PLENARY SESSION

Asia-Pacific Outlook of Medical Device Developments & Opportunities

Kang-Ping Lin

Secretary General at International Federation for Medical and Biological Engineering (IFMBE) Distinguished Professor, Dept. of Electrical Engineering, Chung-Yuan Christian University, Taiwan

Abstract

The aging problem accelerates the development of medical device and health service industry related to the aged, such as the requirements of implants and filler to supplementary devices, orthopedics and dentistry. Medical care has gradually developed towards health and preventive medicine instead of focusing on curing diseases, which results in long-term care based on information communication. The developed or developing countries in Asia have gradually transformed into an aging society; as a result, medical care is strongly required. Technologies that are developed to meet the current healthcare eco-system including, to provide VALUE to the customers, to fulfill the current unmet clinical needs, to reduce the healthcare spending, to provide early diagnosis and prevention of diseases, to promote personalized and regenerative medicine, and to enhance drug’s therapeutic effects.

Biographical Sketch

Prof. Kang-Ping Lin is a Distinguished Professor for Electrical Engineering and Director of Technology Translation Center for Medical Devices at Chung-Yuan Christian University, Taiwan. He served as Director of Medical Device Technology Division of the Biomedical Engineering Center in Industrial Technology Research Institute in Taiwan (2000-2004). He was the president of Taiwanese Society of Biomedical Engineering (2007-2010). He is the AC member of both Chinese Society of Biomedical Engineering (2015-2019) and Taiwanese Society of Molecular Imaging (2015-2019), and the Deputy Editor-in-Chief of the Journal of Medical & Biological Engineering (2018-2021). He has numerous roles in IFMBE including the Chair of Publication Committee and Publicity Committee, the Co-Chair of Asia Pacific Working Group Committee, and the Editor of IFMBE Newsletter from (2009-2015) to now. He has been elected to be the Secretary General of IFMBE (2018-2021). His research interests include handheld medical devices, physiological signal processing, and medical image processing. His current research topics include also capillary blood velocity measurement, microcirculation images, and hemodynamic data analysis. In the field of medical devices, he has also focused on integration of industry, academia and medicine oriented towards being homecare, small, simple and low-energy consumption.
PLENARY SESSION

Does MBES Need an Ethical Code?

Helmut Hutten

Institute of Medical Engineering, Graz University of Technology, Austria

Abstract

If the answer is YES, the next questions may be: Why? Which ethics shall be the basis? Shall (can) such a code of ethics be more than a code of conduct? Which other disciplines have a code of ethics? Shall the code be established as national, European or global code? How is the situation in other countries, e.g. the USA? Ethics is given the highest priority in EU funded research: all the activities carried out under Horizon 2020 must comply with ethical principles and relevant national, EU and international legislation, for example the Charter of Fundamental Rights of the European Union and the European Convention on Human Rights. An Ethics Assessment Procedure is required for projects under H2020. The UNESCO Bioethics Programme was created in 1993. UNESCO has installed two Bioethics Committees and in 2005 adopted the Universal Declaration on Bioethics and Human Rights. Can these international organizations, commissions and (national) councils give the appropriate answer (also from the sight of concerned disciplines like MBES) to the changes in the meaning of ethics? A first draft of a code of ethics for “Medical and Biological Engineering and Science” (MBES) will be presented. This draft has been submitted to the European Alliance for Medical and Biological Engineering and Science (EAMBES). It is open for discussion by the community.

Biographical Sketch

Em.Univ.-Prof. Helmut Hutten was born in Germany in 1936. He completed his Habilitation with the venia legendi in “Biomedical Engineering and Biophysics” in 1972 and became a professor in the Medical Faculty of the University of Mainz. He was nominated the chair professor for Biomedical Engineering at the University of Technology in Graz and retired in 2004 as professor emeritus. He was member of the AC of the German Society for Biomedical Engineering for more than 10 years. He was member of the AC of IFMBE and chairing the Working Group for European Activities (1994-2000). He was elected as fellow of the IFMBE International Academy. He was member of the AC of IUPESM and chairing the Regional Development Committee (2000 -2003). He was member in the German DKE standardizing committee for medical equipment for more than 10 years and head of the Versuchsanstalt (Institute for Safety Procedures in Medical Technology). His scientific topics are medical electronics and instrumentation, pacemaker technology, blood flow measurement and microcirculation, analysis of physiological systems, computer-assisted modelling and computer-assisted therapy management with special regard to diabetes mellitus, dialysis and cardiomyopathy, biotelemetry and telemedicine, and health care technology assessment.
PLENARY SESSION

Functional Electrical Stimulation in Movement Rehabilitation

Winfried Mayr

Center of Medical Physics and Biomedical Engineering, Medical University of Vienna, Austria

Abstract

Functional electrical stimulation (FES) has proven to be highly effective and efficient in assessment and therapy support of movement rehabilitation in numerous scientific studies. Nevertheless implementation in clinical practice still lags back and this lack of use of potentially highly beneficial methodological improvements is unsatisfactory, causes unnecessary health care costs and limits therapeutic accomplishments. Reasons are difficult to identify. Technology for electrical stimulation is available in a wide spectrum from simple to highly complex, non-invasive or implantable, and at a wide range of costs. A most effective application must include comprehensive clinical knowledge in combination neurophysiological and biomedical engineering expertise to analyze underlying mechanisms and optimize intervention setups. Engineers need to build on most actual technological innovations, but in addition need strong and respectful inclusion of medical and physiological specialists, to be interactively involved in development processes.

