PLENARY SESSION

Biomedical engineering – building International networks for growth of health care and well-being

Prof. dr. sc. Ratko Magjarević

University of Zagreb, Faculty of Electrical Engineering and Computing
Department for Electronic Systems and Information Processing
Zagreb, Croatia

Abstract

Since its founding in 1959, the International Federation for Medical and Biological Engineering (IFMBE) has in sixty+ years grown from a group of enthusiastic researchers, engineers and physicians into the world largest society based association in the field of biomedical engineering. IFMBE unifies the world-wide Medical and Biological Engineering Community in promoting health and quality of life through the advancement of research, development, application and management of medical devices and technology. The IFMBE is the global scientific society of biomedical engineers in official relations with the World Health Organisation (WHO) and has been very active in promoting the role of the biomedical engineers and medical technology. In the past decades, a remarkable increase in numbers of high quality medical devices enabled general improvement of global health. The indicators of the World Bank and the World Health Organisation (WHO) show that life expectancy at birth has never been so long while the under-five mortality rate has never been so low. Medical technology continues to grow on a global scale, and in Europe its development can be traced through the steadily growing number of registered patents in the European Patent Office for more than a decade and medical technology is the area with the largest number of patent applications. Therefore networking in global societies like IFMBE further enables spreding of knowledge and skills worldwide.

Biographical Sketch

Ratko Magjarević received his Ph.D. in Electrical Engineering in 1994 from the University of Zagreb, Faculty of Electrical Engineering. After his appointment in industry at the Institute of Electrical Engineering "Koncar," he joined the Electronic Measurement and Biomedical Engineering Group at the University of Zagreb Faculty of Electrical Engineering and Computing. He is full professor teaching several courses in Electronic Instrumentation and Biomedical Engineering at undergraduate, graduate and at postgraduate studies.

His scientific and professional interest is in fields of electronic and biomedical instrumentation and health informatics, in particular in cardiac potentials analysis and pacing, in research of new methods for drug delivery based on electropermeabilisation and recently in research of personalized intelligent mobile health systems. He is author or co-author of numerous journal and conference papers, several textbooks and book chapters. R. Magjarevic is elected for President of the International Federation for Medical and Biological Engineering (IFMBE) from 2022. to 2025.

PLENARY SESSION

Potentials and Challenges of Healthcare AI Technology for Medical Devices

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

Medical & Biological Engineering & Science (MBES) contribute to the Development of the Humanistic Society (Society 5.0)?

Helmut Hutten

Institute of Biomedical Imaging, University of Technology, Graz (Austria)

Abstract

Following the Societies 1.0 (hunter, gatherer), 2.0 (agrarian), 3.0 (industry) and 4.0 (information) discussion has started about the transition to Society 5.0 (Humanistic Society). On Maslow's hierarchy of needs, Society 5.0 will be related with the highest level of that hierarchy, i.e. with the level of self-actualization. Until now, technology including MBES has contributed to all previous societies. It has been the initiator and driver of Societies 3.0 and 4.0. In the past MBES has especially been involved in the four lower level of Maslow's hierarchy of needs, i.e. survival (level 1), safety (level 2), social needs (level 3) and respectation (level 4), however, not in instrumentation for self-actualization (level 5). The question discussed in the presentation is, whether MBES can contribute to self-actualization, i.e. the Humanistic Society, and how this can be done. The central term for the Society 5.0 is humanism. The presentation starts with the discussion of the development of the foregoing societies, the definition of humanism and self-actualization. It discusses the actual needs for Society 5.0 which is a completely new concept. It describes the effects of technology on the transition of societies, especially considering the Kondratiev cycles, i.e. the interrelationship between economic booms and depression phases. Furthermore, it analyses the advancement of new technologies. Finally it presents a list of typical examples that might be important contributions of MBES to the development of Society 5.0. Summary: Five walls against the transition to Society 5.0 have been identified by the Japan Business Federation. Two of those walls are related with innovative technologies. The required technologies, however, are already available or will become available in the near future. MBES can become a major player for the transition to Society 5.0. What is needed now for this challenge are creative and excellent heads which are willing to work for this transition.

Biographical Sketch

Em. Univ.-Prof. Dr.techn. Dr.h.c. Helmut Hutten was born in Germany in 1936. He received his "Dipl. Ing." degree from the now Technical University in Karlsruhe in 1961, and his "Dr.-Ing." degree from the now Technical University Darmstadt in 1969. Between 1961 and 1964 he was working in a company before leaving to the Institute of Physiology at the University in Mainz. 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. 1991 he was nominated the chair professor for Biomedical Engineering at the University of Technology in Graz and retired in 2004 as professor emeritus. At present he is still active as external examiner for foreign universities and as consultant for companies. He has served in many functions in different organizations. He was member of the AC of the German Society for Biomedical Engineering for more than 10 years, president from 1991 until 1993, and past-president from 1993 until 1995. From 1994 until 2000 he was member of the AC of IFMBE and chairing the Working Group for European Activities. In recognition of his merits he was elected as fellow of the International Academy of Medical

and Biological Engineering. From 2000 until 2003 he was member of the AC of IUPESM and chairing the Regional Development Committee. As consultant he was active in more than 100 projects for different governmental and non-governmental research funding organizations. From 1975 until 1996 he was Editor-in-Chief of the journal Medical Progress through Technology and reviewer for many national and international journals. He was organizer of different national and international conferences, primarily the 1st and 2nd European Medical and Biological Engineering Conference EMBEC in Vienna in 1999 and 2002, respectively. 2005 he was Honorary President of the EMBEC'05 in Prague. 1999 – 2018 he was president of the non-profit organization EMBEC. He was member of the EAMBES Protem group and the first treasurer of EAMBES after its launching. He was the preliminary chair of the EAMBES fellows division. He was member in the German DKE standardizing committee for medical equipment for more than 10 years and head of the Notified Body 0636 until 2004. He and his students have received different awards. He was distinguished by a honorary doctor by the Technical University of Cluj-Napoca and by lifelong honorary membership in different organizations. He has published more than 100 articles in reviewed journals and 21 books or book chapters. He is author or co-author of more than 280 published presentations in proceedings and of more than 220 other publications. He is author or editor of several books. 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. He has more than 10 patents pr primarily in the field of cardiac pacemakers.

PLENARY SESSION

HowThe Post Covid-19 University will be more inclusive and more acessible for student with disabilities and learning disabilities and even more effective for all the students.

Alessandro Pepino

Department of Biomedical Engineering-University of Naples "Federico II", Italy

SiNAPSI University Centre for the inclusion of students with disabilities and learning disabilities

Abstract

Before Covid-19 the most of university courses in Italy and into University Federico II has been hold following a traditional paradigm where the learning require an intensive memory process.

