pagan, Paul A. Sundaram, and Nanette Difffoot-Carlo</i>	
Dual-Scale Microstructure and Surface Analysis of Ti-Mo-Zr-Fe and Ti-Mo-Nb-Fe alloys for Orthopedic Implants .....	75
<i>Vishal Musaramthota, Sushma Amruthaluri, Amit Datye, and Norman Munroe</i>	
Biomechanical Evaluation of Osteoporotic Sheep Long Bones .....	77
<i>G. Feuer, M. Musib, W. Hayes, W. Urban, S. Saha, D. Ruehlman, D. Mijares, and R. LeGeros</i>	

### **S3-4 – Biophotonics**

SERS Biosensor for Label Free Monitoring of Environmental Stress .....	79
<i>Vinay Bhardwaj, Supriya Srinivasan, Rupak Dua, and Anthony J. McGoron</i>	
Implementation of a Novel, Integrative Approach for Optical 3D Positional Tracking towards Accurate Co-registered Imaging Using Hand-Held Optical Imagers .....	81
<i>Rigoberto Roche, YoungJin Jung, and Anuradha Godavarty</i>	
Modeling and Characterizing Optical CMOS Sensors for Biomedical Low-Intensity Light Detection .....	83
<i>Ehsan Kamrani, Mohamad Hamady, Frederic Lesage, and Mohamad Sawan</i>	

### **Poster Session P1**

Investigating Brain Activity when Listening to Different Types of Music by Near-Infrared Spectroscopy .....	85
<i>Nguyen Dinh Nhat, Truong Quang Dang Khoa, and Vo Van Toi</i>	
Distinguish Two Hands Moving Measured by Near-Infrared Spectroscopy .....	87
<i>Duong Duc Thien, Truong Quang Dang Khoa, and Vo Van Toi</i>	
Optical Coherence Tomography Integrated with Reflectometry for Ophthalmologic Measurement .....	89
<i>Hui Lu and Michael R. Wang</i>	
Artificial Neural Networks in Pharmaceutical Research, Drug Delivery and Pharmacy Curriculum .....	91
<i>Vijaykumar B. Sutariya, Anastasia Groshev, and Yashwant V. Pathak</i>	

Novel Central Venous Catheterization Simulation for Medical Training .....	93
<i>Nadine Luedicke, Elizabeth Burghardt, Johnie Hodge, Rebecca Thomas, Alex Barrett, Jiro Nagatomi, and Delphine Dean</i>	
Investigating the Deceptive Task in Dorsolateral Prefrontal Cortex by Functional Near-infrared Spectroscopy (fNIRS) .....	95
<i>Nguyen Ngoc Phuong Trinh, Truong Quang Dang Khoa, and Vo Van Toi</i>	
fMRI Functional Cluster Analysis Using the Stockwell Transform .....	97
<i>Alessio Medda, Jacob Billings, and Shella Keilholz</i>	
Technology in Locomotion and Domotic Control for Quadriplegic .....	99
<i>Mauricio Plaza, William Aperador, and Oscar Aviles</i>	

## **S4-1 – Bioimaging I**

Pulsed Infrared-evoked Intracellular Calcium Transients in Neonatal Vestibular and Spiral Ganglion Neurons .....	101
<i>Vicente Lumbreras, Esperanza Bas, Chhavi Gupta, and Suhrud M. Rajguru</i>	
A Gen-2 Hand-Held Optical Imager: Phantom and Preliminary <i>in-vivo</i> Breast Imaging Studies .....	103
<i>Manuela Roman, Jean Gonzalez, Jennifer Carrasquilla, Sarah J. Erickson, and Anuradha Godavarty</i>	
Pulsed Infrared Radiation Leads to Synchronous Contraction in Stem Cell Derived Cardiomyocytes .....	105
<i>Jordan M. Greenberg, Suhrud M. Rajguru, Daniel Pelaez, and Herman S. Cheung</i>	
Optical Spectroscopy for In Vivo Estimation of Hemodynamics and Structural Properties of the Brain .....	107
<i>Yinchen Song, Arnold Joasil, and Wei-Chiang Lin</i>	

## **S4-2 –Medical Robotics & Prosthetic Devices I**

A Multi-lead Multi-electrode System for Neural-interface Enabled Advanced Prostheses .....	109
<i>Anil K. Thota, Sathyakumar Kuntaegowdanahalli, Jorge Orbay, Amy K. Starosciak, James J. Abbas, Kenneth W. Horch, and Ranu Jung</i>	
Knee Angle Estimation based on IMU data and Artificial Neural Networks .....	111
<i>Christopher L. Bennett, Crispin Odom, and Matan Ben-Asher</i>	
Novel Use of Retro-reflective Paint to Capture 3D Kinematic Gait Data in Non-human Primates .....	113
<i>Anil K. Thota and Jay L. Alberts</i>	

Biomechanical Effect of One-Level or Two-Level Minimally Invasive Posterior Cervical Foraminotomies .....	115
<i>Denis J. DiAngelo, Raul J. Cardenas, Daniel M. Wido, Hamid M. Shah, and Kevin T. Foley</i>	

### **S4-3 – Biomechanics & Comp Fluid Dynamics I**

Modeling Shear Stress in Microfluidic Channels for Cellular Applications .....	117
<i>Sawyer D. Stone and Bryant C. Hollins</i>	
A Biofidelic Testing Platform and Protocol for Evaluating and Classifying Spinal Orthoses .....	119
<i>John C. Simmons, Daniel M. Wido, and Denis J. DiAngelo</i>	
Classification of Age-Related Changes in Lumbar Spine with the Help of MRI Scores .....	121
<i>A.A. Khan, D.D. Iliescu, E.L. Hines, C.E. Hutchinson, and R.J.S. Sneath</i>	