Biographical Sketch

Prof. Winfried Mayr received his Diploma in "Electronics and Control Engineering" from Vienna University of Technology in 1983, his work is focused on Functional Electrical Stimulation (FES) and rehabilitation engineering, mainly at Vienna Medical University, since. His Ph.D. in Biomedical Engineering was on "Reactivation of Paralyzed Muscles by FES via Implants" (1992) and included experimental and applied research on phrenic pacing, lower extremity, pelvic floor and denervated muscles. Work in the subsequent years was dedicated mainly on non-invasive FES of lower extremity in paraplegia, in microgravity and clinical bed-rest, and upper extremity. Outcome of the European Project RISE on FES of denervated muscles, an initiative with 20 partner groups under his coordination, was development of a novel clinical method and associated equipment for rehabilitation after flaccid paraplegia. His special current focus is spinal cord stimulation for modification of spasticity and restoration of movement after SCI. 2001 he received his venia docendi from the Technical University and was appointed as assoc. Univ.-Prof. at the Medical University of Vienna. In 2010 the Technical University of Cluj-Napoca, Romania awarded him with a Dr. h.c. degree. Between 2009 and 2017 he chaired the Austrian Society for Biomedical Engineering (OeGBMT), and is current vice-president and IFMBE delegate of OeGBMT, and councilor in EAMBES, the roof organization of European Biomedical Engineering Societies. He is foundation member and board member of the International FES Society IFESS. He serves as reviewer in various journals and funding agencies and Co-Editor for FES in the Journal "Artificial Organs".
PLENARY SESSION

Spinal Cord Stimulation for the Abbreviation of Spasticity

Thordur Helgason

Associated Professor at of Science and Technology at Reykjavik University, Iceland. President of the Icelandic Society for Biomedical Engineering and Medical Physics (HTFI).

Abstract

Transcutaneous spinal cord stimulation (tSCS) has been shown to alleviate spasticity of the lower limbs in people with incomplete spinal cord injury (SCI). tSCS is believed to have inhibitory effects on motor output through posterior root afferent fibres that lead to the neural network of the spine connected to the motor neurons and interneurons that generate the motor output. Stimulation of the posterior roots sensory fibres can be reached without stimulating the motor neuron of the same muscle as they have a bigger diameter and therefore a lower stimulation threshold compared to the motor neurons. The question arises how the tSCS influences the spinal cord circuitry? In order to investigate that we looked at EMG in pendulum test and in Achilles tendon test by spinal cord and brain injured people. The talk will give overview on research work on spinal cord stimulation for the abbreviation of spastic by spinal cord injured and brain insulted people including hypothesis, stimulation methods, research protocol, assessment methods and some result. Additionally, some future work will be outlined.

Biographical Sketch

Professor Thordur Helgason is an Associate Professor for Biomedical Engineering at Reykjavik University (RU) and Landspitali – University Hospital (LSH). He served as Director of Department of Research and Development at LSH (2000-2010) and of Department of Physics and Medical Engineering at the same hospital (1990 - 2000). He is the president of The Icelandic Society of Biomedical Engineering and Medical Physics (2000 to date) He is a member of The Icelandic Neuroscience Society, The Icelandic Pain Society, The German Society for Biomedical Engineering, IEEE and several additional national and international societies concerning medical technology. He is a co-founder of Kiso ehf, Fire ehf and worked for several other start-up companies including Flaga ehf and Össur hf.

His research interests are all in the frame of neural engineering including electrical stimulation, medical image and signal processing, mathematical modelling of physiological phenomena, 3D printing and physiological fundaments of the nervous system. He has published numerous scientific articles and over hundred conference articles. Current work focuses on spinal cord stimulation for neural modulation and on prosthesis for finger movements.
PLENARY SESSION

*University Support Services for Inclusion of Student with Disabilities and Learning Disabilities could be an Opportunity of Improvement for all the Students*

Alessandro Pepino

Department of Biomedical Engineering-University of Naples “Federico II”, Italy

Abstract

The university has among its objectives the full personal and social realization of the student. The SiNAPSi center has the responsibility to reduce the factors which cause the restriction of student participation. The current SiNAPSi structure includes five areas: “Disability services”; “Services for specific learning disorders”; “Services for successful training”; “Services of anti-discrimination and culture of differences” and “Services for the promotion of employability”. The SiNAPSi center looks to the individual in its entirety and complexity and puts in place targeted actions using skills in the areas of psychology, pedagogy, sociology and bioengineering.