The student with learning disabilities normally uses, supported by SINAPSI University centre for student with disabilities and learning disabilities, the lecture recording in order to compensate their memory disturbance. The Covid-19 experience provided to all the students the opportunity to explore these new experiences and to realize its effectiveness. Moreover, the distance learning, forced by Covid-19, led the lecturer to improve their ict skills and to take profit of the huge amount of didactic facilities available in Internet.

SiNAPSi University centre on the basis of its long experience on this matter, supported a lot of teacher in these new challenges.

Today after the Covid-19 experience the University is aware that nothing will be the same and many paradigms concerning education will change

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 May 1988 he became senior Technician at the Electronic Department of the University of Naples and since the 1998 he is associate professor at University of Naples. Since the 1999 he is responsible for Assistive Technologies at SINAPSI University Centre for Tutoring Disable Students and he is from the 2018 delegate by the rector for all the matters concerning disabilities and learning disabilities. From the 2000 up to now he was responsible, in different public companies, for several projects concerning e-Health, innovation process and education management of personnel. He was invited speaker at many scientific national and international conferences. He published more than 150 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

Artificial Intelligence in Health and Social Care: Ethical and Legal Issues

Lenka Lhotska

Czech Institute of Informatics, Robotics and Cybernetics,
Czech Technical University in Prague, Czechia

Abstract

Artificial intelligence and robotics are not purely theoretical research areas anymore. They already entered our daily life. The development of autonomous vehicles opened many questions that were previously touched only on a high theoretical level. Recently, artificial intelligence and robotics have penetrated areas of health and social care. That has opened many ethical and legal questions that must be solved (or at least considered) before introduction of these systems into routine practice.

Already in July 2019, the first intergovernmental declaration on ethical rules for AI was issued and endorsed by the 20 largest industrialized countries that are part of the G20. Then, thanks to the data collected, the authors of the study published several key areas on which most of the materials analyzed agreed, namely transparency, equality, fairness, beneficence, responsibility, and explainability. The most important ethical principle of AI is responsibility.

Once software systems utilizing AI methods are categorized as medical devices then the Medical Device Regulation (the EU Regulation 2017/745 of the European Parliament and of the Council) is applied and software must be certified accordingly. That means that the software development must strictly adhere to all standards that formulate appropriate rules for medical device software design.

Biographical Sketch

Lenka Lhotská, PhD, MIET, MIEEE, graduated as Master of Science in Electrical Engineering at the Czech Technical University in Prague (CVUT), Czech Republic and got PhD degree in Cybernetics from CVUT. Currently she is head of the Cognitive Systems and Neurosciences Department at the Czech Institute of Informatics, Robotics and Cybernetics and associate professor at the Department of Natural Sciences of the Faculty of Biomedical Engineering, CVUT. Her research focus: Knowledge-based systems, application of artificial intelligence (AI) methods to medicine, digital signal processing, machine learning, semantic interoperability, mobile technologies in healthcare, electronic health record. She is scientific secretary of the Czech Society for Biomedical Engineering and Medical Informatics, National representative in IFMBE, chair of the Europe Region of the Council of Societies of IFMBE, co-chair of the WiMBE WG of IFMBE, chair of the Women in Medical Physics and Biomedical Engineering TG of IUPESM, chair of the Working Group Personal Portable Devices of European Federation for Medical Informatics (EFMI) and member of the EFMI Council, and National representative in International Society for Telemedicine and eHealth (IsfTeH). She was co-chair of the IUPESM World Congress 2018 and member of the PC EMBEC 2005, regularly she is PC member of international conferences on AI and ICT in health care.

PLENARY SESSION

Innovations in Medical Robotics

Doina Pîslă

Research Center of Robots Simulation and Testing
Technical University of Cluj-Napoca, Romania

Abstract

In parallel with the continuous evolution and discovery of new medical techniques, the evolution of technology has enabled the introduction of robotic systems in the medical applications.
Rehabilitation robotics is one of the most important subdomains of the medical robotics, with a highly potential worldwide, and its development is correlated with the increased life expectancy and the growing number of elderly persons. The already achieved robotic systems for rehabilitation of upper and lower limbs have shown a continuous evolution in this challenging and difficult research field. Stroke is one of the leading causes of motor disability and a post stroke patient must undergo rehabilitation exercises to gain back its ability to perform daily life activities. The main problem here is that in the future, more precisely in the next 20 years, there is a crisis projected because the incidence of stroke will rise due to the ageing of the population and the survival rate of stroke will also increase due to medical innovation, which in turn will lead to an increased number of post stroke patients relative to the number of kineto-therapist, creating an unbalance in the healthcare system. Therefore, it is important to develop innovative robotic systems which allow physical therapists to develop patient-oriented rehabilitation programs that can maximize the therapeutic effects aiming towards an increased quality of life in the framework of Activities of Daily Living.

Biographical Sketch

Professor **Doina PISLA** is currently the Director of Council for University Doctoral Studies within the University of Cluj-Napoca, Romania and the Director of the Research Center for Robots Simulation and Testing - CESTER within the same university. Professor Doina PISLA obtained her PhD within the Technical University of Cluj-Napoca in 1997. Following an academic carrier she became full professor at the Department of Mechanical Systems Engineering in 2005, teaching lectures in Parallel Robots and Medical Robotics.

Prof. Pisla's research activity is focused mainly on the field of Robotics and Mechatronics, with emphasis on the kinematics and dynamics of parallel robots, development of innovative medical robots, reconfigurable structures. As a result of her scientific activity, Prof. Pisla published over 200 peer-reviewed full papers in scientific journals and conferences, co-authored over 10 patents. She has been director or key member of more than 50 international and national projects. In the meanwhile, she served in boards and program committees of various international conferences and congresses, being currently member of the Technical Committee for Computational Kinematics and for Biomechanical Engineering of International Federation for the Promotion of Mechanism and Machine Science (IFToMM). She serves also as reviewer in various journals and funding agencies and Editor of the Series "New Trends in Medical and Service Robotics" (Springer) .

PLENARY SESSION

Spinal cord stimulation after spinal cord injury - encouraging accomplishments, but problematic public relations

Winfried Mayr

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

Abstract

Spinal cord stimulation (SCS), more precisely posterior root stimulation, is a newer modality in the spectrum of spinal cord injury (SCI) rehabilitation with functional electrical stimulation (FES). It is based on activation of proprioceptive afferent neurons entering the segmental spinal interneuron networks via dorsal nerve roots, and thus substituting afferent or supraspinal input, lost after SCI. Stimuli can be administered either via noninvasive skin attached or epidurally implanted electrodes. Stimulation intensity determines recruitment of neurons in a size dependent order, frequency influences interneuron processing.

