

BIO MEDICAL ENGINEERING

PROBLEM SOLVING USING CLINICAL
AND BIOMEDICAL APPLICATIONS

ABSTRACTS

6th - 8th June 2017
Location: Online

EuroSciCon 

Including topics such as tissue, neural and pharmaceutical engineering as well as regenerative medicine, this informal international gathering will discuss the future of biomedical engineering for improved healthcare.

This event has [CPD accreditation](#)

This abstract book will be finalised two weeks before the event

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Invited Speakers Abstracts

Assistive technologies and robotic rehabilitation for spinal cord injury patients

Dr. Arash Arami, Imperial College London, London, United Kingdom

This talk will cover our recent achievements in identification of the neuromechanics of lower limbs, spasticity modelling and design of control strategies enabling the SCI patients to walk again with wearable exoskeletons. The joint mechanical impedance identification techniques used during walking will be briefly described with an application-oriented view. The instrumented tests that we developed and employed for modelling the spasticity of SCI patients will be described. Finally the link between the joint mechanical impedance and spasticity analysis and the design of rehabilitation techniques and assistive control strategy for SCI patients will be demonstrated.

Sealantis, a biomimetic tissue adhesive inspired by algae

Associate Professor Havazelet Bianco-Peled, Technion – Israel Institute of Technology, Haifa, Israel

Tissue adhesives are a relatively new alternative for traditional wound closure means such as sutures and staples. A challenging aspect of their development is finding a material capable of adhering to wet tissues. Inspired by the adhesion mechanism of brown algae, studied by our group in detail, we invented a novel class of biomimetic adhesives. We found that the properties of these man-made formulations are similar to those of the alga-born adhesives. The technology was patented and is currently commercialized by Sealantis Ltd. The adhesives were found to be effective for sealing blood vessels and for local delivery of drugs.

Beyond usability: ensuring biomedical technologies are fit for purpose

Professor Ann Blandford, University College London, London, United Kingdom

Patient safety depends on many factors, including the reliability and use of biomedical technologies. In this talk, I will discuss the role of the user of biomedical technologies, with a particular focus on infusion devices in medication administration. Infusion devices are interactive and safety critical. Poor design can result in workarounds and lead to untoward incidents. Good design requires an understanding of human factors, and of how the devices are used in patient care. I will report on findings from observational studies of infusion administration and discuss implications for design, procurement and training.

Mechanical design principles in spine surgery: from validation to application

Dr. Luigi La Barbera, Politecnico di Milano, Milan, Italy Despite the enormous strides made in the last decades by the orthopaedic technologies, mechanical fatigue still represents a compelling challenge. This is particularly true in the spinal field, where the failure of posterior spine stabilization devices is not so uncommon. The talk will address this issue by showing how mechanical design methods, typical of bioengineering, can help to better understand and manage the stated issue. Particular attention will be devoted to study specific scenarios with finite element method and to describe how to validate them by comparison with experimental tests.

Microfluidics for investigating liver metabolic disorders

Dr. Manuele Gori, Universita' Campus Bio-Medico di Roma, Rome, Italy

Nonalcoholic fatty liver disease (NAFLD) is a chronic liver condition, ranging from steatosis to nonalcoholic steatohepatitis, cirrhosis and hepatocarcinoma. The molecular mechanisms underlying NAFLD are still under investigation. So far, many in vitro studies on NAFLD have been hampered by the limitations of 2D culture systems, in which cells rapidly lose tissue-specific functions. Our "Liver-on-Chip" system is the first in vitro model of human NAFLD developed within a microfluidic device that aims at filling the gap between conventional in vitro models, often scarcely predictive of an in vivo condition, and animal models that are potentially biased by their xenogeneic nature.