Biographical Sketch

Assoc. Prof. Alessandro Pepino was born in Naples, Italy, in 1958. He graduated with honors in Electronic Engineering (biomedical) in 1982. In 1983 he started the Doctorate in Bioengineering. In 1985, between June-December he successfully researched at the Biomedical Dept. of the King’s Collage Medical School, London (UK) on a research project concerning gait analysis of the movement of amputated patients. In the 1988 he got his PhD in Bioengineering discussing the thesis entitled “Methods and Instrumentation for the Functional Evaluation and Therapy of Hemiplegic Patients”. In May 1988 he became senior Technician at the Electronic Department of the University of Naples. He holds numerous courses concerning biomedical engineering at the University of Naples. He is responsible for Assistive Technologies at SINAPSI University Centre for Tutoring Disable Students. He was responsible for different activities and projects of several Hospital and Public Companies. He was invited speaker at many scientific national and international conferences. He has published more than 100 scientific articles concerning the research areas such as rehabilitation, assistive technologies, computer assisted surgery, FMRI, telemedicine, EHealth, BPM, DES Simulation in Health Care.
PLENARY SESSION

*Cardiovascular Tracking with four Electrodes*

Ramon Pallàs Areny

Professor, Instrumentation, Sensors and Interfaces Group, Dept. of Electrical Engineering, Universitat Politècnica de Catalunya (BarcelonaTech), Spain

**Abstract**

Increasing healthcare costs are endangering the sustainability of public health systems. Medical technology is in part responsible for that high cost, because it is usually designed to fulfil the most stringent functional and safety regulations applicable in hospitals. However, a large demand and expense of health care arises from long-term health conditions, permanent disability and, increasingly, ageing, which ask for health care and monitoring outside hospitals. We have devised a system based on four electrodes able to simultaneously measure the ECG, limb-to-limb IPG, and two local IPGs wherefrom the Pulse Arrival Time (PAT) and bilateral Pulse Travel Time (PTT) can be obtained. These parameters can be used to track the electrical and mechanical cardiac activities, blood pressure changes and arterial condition from four electrodes placed in comfortable user interfaces from handle bars to smartphone cases.

**Biographical Sketch**

Dr. Ramon PALLÀS ARENY is a Professor of Electronic Engineering at the Universitat Politècnica de Catalunya (BarcelonaTech, UPC) since 1989, and teaches courses in electronic and medical instrumentation. In 1989 and 1990 he was a visiting Fulbright Scholar and, in 1997 and 1998 he was an Honorary Fellow at the University of Wisconsin, Madison (USA). His research includes instrumentation methods and sensors based on electrical impedance measurements, autonomous sensors, sensor interfaces, and noninvasive physiological measurements. He is the author or co-author of several books on instrumentation in Catalan, Spanish and English. He is also author or co-author of more 330 papers published in scientific journals or conferences. He is an inventor in 28 patents, 6 of them international and commercially exploited. He has directed three R&D projects that yielded commercial products, and in the last 5 years has been Technical Manager in two projects funded by the European Union (7FP). Dr. Pallàs Areny was elected IEEE Fellow in 1998, and nominated Professor Honoris Causa by the Faculty of Electrical Engineering of the University of Cluj-Napoca (Romania) in 2001. He received the Award for Quality in Teaching granted by the Board of Trustees of the UPC in 2000, and the Narcís Monturiol Medal from the Autonomous Government of Catalonia in 2002.
PLENARY SESSION

*Augmented Visualization in Medicine and Surgery*

**Lucio Tommaso De Paolis**

Augmented and Virtual Reality Laboratory (AVR Lab), Department of Engineering for Innovation, University of Salento, Italy

**Abstract**

Augmented Reality (AR) and Mixed Reality (MR) technologies refer to a perception of a physical real environment whose elements are merged with virtual computer-generated objects in order to create a single reality. The merging of virtual and real objects has to run in real time and virtual objects have to be aligned (registered) with real world structures. Both of these requirements guarantee that the dynamics of real world environments remain unchanged after virtual data have been added. New applications of AR technology provide systems that help surgeons in the intra-operative phase by means of the overlapping of virtual organs on the real patient; this allows the surgeon to have a sort of “X-ray vision” of the patient’s internal anatomy. The use of augmented visualization in surgery has the potential to bring the advantages of the open-surgery visualization also in minimally invasive surgery, produces a better spatial perception and a reduction in the duration of the surgical procedure permitting to perform the tasks in ways that are both faster and safer. The aim of this speech is to present the new applications of the Augmented Reality technology in medicine and surgery and discuss on the clinical benefits and limitations.

**Biographical Sketch**

Alessandro Pepino Lucio Tommaso De Paolis has a Degree in Electronic Engineering from the University of Pisa and is an Assistant Professor of Information Processing Systems at the Department of Innovation Engineering of the University of Salento. His research interest concerns the study and the design of applications of Virtual and Augmented Reality and Human-Computer Interaction in medicine and surgery, cultural heritage and education. De Paolis is the Director of the Augmented and Virtual Reality Laboratory at the Department of Engineering for Innovation of the University of Salento and the responsible of the “Advanced Virtual Reality for Medicine” research group at the Laboratory of Interdisciplinary Research Applied to Medicine of the Hospital of Lecce. He is the vice-president of Italian Movement Modelling and Simulation association (MIMOS). De Paolis is the organizer of the International Conference on Augmented Reality, Virtual Reality and Computer Graphics. He has been visiting researcher at the Centro de Ciencias Aplicadas y Desarrollo Tecnológico of the Universidad Nacional Autónoma de México, Mexico City and at the Computer Graphics Laboratory of the Sabanci University of Istanbul. De Paolis teaches “Applications of Virtual and Augmented Reality” at the University of Salento and has been the coordinator of Italian and international projects focused on the application of virtual and augmented reality in medicine, cultural heritage and education.
PLENARY SESSION