This is on one hand very important and precious for interaction in the scientific community, public awareness for the needs of SCI victims and keeping persons with SCI informed on actual developments in rehabilitation options, on the other hand is most critical to avoid misleading messages, unrealistic expectations and false hope. Current practice has not always followed these basic necessities, raising ethical issues regarding influence on research funding policies as well as obligation for objective information on actual opportunities and limitations for the patient community and medical professionals.

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. 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" and Associate Editor in “Frontiers in Neuroscience”.

PLENARY SESSION

Artificial Intelligence in Military Medicine Diagnostic and Caregiving Services. Review of the Literature

Doina Baltaru

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

Abstract

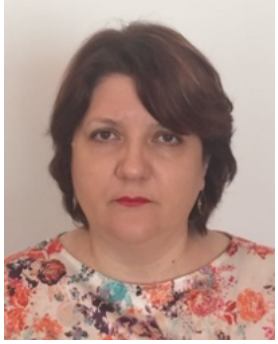
Artificial Intelligence is a part of our lives for quite a few decades.It has led to a explosive development of medical research and practice .

Objective: To evaluate the domains in which artificial intelligence (AI) is used for assessing and providing healthcare services in the army during drills and on tactical field.

Methods: I have used the PUBMED database to search for update on AI use in the field of military medicine and the data published and reported at recent medical military congresses.

Results: AI is deeply involved in the research and healthcare specific to military medicine. The new face of war implies prolonged field care in austere conditions. Wearable sensors are being developed for monitoring biochemical and hemodynamic parameters for rapid diagnosis of decompensation status and allow the caregivers to interviene and restablish the physiological parameters and fully restore the troups fighting capacity. Telemedicine has new faces in modern warfare using phone or tablet-based decision support systems for prehospital tactical combat casualty care. Machine learning is widely used to train medical personel. Conclusions: From diagnosis to management purposes, there are a lot of devices that use AI developed to collect and analyze data and to improve the healthcare services in military medicine domain. The new face of war has led to a huge progress in medicine, from rapid evaluation and management of altered homeostasis during drills and on the tactical field, to trauma care, PTSD management, the use of telemedicine.

Biographical Sketch



Doina Baltaru was born in Romania in 1964. She received her medical degree in 1989 from Bucharest "Carol Davila" University of Medicine and Pharmacy. In 1999 she received her consultant medical degree in internal medicine and she is trained in rheumatology since 2001.

Between 2000-2009 she was head ward at the internal disease department at "Dr. Constantin Papilian" Emergency Military Hospital from Cluj-Napoca. Between 2009-2013 she was medical manager and since 2013 commander deputy at "Dr. Constantin Papilian" Emergency Military Hospital from Cluj-Napoca. The domain of interest for medical research are immunology and endothelial disffunction in rheumatic diseases and she is prepareing an PhD thesis in the last domain. Starting with 2013 she is the commander of "Dr. Constantin Papilian" Emergency Military Hospital from Cluj-Napoca. She published eleven articles in medical magazines. She sustained over 25 oral presentations and poster sessions in symposiums and national congresses. She also sustained 9 oral presentations and poster sessions at various international congresses and symposiums. During the Medical Association and Military Pharmacists she sustained 11 oral presentations and poster sessions.

PLENARY SESSION

Is Higher Education changing in a positive direction to meet the requirements industry has in graduates?

Tony Ward

Department of Electronic Engineering, University of York, England

Abstract

Higher Education is constantly criticized for not providing industry with graduates who are 'work ready'. This is has been the case for a number of years and anecdotally seems to fit all technical disciplines. Are current trends in Higher Education moving in the right direction to correct this? What is it about the education pipeline that leads to less than good outcome? Specific to Medical Technology, a discipline where the pace of technical change is fast a good match is very desirable. The talk presents a personal view of the Medical Technology sector from the perspective of the transition from education to employment. The view from either side of this boundary is quite different – where the two collide is in Knowledge, Skills and Behaviors and. perhaps importantly how they are certified. Covid has introduced changes in the HE sector as has the internationalization of the education market – especially at Masters level. However, even here there are some very deep problems. What will be presented is a personal view along with some ideas for how we might move forwards.

Biographical Sketch

Prof. Anthony (Tony) Ward was born in England in 1954. After graduating with an Honours degree in Electrical and Electronic Engineering from the University of Bristol in 1975 he spent 18 years in Industry, initially as a microwave design engineer, then as technical manager and programme manager for a number of different companies in the UK and, for a short time, on secondment in the US. He is a Chartered Engineer and has an MBA. In 1993 he joined the Department of Electronic Engineering at the University of York as a lecturer in Engineering Management. He was made a full Professor in 2016. Within York he has held the position of Provost of Alcuin College; Director of the Centre for Excellence in Teaching and Learning in Enterprise; and Deputy Head of Department. Externally he has been President of the European Association for Education in Electrical and Information Engineering and managed or participated in over 20 research projects. His research interests are in engineering education, including what skills (specifically generic skills) graduates need; how these are developed and how they can be meaningfully assessed; and in the understanding and assessment of complex competences such as Entrepreneurship. He is the founder and Chairman of Skillsforge Ltd. An international competence management and course booking spinout business from the University of York.

PLENARY SESSION

Interpretation of physical activity data collected with accelerometers

Timo Jämsä

Research Unit of Health Sciences and Technology
University of Oulu, Finland

Abstract

Being physically active is known to have significant benefits for health and wellbeing. Wearable accelerometer-based devices have become very popular in consumer applications, and they are also used widely in research. There is a wide range of algorithms, activity parameters and applications for monitoring daily physical activity (PA). However, interpretation of accelerometric data is strongly dependent on the purpose and health outcome in question. There is no single approach. Instead, a wide range of activity parameters have been presented. Traditional solutions include counting the number of daily steps or estimating the intensity of PA as metabolic equivalents (MET). More recently, machine learning methodologies have also been applied for assessing and classifying PA. This presentation overviews some approaches and algorithms for assessing physical activities and sedentary behavior, applying data collected with accelerometers in daily life.