### **S4-4 – Biosensors**

Determining Binding Kinetics for Microfluidic Carbonylated Protein Enrichment .....	123
<i>Steven A. Jones and Bryant C. Hollins</i>	
Paper-based Immunosensor for Oxidative DNA Damage Biomarker Detection .....	125
<i>Xuena Zhu, Pratikkumar Shah, and Chenzhong Li</i>	
Inorganic Binding Peptides with Electro-Activated Properties via Phage Display Techniques .....	127
<i>Ya-Wen Yeh, Chih-Wei Liao, Seonhoo Kim, David Norton, and Laurie Gower</i>	

### **S5-1 – Bioimaging II**

Hardware Implementation of Active Contour Algorithm for Fast Cancer Cells Detection .....	129
<i>A. Chaddad, M. Maamoun, C. Tanougast, and A. Dandache</i>	
99mTc-MAA vs. 68Ga-MAA as Perfusion Agents .....	131
<i>Alejandro Amor-Coarasa, Andrew Milera, Denny A. Carvajal, and Anthony J. McGoron</i>	
Web Based Interactive Medical Imaging Applications for Teaching Nuclear Medicine .....	133
<i>Senait A. Debebe, Ruchir Bhatt, and Anthony J. McGoron</i>	
Investigation of Planning and Execution of Motor Skills in Healthy Adults using Simultaneous Near Infrared Spectroscopy and Kinematics Study .....	135
<i>Ujwal Chaudhary, Young-Jin Jung, Bryant Thompson, Jean Gonzalez, Jennifer Davis, Patricia Gonzalez, Kyle Rice, Martha Bloyer, Leonard Elbaum, and Anuradha Godavarty</i>	



## **S5-2 –Medical Robotics & Prosthetic Devices II**

Development of an Insole System for Real-time Capture of Ground Reaction Forces in Lower-limb Amputees .....	137
<i>Monica Stalin and Christopher L. Bennett</i>	
Biomechanical Effects of Load on Foot and Ankle Kinematics .....	139
<i>Kelly N. Salb, Daniel M. Wido, Thomas E. Stewart, and Denis J. DiAngelo</i>	
Smart Global Positioning System for Autonomous Delivery Robots in Hospitals .....	141
<i>Francisco Peleato, Mangai Prabakar, and Jong-Hoon Kim</i>	
Advanced Technique for Tele-operated Surgery Using an Intelligent Head-mount Display System .....	143
<i>Irvin S. Cardenas and Jong-Hoon Kim</i>	

## **S5-3 – Biomechanics & Comp Fluid Dynamics II**

Validation of a Novel Kinematic Based Protocol to Study Foot and Ankle Biomechanics .....	145
<i>Kelly N. Salb, Daniel M. Wido, Thomas E. Stewart, and Denis J. DiAngelo</i>	
Stiffness Analysis of Footwear Foams Subjected to High Strain Rate Uniaxial Compressive Loading .....	147
<i>Mohammad Reza Shariatmadari</i>	
Reducing Apoptosis of Porcine Cartilage through Mechanical Loading Following Impact Injury .....	149
<i>Andre A. Abadin, Lauren L. Vernon, Lee D. Kaplan, and Chun-Yuh C. Huang</i>	

## **S5-4 – Bioinformatics, BME Education & Telemed**

A Metagenomic Approach to the Airways Microbiome of Chronic Obstructive Pulmonary Disease (COPD) .....	151
<i>Mitch Fernandez, Melita Jaric, Lisa Schneper, Jonathan Segal, Eugenia Silva-Herzog, Michael Campos, Joel Fishman, Mathias Salathe, Adam Wanner, Juan Infante, Kalai Mathee, and Giri Narasimhan</i>	
A Common Interface for Bluetooth-based Health Monitoring Devices .....	153
<i>Dominik Kobylarz and Jacek Danda</i>	
A Study of Telerobotic Surgery and Telementoring in Space Missions .....	155
<i>Mangai Prabakar, Alejandro Diaz, Daniela Chavez Guevara, and Jong-Hoon Kim</i>	
Designing Primers with Higher Taxonomic Distinguishability .....	157
<i>Melita Jaric, Jonathan Segal, Eugenia Silva-Herzog, Lisa Schneper, Kalai Mathee, and Giri Narasimhan</i>	

## Poster Session P2

Statin Inhibition of HMG-CoA Reductase by Quantum Biochemistry Computations .....	159
<i>U.L. Fulco, E.L. Albuquerque, and L.R. da Silva</i>	
Biosensors to Probe Amyloidosis-Like Diseases .....	161
<i>E.L. Albuquerque, U.L. Fulco, and L.R. da Silva</i>	
Frequency-based Connectivity Analysis of Interictal iEEG to Localize the Epileptogenic Focus .....	163
<i>Ioannis Vlachos, Balu Krishnan, Joseph Sirven, Katherine Noe, Joseph Draskowski, and Leon Iasemidis</i>	
Specific Overground Walking Kinematic Measures are Related to Degree of Spinal Injury in the Rat .....	165
<i>Anil K. Thota and Ranu Jung</i>	
Design and Development of Hand-opening and Pinch Force Sensors .....	167
<i>Andres Pena, Sathyakumar S. Kuntaegowdanahalli, James Abbas, and Ranu Jung</i>	
Seated Tracking for Correcting Computer Work Postures .....	169
<i>Alvaro Uribe-Quevedo, Byron Perez-Gutierrez, and Cesar Guerrero-Rincon</i>	
A Framework for Affordable Telemedicine Service .....	171
<i>Uwe J. Cerron, Nagarajan Prabakar, and Jong-Hoon Kim</i>	
<b>Author Index</b> .....	<b>173</b>