*Healthcare Interoperability and Standards by the Numbers – a Framework for Answering “Why…”*

**Harry Solomon**

American Medical Informatics Association

**Abstract**

Why is healthcare interoperability so hard? Why are the standards not enough? Why does interoperability take so darn long? Answering these “whys” requires understanding the principles, processes, and practices of healthcare interoperability. We will use concepts based on the numbers one through five as a framework for that understanding, and a start to answering those questions.

**Biographical Sketch**

Harry Solomon has been involved in computer communication protocols and standards since 1978, when he worked on a host interface to the ARPAnet. He came to the medical world in 1993 to develop the first extension of the Digital Imaging and Communications in Medicine (DICOM) Standard to support cardiac image exchange. Until his retirement in 2016, Solomon was an Interoperability Architect at GE Healthcare, responsible for promoting product connectivity in radiology, cardiology, and pathology. He is the past Industry Co-Chair of the DICOM Standards Committee, and has been active in other standards development organizations, including HL7, IEEE, IHE, ISO, LOINC, and SNOMED. He has also taught healthcare interoperability and standards at Northwestern University and Oregon Health & Science University, and is currently preparing a textbook on the theory and practice of interoperability. In 2010, Solomon was presented the Kite and Key Award of the National Electrical Manufacturers Association for his work in healthcare interoperability standards and education. He is a Life Senior Member of the Institute of Electrical and Electronic Engineers, and a member of the American Medical Informatics Association.
PLENARY SESSION

Towards High Fidelity “in silico” Computer Modelling and Simulation in Surgery

Sanjay Padhiar

CAE Engineer at INAS SA, Fluids Business Unit (FBU), Cluj-Napoca.

Abstract

As healthcare organizations labor toward profit, they embrace simulation tools and methodologies not just for rapid development but to ensure extreme product safety and reliability — a goal of 100 percent efficacy. Computer modeling and simulation known as “in silico” is revolutionizing the field of healthcare in particular surgery. The methodology provides valuable insights upfront, bringing earlier product launch and greater return on investment through reduced reliance on animal studies and bench testing. Innovative companies are now leveraging simulation as a gateway to personalized medicine. This presentation shares the knowledge and experience of ANSYS experts and our partners to guide you in the strategic adoption of engineering simulation in surgery and healthcare.

Biographical Sketch

Sanjay Padhiar has over 20 years of experience of working in the aerospace, automotive and engineering software industries using numerical modelling and simulation for product design and development. He specializes in Computational Fluid Dynamics (CFD), geometry modeling and meshing. Currently, Mr. Padhiar provides technical expertise for the application and support of ANSYS Multiphysics products in various engineering disciplines including electric motors, combustion, aerodynamics and biomedical applications.
PLENARY SESSION

1. Monitoring the Stability of Bone-implant Structures by Vibration Analysis

Leonard Cezar Păstrăv
Smart Instrumentation Research Group, Campus Group T, Faculty of Engineering Technology, K.U. Leuven, Belgium

Abstract

The stability of the bone-implant structures is a major concern since, for example, more than 12% of the total hip arthroplasty (THA) procedures are revision surgeries mainly due to aseptic loosening. The initial stability obtained intra-operatively by press-fitting the implant in bone is a critical factor for the osseointegration process that should lead to a long term secondary stability. Detecting the insertion endpoint corresponding to the optimal initial stability is challenging for any surgeon. Excessively press-fitting the implant in the bone cavity cause intra-operative fractures up to 5% during primary THA and even up to 30% in revision THA, hence there is need for objective monitoring methods. This talk describes studies related to non-destructive vibrational techniques applied in vitro and in vivo to assess intra-operatively and post-operatively the stability of different bone-implant structures.

2. Structural Health Monitoring Techniques Applied in Orthopaedics

Abstract

Structural Health Monitoring (SHM) is defined as the process of implementing a damage detection strategy for engineering structures based on vibro-acoustic techniques. Successfully used to detect damages in bridges, aircraft, oil ridges and large buildings, SHM techniques were implemented in orthopaedics to determine bone mechanical properties and to monitor fracture healing. Also, several vibrational features, such as harmonic distortion or resonance frequency shift, have been used to detect implant loosening and acoustic methods are applied in vibroarthrography to detect cartilage loss due to osteoarthritis and other degenerative diseases. This presentation will show how SHM techniques have been adapted for biomechanics in several in silico, in vitro and in vivo research studies at K.U. Leuven.