Biographical Sketch

Dr Timo Jämsä is Professor of Medical Technology at the Faculty of Medicine, University of Oulu, since 2002. He has published over 200 peer-reviewed articles in biomedical engineering and medical technologies. He has been involved in numerous research projects funded e.g. by EU, Academy of Finland and the Finnish Funding Agency for Innovation TEKES. His main research interests are musculoskeletal biomechanics, eHealth solutions, and technology applications for health promotion and independent living of aging people. The research highlights of his group include biomechanical risk factors of hip fractures, monitoring of health exercise, and technologies for fall detection. He has a number of regional, national and international academic activities. Currently he is Past President of the European Alliance for Medical and Biological Engineering & Science (EAMBES). He has also been member of the Administrative Council of the International Federation of Medical and Biological Engineering (IFMBE) and the International Union for Physics and Engineering Sciences in Medicine (IUPESM). He is Fellow of EAMBES and IUPESM.

PLENARY SESSION

Educational strategies for capacity building in medical physics and technology

Dipl. Ing. Prof. Dr. Magdalena Stoeva, PhD, FIOMP, FIUPESM

Department of Diagnostic Imaging, Medical University of Plovdiv, Bulgaria

Secretary General IOMP, Secretary General IUPESM

Abstract

The availability of adequately trained technical staff and the effectiveness of medical technology usage are among the key aspects ensuring the quality and availability of contemporary healthcare. Adequate education and training for medical physicists and engineers, who are the front-liners when it comes to dealing with technology in healthcare, is crucial when it comes to safe and effective use of medical equipment and technology.

Recent studies show quite uneven distribution of the medical physics workforce, leaving certain LMICs or entire regions with limited staff availability, which has direct effect on the healthcare provision. To help LMICs professional growth in the field of medical physics and technology, we developed an education and capacity building strategy, based on the application of digital resources combined with experience sharing through large international network.

Biographical Sketch

Prof. Magdalena Stoeva is a member of the governing bodies of the International Organization for Medical Physics (IOMP) and the International Union for Physical and Engineering Sciences in Medicine (IUPESM). She is Series Editor of the CRC Press (Taylor & Francis Group) Focus Series on Medical Physics and Biomedical Engineering and the Editor-in-Chief of the journal Health and Technology, jointly published by Springer Nature and the IUPESM in cooperation with the World Health Organization (WHO).

Dr Stoeva holds master's degrees in medical physics, medical engineering, computer science, a PhD in Diagnostic Imaging and over 20 years professional experience in various academic institutions - Technical University, Medical University, International Medical Physics Center and the ICTP with focus on the various aspects of medical physics, engineering and healthcare.

Her most recent interests are directed towards the professional development of the physical and engineering sciences in medicine, incl. educational strategies, gender and workplace balance, promoting and supporting science for young professionals and the LMICs, e-learning, distant education and training, the technological advancements as a driving factor of contemporary healthcare,.

PLENARY SESSION

The digital ecosystem facilitating treatment of people with diabetes

Piotr Ladyzynski

Nalecz Institute of Biocybernetics and Biomedical Engineering,
Polish Academy of Sciences, Warsaw, Poland

Abstract

The goal of the diabetes treatment is to keep the course of glycemia as close as possible to that of a healthy person. Some components of the digital ecosystem are available to help achieve this goal, but almost all need improvements. There are glucometers for intermittent blood glucose testing as well as continuous glucose monitoring (CGM) systems, but noninvasive glucose monitoring is still not possible. Automatic insulin bolus calculators require people with diabetes to self-estimate the carbohydrate content of meals. Automatic meal composition recognition systems are not fully developed. Physical activity monitoring has limited accuracy. Insulin delivery devices are effective but invasive, and there is not implantable insulin pump under production. Finally, home and mobile telecare systems have been under development and clinical evaluation for the last three decades. Nevertheless, sophisticated decision support algorithms using AI techniques are still to be developed and tested. Only then will telemedicine services in combination with the aforementioned technical components create a digitally enabled, fully connected, ubiquitous, clinically effective, personalized and economically sound diabetes care ecosystem.

Biographical Sketch

Piotr Ladyzynski received the M.Sc. degree with major specialization in “Biomedical Engineering” from the Warsaw University of Technology in 1990. He started his professional career at the Nalecz Institute of Biocybernetics and Biomedical Engineering, Polish Academy of Sciences (IBBE PAS) in 1991, where he received the Ph.D. (with distinctions) and D.Sc. degrees in technical sciences in 1997 and 2009, respectively. In 2000-2001, Dr. Ladyzynski worked at the Nara Institute of Science and Technology (Japan). In 2022 he was awarded the title of full professor of technical sciences. In 2007-2022 Prof. Ladyzynski was a deputy director, and since 2022 he has been the Director of IBBE PAS. The scientific interests of Prof. Ladyzynski are concentrated on artificial internal organs including artificial pancreas and diabetes treatment, technical support for intensive monitoring and treatment of chronic diseases, applications of ICT in medicine, telemedicine and biomeasurements. Prof. Ladyzynski is an author of more than 180 scientific publications and 4 patents. He and his team received a few scientific awards including the Economic Award of the President of the Republic of Poland in R&D. Prof. Ladyzynski was the President of the European Society for Artificial Organs (ESAO) from 2019 to 2021. Since 2016 he has been the Chairman of the Industry Working Group and since 2022 a member of the Administrative Council of the International Federation for Medical and Biological Engineering (IFMBE). Since 2017 he has been the Editor-in-Chief of the journal “Biocybernetics and Biomedical Engineering”.

PLENARY SESSION

Technical Creativity in a Knowledge-based Society

L. Dan Milici

Stefan cel Mare Univeristy of Suceava, Romania

Abstract

The future started a few years ago. Industry 3.0 has robotized industry, and the machine has gradually replaced human physical labour. Industry 4.0 relies on communications and artificial intelligence, which will gradually lead to the reduction of human intellectual labour. "Anorganic thinking" and artificial intelligence have started to replace humans in management, medicine, law. What hasn't the machine done yet? It can't be creative. The postumanist concept (the death of the classical form of humanism) will lead to the individual's need to be better, to enjoy as much as possible what he likes and wants, to be able to do things easily, quickly and well, accelerating the metamorphosis to cyborg as a result of advances in neuroscience, nanotechnology, medicine, communications. Although it learns much faster and better compared to humans, although it is able to make much faster and more efficient decisions, the artificial brain fails to be creative and express feelings. This is perhaps where future human generations will be able to fully manifest themselves. Now is probably the time to focus on creative education as the only way to prepare young people for future professions.

Biographical Sketch

Prof. L. Dan Milici received his Diploma in "Electrical Engineering" from Gh. Asachi Technical University of Iasi in 1993, his work is focused on metrology, microsystems for monitoring and measurement, virtual instrumentation, creative education and human performance monitoring. His master's degrees is in Informatics and Ph.D. in Instrumentation (2003). The works of the following years were mainly dedicated to education in engineering sciences, monitoring human performance and measurements in biomedicine and ecology, monitoring technological processes, sensors, and special actuators where he registered a series of 45 patents. He is the coordinator of Innovation and Technological Transfer Laboratory of Stefan cel Mare University of Suceava and have the habilitation certificate and the quality of PhD supervisor in the field of Electrical Engineering.