State of the art and failure mechanisms of DLC coated articulating joint replacements

Dr. Hauert Roland, Empa, Swiss Federal Laboratories for Materials Science and Technology, Dübendorf, Switzerland

Hard coatings such as diamond-like carbon (DLC) show extremely low wear in technical applications. However, in vivo applications using DLC coatings on articulating joints resulted in failures some years after implantation, due to unpredicted coating delamination. It will be shown that in some cases a delayed in vivo delamination was caused by slow crevice corrosion of the adhesion-promoting interlayer. Furthermore, at the coating/substrate interface a few atomic layers of reaction products are formed. Depending on the interface composition, delamination can occur by a slowly advancing crack in this thin interface material governed by the laws of stress corrosion cracking.

Biodegradable magnesium for orthopaedic applications

Dr. Yan Huang, Brunel University London, London, United Kingdom

New generation of biodegradable magnesium alloys and magnesium matrix composites is developed for orthopaedic applications. A novel route for the fabrication of the magnesium biomaterials is tested, which combines high shear solidification and severe plastic deformation. The materials are characterized in terms of microstructure, mechanical performance and in-vitro electrochemical behaviour. Mechanisms responsible for the control of degradability are discussed.

Data processing and visualisation in Cardiac Magnetic Resonance Imaging

Dr Rashed Karim, King's College London, London, United Kingdom

Cardiac magnetic resonance (CMR) imaging plays an important role in the diagnosis of patients with cardiovascular diseases. A wealth of CMR data is acquired routinely in hospitals around the world. The processing of such data can be cumbersome and complex. I will be presenting a few state-of-the-art techniques on processing CMR images and on the best approaches for visualising them.

New Materials from Biomass

Professor Mark MacLachlan, University of British Columbia, Vancouver, B.C., Canada

Cellulose and chitin are two of the most abundant biopolymers in nature. Since 2010, we have been using cellulose and chitin nanocrystals to construct new iridescent materials that may be useful for sensing and photonics applications. In this talk, I will present some of our work toward constructing new materials using cellulose and chitin nanomaterials as templates.

Biomimetic systems for tissue regeneration

Dr Elisa Mele, Department of Materials, Loughborough University, Loughborough, United Kingdom

In regenerative medicine, the development of advanced systems for the efficient treatment of skin wounds is becoming crucial in order to face global demographic issues (ageing population, obesity and diabetes). An ideal biomedical device for wound care should promote the complete regeneration of the injured tissue, effectively restore its biological activity and aesthetic aspect, while reducing inflammation and preventing microbial invasion. Here we present the development of bioactive dressings that encapsulate natural active agents with anti-inflammatory and antibacterial activity. The porosity of the scaffolds produced is suitable for gas permeation, and their mechanical properties can be engineered.

A complete software application for automatic registration of x-ray mammography and magnetic resonance images

Dr. María José Rupérez Moreno, Universitat Politècnica de València, Valencia, Spain

This work presents a complete and automatic software application to aid radiologists in breast cancer diagnosis. The application is a fully automated method that performs a complete registration of magnetic resonance (MR) images and x-ray (XR) images in both directions (from MR to XR and from XR to MR) and for both x-ray mammograms, craniocaudal (CC), and mediolateral oblique (MLO). This new approximation allows radiologists to mark points in the MR images and, without any manual intervention, it provides their corresponding points in both types of XR mammo-grams and vice versa. The results show that the application can accelerate the mammographic screening process for high risk populations or for dense breasts.

ANIMO for cartilage development

Assistant Professor Janine Post, MIRA institute for biomedical technology and technical medicine, University of Twente, Enschede, Netherlands

An intricate network of regulatory processes determines the chondrocyte cell fate both during development and maintains tissue homeostasis. The exact regulation of these cellular processes by this network during development are yet unknown, hampering cartilage and bone tissue engineering initiatives. Because of the inherent complexity of regulatory networks, they cannot be efficiently analysed and understood without computational assistance. To obtain insight into the function of such complex networks we developed a dynamic computational model of chondrocytes, the Executable CHondrocyte or ECHO. We used ECHO to mimic all steps of the development of stable articular cartilage.