Biographical Sketch

Prof. Leonard Păstrăv was born in Paltinoasa, Suceava county, Romania, in 1957. He graduated in Mechanical Engineering at the Technical University “Gheorghe Asachi” in 1982. Also, he graduated in Computer Science at the University “Alexandru Ioan Cuza” in 2001. Both universities are from Iasi, Romania. After working 20 years in the Romanian industry and education, in 2002 he started working at K.U. Leuven, the oldest university in Belgium, first as technical manager in international e-learning projects and then as researcher in biomechanics. He obtained his PhD in engineering at K.U. Leuven in 2010 with the dissertation “Monitoring of the fixation of orthopaedic implants by vibration analysis”. He divides his working time between research studies in biomechanics and didactic activities as coordinator of the courses “Machine Parts”, “Manufacturing Technology”, and “Advanced Manufacturing”. He has about 70 scientific publications.
PLENARY SESSION

Electromagnetic hyperthermic technologies: current challenges and future opportunities.

Dr Lourdes Farrugia

Abstract

Electromagnetic (EM) hyperthermic technologies hold great potential in the treatment of diseases, especially for cancers that are resistant to standard regimens. These technologies modify tissue temperature: hyperthermia heats the diseased tissue to make it susceptible to treatments, and ablation heats the tissue until it is destroyed. Hyperthermia is particularly effective in treatment of cervical and breast cancer, head and neck cancers, sarcoma in adults, and germ cell tumours in children; while radiofrequency and microwave ablation offer promise for treating liver, kidney, and lung cancers.

Overall, these techniques have shown significant potential and there is substantial opportunity to solidify their use clinically and to apply them to a wider range of medical conditions. However, underpinning the development of these techniques is the need for accurate knowledge of the dielectric and thermal properties of tissues, which provide the foundation for these technologies and de-risk the technical challenge before commercialization. Furthermore, contributing to the stagnant market of EM hyperthermic medical devices is the fact that, often researchers working on the development of medical technologies are not fully aware of, and not trained to address, the clinical and commercialisation challenges facing novel medical devices.

Biographical Sketch

Dr Lourdes Farrugia is currently a lecturer in the Department of Physics at the University of Malta. She joined the Physics department in 2011 as a Research Officer working in the Electromagnetics laboratory. She obtained her Ph.D. from the University of Malta in 2016, studying the interaction of electromagnetic fields with the human body. In particular, she conducted measurements of dielectric properties of various biological tissues. Her research interests are mainly focused on aspects of instrumentation and measurement of physical quantities, especially sensor design, applied electromagnetics (in particular, dielectric properties of biological tissue) and biological effects of electromagnetic radiation. She is currently focusing her research on addressing gaps in knowledge of dielectric properties of biological tissues relevant to microwave medical devices. Lourdes is the COST Action chair of ‘CA17115 -European network for advancing Electromagnetic hyperthermic medical technologies’.
PLENARY SESSION

*Application of the High-resolution Manometry in the Investigation of the Esophageal Motility*

Dan L. Dumitrașcu

Semiology Department, 2nd Medical Clinic University of Medicine and Pharmacy “Iuliu Hațieganu” Cluj-Napoca, Romania

**Abstract**

Esophagus is an organ with the main function the transportation of the alimentary bolus toward the stomach. The motility function is of paramount importance for the successful achievement of this function. Motility disorders may result in embarrassing clinical conditions. Their diagnosis is possible thanks to new diagnostic equipment for high-resolution manometry. Our presentation will display the results of the main manometry lab in South-East Europe in diagnosing motility esophageal disorders.

**Biographical Sketch**

Prof. Dr. Dan L. Dumitrașcu was born in 1957 in Cluj, Romania, and graduated from the medical school of the same city in 1982. Currently, he is Professor of Medicine at the University of Medicine and Pharmacy, “Iuliu Hațieganu”, Cluj-Napoca, Romania, and Head at the 2nd Medical Department. He is also Consultant of Gastroenterology and Internal Medicine at the County Emergency Hospital, where he also leads the laboratory for functional GI investigations. He has been interested in gastroenterological motility and functional disorders for over 20 years, benefiting during this time from the advice of Douglas Drossman. He worked almost 2 years as Humboldt Research Fellow with Dr. Martin Wienbeck in Germany. Dr. Dumitrașcu founded the Romanian Society of Neurogastroenterology and organized 2 International Symposia in Neurogastroenterology. He also chairs the Section of Neurogastroenterology at the annual Romanian gastroenterology meetings. Prof. Dr. Dan L. Dumitrașcu is President of the Romanian Society of Gastroenterology and Hepatology, Vice-President of the Romanian Society of Internal Medicine, Chairman of the International Association of the Rome Foundation, Corresponding Member of the Academy of Medical Sciences, Deputy Secretary of the European Association of Psychosomatic Medicine and former vice president of the European Society of Clinical Investigation. He has published 20 books, over 200 studies in medical journals in the country and abroad and is a distinguished personality of the Romanian medical world, being recognized for his work in neurogastroenterology.
PLENARY SESSION