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

One trend in surgery is the transition from open procedures to minimally invasive laparoscopic interventions, where visual feedback to the surgeon is only available through the laparoscope camera and direct palpation of organs is not possible. The view of the patient's organs is not as clear and the ability to manipulate the surgical tools is diminished in comparison with traditional open surgery. To successfully perform such sophisticated interventions, the provision of additional intraoperative feedback can be of great help to the surgeon. The use of the Augmented Reality (AR) technology shows the way forward in bringing the direct visualization advantage of open surgery back to minimally invasive surgery and can increase the physician's view of his/her surroundings with information gathered from patients' medical images. AR has the potential to revolutionize medicine and provides in surgery a sort of an X-Ray vision of the patient anatomy and pathology. During surgery, AR systems provide medical imaging data and other patient information superimposed on the operation area in the most intuitive way. It can increase the surgeon's view with additional information consisting in virtual organs reconstructed by medical images showing the area involved in surgical operations. AR technology can improve the surgeon efficiency and allow a faster intraoperative decision making; furthermore, the augmented navigation systems can reduce the risk of complications and improve the safety and quality of surgeries.
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

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. 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 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. In the current academic year, De Paolis is visiting professor at the Riga Technical University, Latvia

PLENARY SESSION

Breath tests for digestive diseases: an update

Dan L. Dumitrașcu

Professor, Member of the Romanian Academy of Medical Sciences

Iuliu Hatieganu University of Medicine and Pharmacy Cluj-Napoca and Cluj County Clinical Emergency Hospital, Romania

Abstract

Breath tests are used by gastroenterologists to assess different gastrointestinal and liver diseases. Their principle relies on the ingestion of a certain substrate which is metabolized in the digestive tract and exhaled in the expired air. The concentration of the processed substrate is performed by mass spectroscopy or infrared spectroscopy. We use H2 breath test for the detection of orocecal transit time, for small intestinal bacterial overgrowth and for disaccharide malabsorption. C13 breath test is used for gastric emptying assessment or for H. pylori infection diagnosis. Several substrates are used for the liver and pancreatic function. New data occurred in recent years, included 2 European guides where we contributed. They will be presented here.

Biographical Sketch

Prof. Dr. Dan L. Dumitrașcu graduated from the medical school of the same city in 1982. Currently, he works as head of department and consultant, Cluj County Clinical Emergency Hospital and as professor at the University of Medicine and Pharmacy, "Iuliu Haţieganu", Cluj-Napoca, Romania.. He has been interested in gastroenterological motility and functional disorders for over 25 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 several International Symposia in Neurogastroenterology and Hands-on courses, last in March 2022; two European meetings and two Central-European meetings.. He also chairs the Section of Neurogastroenterology at the annual Romanian gastroenterology meetings. Prof. Dr. Dan L. Dumitrașcu is Past President of the Romanian Society of Gastroenterology and Hepatology, Past Vice-President of the Romanian Society of Internal Medicine, Past Chairman of the International Liaison Committee of the Rome Foundation, Full Member of the Academy of Medical Sciences, Past Deputy Secretary of the European Association of Psychosomatic Medicine and former vice president of the European Society of Clinical Investigation. He is chairman of the National Societies Committee of the United European Gastroenterology, President of EAGEN (European Association for Gastroenterology Endoscopy and Nutrition). Chairman of the publication committee of WGO. Editor in chief of J Gastrointestin Liver Dis. He has published 20+ books, over 400 indexed papers.

PLENARY SESSION

Patient specific therapeutic solutions in cranio-maxillofacial surgery

Cristian Dinu, Mihaela Băciuț, Simion Bran, Florin Onișor, Sergiu Văcăraș, Gabriel Armencea, Ileana Mitre, Sebastian Stoia, Tiberiu Tamaș, Daiana Opriș, Horia Opriș, Avram Manea, Grigore Băciuț

University of Medicine and Pharmacy, Maxillofacial Surgery Clinic, Cluj-Napoca, Romania

Abstract .
Face represents identity. Any damage to this region will generate physical, functional and psychological problems. There are many pathologies such as trauma, tumors or malformations that will require a very precise rehabilitation. Virtual planning and 3D printing technologies are indispensable tools in oral and maxillofacial surgery. Custom implants are made using computer-aided design (CAD) using a virtual plan based on the patient's 3D scan. All CAD-based individualized implant systems require preoperative computerized planning. The scan will be transferred to the planning software, where the unaffected side can be mirrored to match the affected one. From this moment, 3D models of the reconstructed skeleton can be obtained with the help of 3D printers. On these models, standardized plates, meshes or implants can be designed, bent and sterilized preoperatively together with the 3D model and can be used intraoperatively. Virtual planning is used for the manufacture of patient-specific implants (PSI) through the process of selective laser melting. This method is currently considered the most accurate technique for skeletal reconstruction. PSI is not malleable and avoids human errors. These technologies are used for a very wide field of pathologies such as orbit reconstruction, orthognathic surgery, microsurgical reconstructions with free flaps, temporomandibular joint reconstruction and recently for facial transplantation and facial feminization surgery.

Biographical Sketch

Cristian Dinu DMD, MD, MSc, PhD**.** Assoc. Professor, Consultant in Oral and Maxillofacial Surgery, Department of Maxillofacial Surgery and Implantology, University of Medicine and Pharmacy „Iuliu Hatieganu" Cluj-Napoca, Romania. Dean of the Faculty of Dental Medicine, University of Medicine and Pharmacy „Iuliu Hatieganu" Cluj-Napoca, Romania. Master of Plastic Periodontal Surgery at University of Bologna (Director: Prof. Dr. Giovanni Zucchelli). Extensively lectures in several national and international congresses of Oral and Maxillofacial Surgery and Oral Implantology. Research member and coordinator in 15 european and national scientific projects. Received several prizes in national and international scientific events. Author and co-author of more than 90 papers in national and international journals. Co-author of 8 speciality books. Specific focus in reconstructive microsurgery, plastic and reconstructive surgery, craniofacial trauma and malformations, salivary glands pathology and advanced oral implantology and periodontology. General Secretary of the Romanian Society of Oral and Maxillofacial Surgery, Member of European Association for Cranio-Maxillofacial Surgery, International Association of Oral and Maxillofacial Surgery, Arbeitsgruppe fur Ostheosynthesefragen AOCMF, International Team for Implantology, etc.