Analysis of the voice for screening purposes

Professor Giovanni Saggio, University of Rome Tor Vergata, Rome, Italy

The voice production depends on four main parts: the lungs that provide air with energy content; the vocal chords that produce sound vibrating accordingly to the amount of air; the cavities (mouth, nose, chest, ear) that produce resonations; the articulators (lips, tongue, teeth) that shape the sound. In turn, these parts depend on the brain that coordinates.

When one or more of these parts are subjected to infections, the resulting disease impacts the voice production system to a significant and measurable extent.

Our research demonstrates correlations between the “quality” of the voice and some upper and/or lower respiratory tract diseases or some neurological diseases.

A Multimodal Smart Walker for rehabilitation assistance and clinical evaluation of people with cerebellar ataxia

Dr. Cristina Manuela Peixoto Santos, University of Minho, Guimarães, Portugal

This talk describes the development of the ASBGo Smart Walker with the intent of helping patients with high disorders of balance, such as cerebellar ataxic patients. It describes the first steps towards the proposal of a new treatment with the ASBGo with real, ataxic patients. The talk is structured in different sections: first the walker and associated sensory systems are presented. Then the four operating modes delineated (autonomous, manual, safety and remote control) in the ASBGo are described. Then it is described the application of the developed gait and posture assessment tool into the rehabilitation of patients with ataxia, including a brief description of the disease and case studies.

My personalized biomedical model: when medical imaging supports computer-assisted diagnosis and intervention

Professor Jérôme Schmid, Geneva School of Health Sciences, University of Applied Sciences and Arts Western Switzerland, HES-SO Genève, Genève, Switzerland

Medical imaging is an essential clinical tool in medical diagnosis and patient follow-up. Computer-assisted processing of medical images can accurately produce patient-specific models – capturing morphological and functional aspects. Model creation particularly relies on image segmentation which remains one of the most challenging issues in image processing due to the diversity of imaging modalities, patient morphology and related pathologies.

In this talk, we will present segmentation approaches based on deformable models driven by physical concepts and prior knowledge. Their application on various modalities (MRI, CT and X-Ray imaging) will be exemplified with orthopaedic applications related to diagnosis, surgical planning and post-operative assessment.

AIE Materials for Bioimaging, Diagnosis and Therapy Applications

Dr. Ben Zhong TANG, The Hong Kong University of Science and Technology, Kowloon, Hong Kong

Traditional π -conjugated fluorophors are prone to aggregate with light emission quenching which is known as aggregation-caused quenching (ACQ). We have observed an opposite phenomenon termed “aggregation-induced emission” (AIE) and identified the restriction of intramolecular rotation (RIR) as the main reason for the AIE effect. Guided by the RIR mechanism, we have developed a series of new AIE materials with emission

colors covering the whole visible spectrum, fluorescence quantum yields up to unity. Nanoparticles of the AIE materials with efficient fluorescence and excellent biocompatibility can be readily fabricated. The nanoparticles of the AIE materials with specific surface functional groups exhibit high emission efficiency, large absorptivity, excellent biocompatibility and strong photo-stability, endowing them ideal for targeting specific cells and/or tissues, and long-term non-invasive in vitro and in vivo cell tracing. Moreover, some AIE materials show aggregation enhanced photodynamic activity and the formulated AIE dots have been used for targeted and imaging-guided photodynamic cancer therapy.

Magnetic and Plasmonic Nanoparticles for Cancer Thermal Therapies

Dr. Claire Wilhelm, University Paris Diderot, Paris, France

Medical hyperthermia consists of destroying a pathogenic tissue by raising its temperature. Recent advances in nanotechnology have raised the prospect of effective, targeted thermal treatments that have few if any adverse effects. Two promising classes of nanoparticles have recently been developed for delivering controlled hyperthermia: magnetic and plasmonic nanoparticles. I will present different aspects of these thermal nano-therapies, from in situ measurement of therapeutic efficiency to long-term nanotransformation in the tissue.

Day 1:

Oral Presentation Abstracts

Oral presentations will be added after the submission deadline

Day 2:

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Poster Presentation Abstracts

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