Affective Education in Medicine Through the New Technologies

Doru Ursuțiu

“Transilvania” University of Brașov, Romania

Abstract

For any enterprise, a key success factor is the quality of the product it delivers. In the education sector, this “product” is the delivery process itself, while in the medicine, the customer – i.e. the student – actually takes part in the process as a “co-producer”. This interactive aspect of the service delivery has a significant consequence for us as technology providers in medicine, namely that any time student fail to engage with the educational process, they suffer a kind of “loss”, i.e. they experience a diminished product, while at the same time the business suffers a “loss” of its own: it fails to score the success that it could have potentially achieved. To get at the heart of education in medicine, is it really necessary first to develop a set of sophisticated analytical tools? Perhaps we can manage without. We’re reminded of something Ray Kurzweil wrote in his book How to Create a Mind (Viking, 2012): “The mathematics of how Bernoulli’s principle produces wing lift is still not yet fully settled among scientists, [nevertheless] engineering has created the entire world of aviation.” So although we may not have a comprehensive understanding of all the factors that impinge on medicine, from sociobiology to cognitive neuroscience, we do feel comfortable enough to move forward anyway and model a new product for our market: “Affective medicine.” or how remote technology may enhance the experience of students in universities and training programs.

Biographical Sketch

Prof. Dr. Phys. Doru Ursuțiu is the Manager of Center for Valorization and Transfer of Competence CVTC from „Transylvania” University of Brasov and coordinator of CVTC Creativity Laboratory. He completed his studies of Physics at the „Babes-Bolyai” University from Cluj-Napoca – Romania and is specialized in Open and Distance Learning (LOLA course - Heriot Watt University UK) and Noise in Electronic Systems. The key qualifications of Prof. Ursuțiu are Physics, Electronics (with a doctorate in Noise and Fluctuations in Electronic Systems and Devices), Graphical Programming, Remote and Virtual Instrumentation. He is Associate member of Academy of Romanian Scientists AOSR, member of Executive Committee - Central European Chapter of Association for the Advancement of Computing in Education (AACE) and Past President of International Association of Online Engineering IAOE. In the same time he is member of Scientific Committee and reviewer for many international conferences and publications (REV, ICL, IMCL, EURODL, IJIM, IJ-SoTL, etc.)
PLENARY SESSION

*Bioinspired Multi-Sensitive Materials for Tissue Engineering and Regenerative Medicine*

Liliana Vereștiuc

Faculty of Medical Bioengineering, “Grigore T. Popa” University of Medicine and Pharmacy, Iasi,

Abstract

The repair of tissue defects is still a challenging clinical problem and various techniques and methods have been tested in the aim to obtain a better solution. With the apparition of tissue engineering and its promising repair strategies, an increasing interest was noticed for developing of biocompatible and biodegradable materials. A variety of natural or synthetic biomaterials have been tested for tissue regeneration and drug delivery applications, some of them with very good performances. The talk is focused on optimizing bioinspired multisensitive scaffolds, like as morphology and mechanical properties, stimuli responsiveness, bioadhesion, cells and tissue response. The overall advantages of the applications of composite scaffolds in tissue engineering are discussed in terms of their ability to reproduce the tissue architecture and to stimulate the cells attachment, migration and proliferation.

Biographical Sketch

Prof. Dr. Eng. Liliana Vereștiuc graduated Technical University of Iasi in 1992 and she obtained a PhD in Science and Engineering of Materials in 2002. From 1999 she joined to Faculty of Medical Bioengineering from “Grigore T. Popa” University of Iasi, where she is a professor of Biomaterials and Tissue Engineering and coordinator of the Research Center of Tissue Engineering, Artificial Organs and Regenerative Medicine. She was a visiting researcher or academic in several laboratories and performed some trainings related to biomaterials surface analysis and cells-materials interactions (France, United Kingdom). She was invited speaker at many scientific national and international conferences with topics on Biomaterials, Tissue Engineering, and Nanotechnologies for Diagnostics and Drug Delivery. Her professional and scientific activity comprises: books and chapters in other books (9); papers published in scientific journals (over 120); papers published in the conference proceedings (95/52 international); patents (12); research projects: (32/16 as project leader).
PLENARY SESSION

Technical Issues Specific to Military Medical Assistance

Doina Baltaru

“Dr. Constantin Papilian” Emergency Military Hospital of Cluj-Napoca, Romania

Abstract

The Military Medical Service's mission is to maintain the health of the MApN employees in peacetime, to recover them after participating in missions and to recover and regenerate their force in wartime. Medical assistance is provided during missions, but also at war, by mobile medical structures. Medical evacuation is done terrestrially with armored ambulances and in air with helicopters or sanitary aircrafts. The equipment used is robust having dimensions that make it portable. Medical devices have been developed in order to study the impact of different types of weapons on military health (biosensors). Telemedicine has an important role in cases assessment and also in supporting of therapeutic solutions establishment. To prepare medical staff, simulators equipped with specific conflict areas support modules are used. The techniques and devices that are used for post-mission recovery have also a number of particularities. In conclusion, the research in the technical fields has an essential role in the military medicine progress and also in the adaptation of healthcare to the modern warfare.