PLENARY SESSION

Personalized approaches in cranio-maxillofacial surgery

Horațiu Rotaru

Department of Cranio-Maxillofacial Surgery, "Iuliu Hatieganu" University of Medicine and Pharmacy, Cluj-Napoca, Romania

Abstract

The pillars of personalized medicine stand on medical and engineering grounds. Decades of research lead to the development of countless medical applications with the help of rapid prototyping, opening clinical practice to personalized approaches for the reconstruction of different tissue defects. Virtual surgical planning and three-dimensional printing in medicine cover various specialties—spinal surgery, orthopedics, cardiac surgery— but by far, the specialty that boosted the development of medical 3D printing is cranio-maxillofacial (CMF) surgery, driving progresses to what they are now. From patient specific implants to personalized tools, from industrial fabrication to point of care 3D printing, cranio-maxillofacial surgery, fully supported by manufacturing engineering and biomedical sciences, covers a broad spectrum of modern technological applications. This presentation aims to review the progresses achieved with the support of clinical case reports.

Biographical Sketch

Prof. Horațiu Rotaru received his degree in Medical Dentistry in 1999 and in Medicine in 2003, both form "Iuliu Hatieganu" University of Medicine and Pharmacy, Cluj-Napoca. Romania. His PhD in Medical Sciences focused on the applications of 3D printing technologies and medical models in cranio-maxillofacial surgery (2008). Since then, he has been constantly involved in studying and designing personalized solutions for cranio-facial bone reconstructions. In 2006 he published for the first time the method of custom-made cranial plates fabrication by casting PMMA into silicone rubber molds. Over the years, some other personalized solutions had been conceptualized like Voronoi diagram design of custom-made cranioplasty plates made from titanium by selective laser melting of electron beam melting. In the last years, more efforts had been invested in studying the feasibility of point of care solutions for personalized medical products. He has received various distinctions for patented biomaterials and solutions for personalized cranio-facial implants. He is Director in the Vice-Rector Office for Postgraduate Studies. He is Fellow of International Federation of Head and Neck Oncological Societies and member of different professional societies like EACMFS, IAOO, EHNS, AO, EAO, ITI etc.

PLENARY SESSION

The fundamental role of computer model & simulation (CM&S) and Artificial Intelligence (AI) to digitalize healthcare towards Participatory, Personalized, Preventive and Predictive (P4) medicine

Thierry Marchal

Ansys, Inc. & Avicenna Alliance

Abstract

As Participatory, Personalized, Predictive and Preventive medicine is changing from dream to urgent necessity, the healthcare stakeholders from industry, academia and authorities are carefully evaluating and adopting digital technologies such as in silico methods, including artificial intelligence, to digitalize healthcare activities. Indeed, the past decade has produced overwhelming evidence that changes in the health status of individuals, measured by well-defined quantitative clinical endpoints, can, in many specific cases, be predicted by computer models. The need for speed calls for a combination of data-driven models typical of artificial intelligence approaches with mechanistic or knowledge-driven models to develop and validate the necessary computer models.

This presentation will use several examples to describe and illustrate how the greatest public health gain should be obtained by combining various approaches. The power and limitation of mechanistic models and the complementing role of data driven technologies will be discussed for the design and optimization of new medical devices, the testing and regulatory approval of innovative treatments and the development of emerging Clinical Decision Support (CDS) software. The perspectives and concerns induced by this technology will be discussed.

Biographical Sketch

As the Ansys Program Director for Healthcare Solutions, Thierry Marchal leads the medical devices, pharmaceutical and biotech strategy of Ansys through the in silico and personalized medicine evolution. Thierry's vision of Personal Digital Avatar -- driven by the potential of healthcare digitalization, including Medical Digital Twin and AI -- could be achieved by closely interacting with industrial innovators and SMEs, academic leaders and governmental and regulatory authorities (FDA, EMA, etc.) Since January 2018, Thierry is the Secretary General of the Avicenna Alliance, a global non for profit organization of leading healthcare companies collaborating towards the large scale adoption of in silico healthcare. Thierry is also a member of the eHealth Stakeholder Group which provides advice and expertise to the European Commission.

In his 30+ years of professional experience, Thierry has worked as the Global Materials Market Segment Manager with Fluent and Product Manager for Polyflow. Thierry is the author of more than 150 publications and communications; he holds a degree in Mechanical Engineering and a MBA both from Catholic University of Louvain, Belgium.

PLENARY SESSION

The important role that software solutions play in the biomedical field. Innovation, precision, accuracy.

Irina David

INAS SA – Romania

Abstract

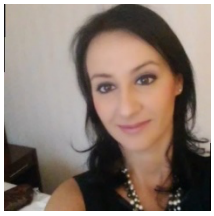
The Healthcare industry has undergone a vast process of development and innovation over the last decade, and this has been made possible by digital technologies including software tools. Researchers in all industry fields can put their ideas into practice by having access to powerful simulation tools, without which the whole process would have taken an extremely long time and the accuracy of the results would certainly not be the same. Everything starts with an idea, but validation is extremely important, and this is done virtually, based on "what if" scenarios, which are difficult to put into practice in a traditional way.

INAS understood this 31 years ago and became a partner of ANSYS, the developer of the most powerful simulation tool in the world, on which thousands of companies that innovate, rely on, providing the necessary medical devices, so that the medical act can be extremely safe and the diagnosis as accurate as possible. The INAS portfolio has grown year by year and today we are certified to provide software solutions covering the entire CAD/CAM/CAE/PLM/IoT/AR production cycle. We belief that working together as a team with our customers, creating a win-win, highly profitable situation, are fundamental to a successful and long-term working partnership. This is why we integrated in our system innovation and technical excellence as premises which allow INAS to provide high value-added solutions and services.

INAS currently employs 48 people, has more than 1,000 software implementations, more than 80 beneficiaries of consulting services in Romania, US and EU, and is being active in EU-funded projects in research, development and innovation programs.

Irina David

Key Account Manager – INAS SA



I graduated an Engineering University and joined the INAS team about 7 years ago. I appreciate that my professional development has been on an upward trend, thanks to the information we have to constantly assimilate in order to provide technical and informational support to our clients and collaborators. I am a Key Account Manager and I am in charge with promoting the entire ANSYS portfolio to Romanian Industry and Universities and beside this, the most important is to keep close to our customers' requests.

