Proposed by AIMETA group on Biomechanics

Advances in Biomechanics: from foundations to applications

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Biological systems are complex, both functionally and geometrically, heterogeneous, and have sophisticated structural hierarchies. Multidisciplinary modelling and simulation efforts to deal with these systems can both provide new perspectives and solutions to biology and medicine, and push the boundaries of engineering in many directions.
Several challenges need to be faced in these basic issues, including the inherent property of biological systems to adapt to mechanical and biochemical environments, the coupling among structural, fluid, chemical and electrical fields; the inter-patient variability of loading conditions or constitutive properties. We underline the ability to deal with complex geometries and with complex material, from fluid to soft to hard ones, simulate mechanics at multiple scales, gather accurate patient-specific data, process huge nonlinear models; and how to establish validity of such models. On the other side, applications such as mini-invasive surgery and rehabilitation techniques pose demanding questions whose answers can greatly affect human life. Here, the significant development of robotics and mechatronics, with the exploitation of new materials, paves the way to great advances and raises a number of challenging issues related to human-machine interaction.
The proposed session aims to gather the state-of-the-art developments pertaining to biomechanics, and to foster the exchange of new ideas that will lead to the development of more realistic models, simulations, and reliable machines thus allowing a better understanding of the questions implied in physiology, pathology, and interaction with medical devices.
Topics of interest include, but are not limited to, the following:

- Biomechanics of soft or hard tissues
- Biofluid mechanics and fluid-structure interaction
- Multiphysics and multiscale analyses
- Computational modelling of biological systems in medicine and biology
- Biomedical devices
- Development and validation of reliable simulation algorithms
- Theoretical or numerical investigation of physiological and pathological mechanisms
- Applications with potential clinical relevance
- Inverse and in-vivo parameter estimation
- Experimental techniques for biomechanical testing