Biographical Sketch

Col. Dr. Doina Baltaru was born in Romania in 1964. She received her medical degree in 1989 from “Carol Davila” University of Medicine and Pharmacy, Bucharest. In 1999 she received her consultant medical degree in internal medicine and she is trained in rheumatology since 2001. She was the head of the internal diseases department of “Dr. Constantin Papilian” Emergency Military Hospital from Cluj-Napoca (2000-2009) and medical manager and commander deputy of “Dr. Constantin Papilian” Emergency Military Hospital from Cluj-Napoca (2009-2013). The research domains of interest are immunology and endothelial dysfunction in rheumatic diseases. The latter represents the focus of her PhD thesis. Starting with 2013, she is the commander of “Dr. Constantin Papilian” Emergency Military Hospital from Cluj-Napoca. She published many articles in medical journals. She delivered over 50 oral and poster presentations at national and international symposiums and congresses, part of which were presented at the Military Physicians and Pharmacists Association Conferences.
PLENARY SESSION

Genetics and Vaccines

Mircea Gelu Buta

Babeș-Bolyai University of Cluj-Napoca, Emergency County Hospital Bistrița, Romania

Abstract

Vaccines have been used for over 300 years and are one of the most effective strategies for preventing infections. Unlike conventional drugs that are prescribed to patients, vaccines are administered to healthy people without a preliminary screening to detect underlying susceptibility, which may be of concern to us. Recently, there has been reported a new syndrome, called "ASIA", which includes a spectrum of immune-mediated diseases triggered by an adjuvant stimulus (silicone, tetramethyl pentadecane, pristan, aluminum etc.).

Physicians should be aware that vaccines may cause serious, potentially debilitating and even fatal manifestations in certain individuals. Therefore, efforts should be made to identify subjects at increased risk of developing autoimmune side effects and, on the other hand, the vaccine industry should be encouraged to make safer products.

Biographical Sketch

Prof. Dr. Mircea Gelu Buta currently works at "Babes-Bolyai" University of Cluj-Napoca, where he is teaching Christian Bioethics. He is Primary Physician in Pediatrics and Manager of The Emergency County Hospital Bistrița. He is the organizer of "International Seminar of Medicine and Theology" in Bistrița, now on its fifteenth edition. He is author of 48 specialty and belletrist books and he published over 300 articles in various magazines in the country and abroad. He activates as a member in numerous medical and cultural associations. He obtained many Honors and Awards like: The Order "Saints Constantine and Helen" of Romanian Patriarchate (2016); Silver Medal of “Babes-Bolyai" University of Cluj-Napoca (2016); The Order "Holy Martyrs of Năsăud" (2015); Honorary citizen of the village Bistrita Bargaului (2013); Transylvania Cross (2005); The Order and Medal "Sanitary Merit" in the rank of Officer (2004); Patriarchal Cross (1999).
PLENARY SESSION

Potential of the Mechanomyogram

Mihai Tărâță

University of Medicine and Pharmacy of Craiova, Romania

Abstract

MMG (Mechanomyogram) reflects the mechanical muscle vibrations generated by the spatio-temporal summation of the individual muscle fiber twitches, which are evoked through motor unit (MU) activation by the motor neurons (MNs). Ongoing research showed the MMG to be reliable in studying (i) the development of fusion and the changes in muscle contractile properties during repetitive unfused contractions, and (ii) monitoring the development neuromuscular fatigue. The presentation shows original results, while underlining the added value of MMG, namely it encapsulates the mechanical properties of the muscle, and therefore it may be useful to modeling the profile of the muscular force, from MMG as an input, in static and dynamic contractions, as well.

Biographical Sketch

Prof. Dr. Eng. Mihai Tărâță currently works at the University of Medicine and Pharmacy of Craiova where he is teaching “Medical Informatics and Biostatistics” in Romanian and English. He initiated a new approach in monitoring muscle fatigue through the EMG & MMG signals. He also performed research on the national and international scientific arena. He was postdoctoral researcher (1998 – 1999) at Catholic University of Leuven, Belgium Faculty of Physical Education and Kinesiology, Lab of Ergonomics. He developed a new approach to study and monitor the changes in the EMG and MMG signals in submaximal tasks; he developed also a new model for the muscular force from the EMG as an input, having an important contribution to the promotion of the Faculty of Physical Education and Kinesiology. He was a visitor professor (2001) at Universitaet der Bundeswehr, Institut für Mathematik und Datenverarbeitung, Muenchen, Germany. He developed an original method to detect the abrupt changes within biological signals with direct application to single trial detection of M1, M2, M3 EMG activity of the stretch reflex Prof. Mihai Tărâță was a visitor professor (2002 – 2003) at Iowa State University for Science and Technology, Ames, USA. He developed novel concepts, systems, and experiments to study the adaptive behavior in human prehension. He contributed to the development of the Motor Control & Learning laboratory and also to the promotion of the Health & Human Performance Department.
PLENARY SESSION

Nanotechnology and based Targeted Drug Delivery in Cochlear Implantation

Alma Maniu

Associate Professor, Head of the E.N.T Department, University of Medicine and Pharmacy Iuliu Hatieganu Cluj-Napoca

Director of the National Program for Hearing Loss Treatment Through Implantable Devices and Cochlear Implant in Cluj-Napoca