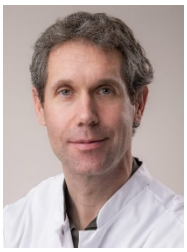
PLENARY SESSION

Pyrocarbon implants used in hand and wrist surgery. Measurements of the in vivo wear

Abstract

Trauma, osteoarthritis and rheumatoid arthritis often lead to dysfunction, deformity and pain in the hand and wrist joints. Different artificial implants have been designed and used to solve these problems. The presentation will focus on the pyrolytic carbon implants that are used in hand and wrist surgery for few decades. However, some of their biomechanical properties are not fully known. More specifically, data on wear in vivo are limited. An exploratory study was conducted on explanted pyrolytic carbon implants to estimate the effect on their surface quality and check if a prediction of their lifespan could be made. Explanted Pyrocarbon PIP Implant®(Ascension-I ntegra), Pyrocardan® (Wright Medical) and Amandys® (Wright Medical) were examined by a Keyence VHX 6000 and a Mitutoyo Formtracer CS 3200 and compared to a new Pyrocardan® implant. Some implants showed fractures. The surfaces were checked for traces of the use of metal surgical instruments as this might be a potential weakening of the implant. Although the implants presented little wear in general, more specimens should be tested to predict their tribological behavior and lifespan expectation.

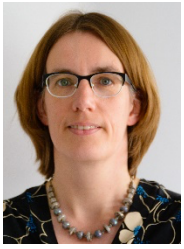
Authors



Dr. Thomas Lauwers (presenting author)
Maastricht University Medical Centre, Netherlands
Thomas Lauwers studied medicine at KU Leuven. He is specialized in General Surgery and in Plastic, Reconstructive and Aesthetic Surgery. In 2013 he obtained the diploma of the European Board of Hand Surgery. From 2006 on he is working as a plastic surgeon in the Maastricht University Medical Centre, with a focus on hand surgery.

Professor Han Haitjema
Mechanical Engineering Department, KU Leuven, Belgium
Han Haitjema studied Experimental Physics at the Utrecht University and obtained his PhD in 1989 at the Delft University of Technology. Specialized in dimensional metrology, he was director of Mitutoyo Research Center Europe. Since 2018 he is professor at the KU Leuven.

Dr. Ir. Leonard Cezar Pastrav
Smart Instrumentation Research Group, K.U. Leuven, Belgium
Leonard Pastrav obtained his PhD in engineering at the K.U. Leuven in 2010 with the dissertation "Monitoring of the fixation of orthopaedic implants by vibration analysis". He is doing research related to the stability of orthopaedic implants and teaches "Advanced Manufacturing".



Professor Kathleen Denis
Smart Instrumentation Research Group, K.U. Leuven, Belgium
Kathleen Denis is associate professor at the Faculty of Engineering Technology of KU Leuven. She obtained her PhD from KU Leuven in 2005, with a thesis entitled "Robot-Assistance in Total Knee Arthroplasty: Procedure, Registration and Estimation of Local Bone Properties". She is the head of the Smart Instrumentation Research Group.

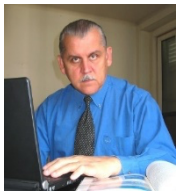
PLENARY SESSION

Virtual Instrumentation and Remote Technologies in Biomedical Engineering

Abstract

In 2004, a team from Romania and Austria started the International Conference on "Remote Engineering and Virtual Instrumentation" (REV) and from 2005 the International Association of Online Engineering (IAOE). The REV conference is now the main IAOE conference of and each year attracts under the same cupola many researchers who work and do research in this well-anticipated field of Virtual Instrumentation and Remote Technologies.
Starting in 2008, the Center for Valorization and Transfer of Competences (CVTC) collaborate with the Faculty of Music in Music Therapy Master. In this Master based on expertise in Remote Engineering and Virtual Instrumentation, members of CVTC were able to implement the new technologies in the modern field of Biomedical Engineering. Nowadays, many people discuss the modern aspects of reconfigurable computing, and especially reconfigurable hardware. CVTC developed the collaboration with CYPRESS Semiconductors (INFINEON) using PSoC (Programmable System on a Chip). These chips include a CPU core and mixed-signal arrays of configurable integrated analog and digital peripherals and offer the foundations of the new family systems "hardware reconfigurable by software".
The CVTC members try to put all these modern technologies together: Virtual Instrumentation, Remote Engineering, Hardware Reconfigurable by Software and LabVIEW to present ideas of fruitful collaboration SCHOOL - UNIVERSITY – INDUSTRY.

Biographical Sketch



Prof. Dr. Phys. Doru Ursuțiu (presenting author) coordinates the CVTC Center from **„Transylvania" University of Brasov**, Member of Academy of Romanian Scientists, Honorary President of International Association of Online Engineering IAOE, awarded with "International Engineering Educator ING.PAED.IGIP", received "Nicola Tesla Prize with the Golden Chain" for International outstanding achievements in the field of Engineering Pedagogy.

Cornel Samoilă, Prof. univ. Emeritus. at **Transylvania University of Brasov.** Research main interest fields are Materials Science, Education and Project Management. Full member in the Romanian Technical Science Academy, Member in IAOE association, Nicola Tesla golden chain awarded by IGIP association, National Order "Cultural Merit" for research activity awarded by the Romanian Presidency.

Horia Modran holds a B.Sc. and a M. Sc degree in Computer Science from the **Transilvania University of Brasov**, Romania, obtained in 2014 and 2017. Since 2019, he is a PhD student in Electronics, Telecommunications, and Information Technologies, researching "Systems based on Artificial Intelligence in Advanced Signal Processing", being also associate lecturer at Transylvania University of Brasov.

PLENARY SESSION

Experimental optometry - a new paradigm on interdisciplinary procedural investigations correlated with biomechanics

Mihaela Ioana Baritz

Product design, Mechatronics and Environment Department

University Transylvania from Brasov, Romania

Abstract

The visual function, the access path of information from the environment of a percentage of approximately 80% to the human being, requires special attention, both from a medical point of view and interactions with other sensory systems. If until recently the main purpose of research in this field focused on the determination of eye correction systems, visual aid or surgical intervention, there is an orientation of research towards knowing the effects of visual stimulation in correlation with other sensory systems, through biomechanics mechanisms. Punctual or more general research that links the visual function to externally or internally stimulated reactions of other sensory systems in the human body constitutes a very vast field of investigations and analyzes involving aspects of biomechanics, biomechatronics, medical engineering, visual psychology, etc. A set of such researches developed at the Transilvania University of Brasov, within the laboratory of experimental optometry and in the research center of the Research and Development Institute of the university, which will be presented next, tries to highlight the need to create a new direction - *experimental optometry* - with everything that means a good understanding of all the phenomena manifested at the level of the visual system.