Abstract

Sensorineural hearing loss caused by inner ear cell damage, represents a major health issue, affecting more than 360 million patients worldwide. The burden of the hard of hearing is considerable, in terms of physical, social and mental well-being, educational development and employment. Currently there is no medical treatment for this condition outside hearing aids. The cochlear implant, the first device to restore a human sense, is an electronic substitute for lost mechanosensory hair cells. Recent advances in regenerative biology and medicine are opening new avenues for enhancing the efficacy of cochlear implants, by use of a biocompatible, resorbable controlled-release drug-delivery system. Nanoparticles, functioning as non-viral vectors of biogenic agents (e.g. genes, neurotrophic factors and steroid sequences), protected from the effects of the body’s metabolism, are to be transported specifically to the desired target location and time-released. Integrating a minute (nanoscale) drug depot into a cochlear implant could lead to targeted release of neurotrophic factors and eventually to an improvement in nerve-electrode interaction.

Biographical sketch

Dr. Alma Maniu is Associate Professor, Head of the E.N.T Department, University of Medicine and Pharmacy Iuliu Hatieganu Cluj-Napoca and Director of the National Program for Hearing Loss Treatment Through Implantable Devices and Cochlear Implant in Cluj-Napoca since 2016. As ear surgeon, she has a comprehensive and detailed knowledge of otology, her professional interest is mainly focused on hearing disorders treatment. Dr. Alma Maniu has also acquired considerable international experience, attending many E.N.T. conferences, as speaker and is a member in many international otology societies. Her research activity has materialized with her publications and research grants projects. Currently the main areas of interest for research are in cochlear implant, nano-otology, metallic nanomaterials for ear disease treatments and nanoparticles' toxicity to the inner ear.
PLENARY SESSION

The Advantages of Femtosecond Laser in Corneal Refractive Surgery and Cataract Surgery

Monica Gavriș

Emergency Hospital “Dr. Constantin Papilian”, Cluj-Napoca

Abstract

Femtosecond laser represents a significant progress in corneal refractive and cataract surgery. It was initially introduced in corneal refractive surgery, becoming superior to the microkeratome and in 2011 it was upgraded and adapted for cataract surgery, hoping to obtain a secure, more precise surgery, with predictable results. The novelty of this technique consists in personalized surgical parameters. The incisions, the capsulorrhexis and the lens nucleus fragmentation can be customized, both preoperatively and intraoperatively after performing a good suction. During phacoemulsification, the classical technique, these steps are performed manually, using surgical instruments and the results are less precise than in femtosecond laser assisted cataract surgery. The execution of the corneal flap during femtosecond laser assisted corneal refractive surgery has a superior safety profile and a better control over its dimensions and border configuration. The flap thickness is performed with a precision of +/- 5 microns and in retreatment, if needed, the FSL can create a thicker and larger flap than the first. Flap diameter can be customized and hinge position can be changed according to the refractive error and the anatomy of the orbit. In conclusion, femtosecond laser assisted ocular surgery has a better safety profile, the FSL provides good precision and control, for both, cataract and corneal refractive surgery, reducing the learning curve and providing predictable results.

Biographical Sketch

PLENARY SESSION

Electrodiagnostic Evaluation of Peripheral Nerve Injuries and Compressions

Dan Zaharia

Faculty of Medical Bioengineering, “Grigore T. Popa” University of Medicine and Pharmacy, Iasi

Abstract

Electrodiagnostic (EDX) medicine is the medical subspecialty that applies neurophysiologic techniques to diagnose, evaluate and treat patients with impairments of the neurologic, neuromuscular, and/or muscular systems. The EDX medicine consultant must then be able to select and perform a logical sequence of electrophysiologic tests and interpret the data to arrive at the probable diagnosis. Practitioners also require special knowledge about electric signal processing, including waveform analysis, electronics and instrumentation, stimulation and recording equipment. Particular aspects of EDX examination and interpretation including criteria of localization, physiopathogical mechanisms and severity of peripheral nerve injuries and compressions will be presented.

Biographical Sketch

Dan Zaharia was born in Targu Neamt, Romania in 1962. He graduated the Faculty of Medicine, University of Medicine and Pharmacy „Gr. T. Popa” Iași, Romania in 1987. Between 1988 and 1994 he was intern and resident at the University Hospitals in Targu Mures and Iasi and became medical specialist in internal medicine/functional testing in 1994. In the 1999 he got his PhD in Medicine with the thesis entitled: ”Researches on myogenic regulation of the coronary circulation”.

In 1991 he has been appointed Assistant Professor in Physiology at the University of Medicine and Pharmacy „Gr.T.Popă” Iași. In 1996 he was Senior Lecturer and starting with 2002 Associate Professor in Physiological Measurements and Biomedical Instrumentation at the Faculty of Medical Bioengineering. Between 2006 – 2016 he was elected Dean of the Faculty of Medical Bioengineering. Since 2005 he is the coordinator of the Rehabilitation Bioengineering Master program and the course holder of Neuromuscular Electrodiagnostic and Functional electrical stimulation. Scientific research grants, papers and invited lectures in the following fields: simulation and modelling of physiological processes, measurement and processing of biomedical parameters, electrodiagnostic, e-health and telemedicine.