Biographical Sketch

Prof. Mihaela Ioana Baritz received her Diploma in "Mechanical engineering" from “Politehnica” University from Bucharest in 1978, her work is focused on Applied Optometry and also on Biomechanics and visual function rehabilitation at Transylvania University from Brasov. Her Ph.D in Mechanical engineering was on " The improvement of holographic systems for the study of special profiles” and also the habilitation thesis, in Mechanical engineering, Mechatronics and Robotics, presented in 2016 with the title “Conceptual and applied development of analyzes of human bio-behavior in occupational and environmental comfort”.The research activity was dedicated mainly on applied optometry, biomechanics and analyzesof human behavior to establish occupational comfort. Her special current focus is on the activities to develop researches in experimental optometry and to work with professors from Transylvania University and future Ph.D students to build the most modern research directions (bio-mechatronics, visual psychology and biomechanics). She is member in different professional associations (AGIR, SORGING, ARoTMM, etc.) and worked on a series of research projects in the field of biomechanics, mechanical engineering or ERASMUS projects.

PLENARY SESSION

Economic influences on medical services quality

Mircea Gelu Buta

Babeş-Bolyai University of Cluj-Napoca, Romania

Abstract

Common values, such as truth, goodness, beauty, which united European civilization, have become relative today, and we sadly see that they are no longer accepted by all members of the multicultural society in which we live. It is what we call secularization or secularism. The only accepted criterion, which remains and continues to rule, is economic success. This is the model to which individuals, groups and even states relate. On the other hand, the conviction that we cannot do without a minimum of moral values, recognized and established in social life is quite widespread. Then, however, when the problem arises of determining them through the game of consensus, which must be obtained at the social level, their consistency is reduced more and more.

Biographical Sketch

Mircea Gelu Buta is professor at "Babes-Bolyai" University of Cluj-Napoca, where he teaches Christian Bioethics. He is Primary Physician in Pediatrics and Manager of The Emergency County Hospital Bistrița (2005-2017). He is the organizer of "International Seminar of Medicine and Theology" in Bistrița, now on its twenty one edition. He is author of 83 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 and Medal "Sanitary Merit" in the rank of Officer (2004); Patriarchal Cross (1999); Transylvania Cross (2005); Honorary citizen of the village Bistrita Bargaului (2013); Silver Medal of “Babes Bolyai" University of Cluj-Napoca (2016); The Order "Holy Martyrs of Năsăud" (2015); The Order "Saints Constantine and Helen" of Romanian Patriarchate (2016); Annual Rotary Award March 2017, "Man of the Year - Father of the modern hospital in Bistrita"; The Northern Cross, awarded by the Romanian Orthodox Bishopric of Northern Europe, Stockholm, December 7, 2017; The "Mihai Voda" order offered by the Metropolis of Cluj, December 6, 2018, no. 9150; "Honorary citizen of Bistrita-Năsăud county", decision no. IB/25068 of 19.11.2019 granted by the Bistrita Năsăud Country Council.

PLENARY SESSION

Value sensitive design, an ethical concern of medical engineering and biological technology

Mircea Leabu

"Victor Babeș" National Institute of Pathology & Research Center for Applied Ethics, University of Bucharest, Bucharest, Romania

Abstract

Since its beginning, technology strived to make human life easier and better. Similarly, people who was building toys strived to protect children playing with them. Easier and better life, as well as protection of humans (children or adults) are values desired by everybody. However, despite the values it adopts, human being is prone to err (including, e.g., driving drunk). A result that proves as an argument for our lecture is designing cars monitoring the state and abilities of the driver. These examples, despite their triviality, explain why in technology value sensitive design (VSD) became a domain in a programmatic development since the middle of 1990's. Therefore, by VSD, ethical and even bioethical concerns are embedded in technology. My lecture is only a sensitization to VSD as an aide-memoire for professionals in medical engineering and biological technology. All devices resulting in their (as a matter of fact, your, people in the audience) efforts have to obey at least the values raised at the status of principles by Principlism theory: autonomy, beneficence, non-maleficence, and justice (according to Anglo-American concept), or autonomy, dignity, integrity, and vulnerability (according to European vision). VSD gained theory and method(s), as well as professionals (dealing with it). Nowadays, collaboration with professionals in value sensitive design becomes critical.

Biographical Sketch

Dr. Mircea Leabu is graduated in Pure Chemistry as head of the class at national level, in 1976, at Faculty of Chemistry and Chemical Engineering of Gheorghe Asachi Technical University of Iași. He started his research activity in 1980, at the Institute of Cellular Biology and Pathology, in Bucharest, studying the chemistry of lumenal surface of endothelial cells, mainly in terms of glycoconjugates. In 1991, Dr. Leabu moved at the Carol Davila University of Medicine and Pharmacy continuing his researches on cardiovascular system, by modeling ischemia-reperfusion on myocardium and finalizing his doctoral thesis in medical biochemistry, and being also committed in cell biology and histology teaching activity for undergraduate students. Between 2000 and 2005 he traveled to University of Western Ontario, London, Ontario, Canada to work as a postdoctoral fellow in the study of controlling cell shape and motility by integrins, as a result of growth factors' signals. Returned home, Dr. Leabu continued his didactic activity at Carola Davila University of Medicine and Pharmacy, and he has initiated his activity at Victor Babeș National Institute of Pathology, in Bucharest, leading a Cell Biology Lab. Starting with 2008, he enlarged his scientific interest to bioethics and professional ethics using an unexpected opportunity and publishing more than 20 papers in this field. In the same time, his textbook related to biomembranes is an appreciated guiding material for students. In 2009, Dr. Leabu was awarded with Professor Bologna title for his outstanding teaching activity. (Details at: https://scholar.google.com/citations?user=0tEfM0cAAAAJ&hl=en)

PLENARY SESSION

Patellar reflex test, transcutaneous spinal cord stimulation (tSCS), H-reflex analysis, and brain activity analysis in spinal cord injured and brain

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. Spinal cord stimulation effect on the brains or the spine plasticity has not been in focus of research so far. Our group has developed a methodology to evaluate EEG, EMG and joint angle measurements made during several common neurological and physio therapeutical tests as well as tSCS in order to analyse the reaction of brain and muscles to these tests. Pipeline for brain network analysis and time-frequency analysis of the neurological signals has been developed. This enables studies of changes in the brain due to different condition of the subject. The talk will give overview of stimulation methods, research protocol, assessment methods as well as preliminary results from research work during patellar tendon test and spinal cord stimulation on healthy young (20 – 30 years) and elder (50 – 70 years), spinal cord injured and brain insulted people. This includes results on the behaviour of the H-reflex, event related potentials and brain connectivity graphs.

Biographical Sketch

Professor Thordur Helgason is an Associate Professor for Biomedical Engineering at Reykjavík 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.