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Preface

Thematic issue on biomechanics of human motion

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Over the last years, it has been recognized that the construction of biomechanical models suitable for studying the human motion requires contributions from many fields of engineering. In this setting, several aspects need to be investigated before such models can reach the status of medical applications, which is the main target of the intended worldwide research. Such aspects include formulations able to describe biomechanical systems with different levels of detail, equipment used for the kinematic and kinetic data acquisition, and methodologies for data processing, just to mention a few.

This thematic issue addresses how biomechanics can benefit from multibody dynamics and how multibody dynamics finds in biomechanics an important area of application. The particular focus of this thematic issue is to demonstrate how some of the most recent scientific and technological developments can help to improve the modeling and analysis of biomechanical models for human body motion, which eventually can contribute to reduce the gap between engineering developments and clinical applications.

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This thematic issue, composed of a total number of 12 papers, aims to illustrate some of the most relevant topics that are currently subject of active investigation in the biomechanics research field, along with examples of application to engineering and clinical practice. Three papers can be considered experimental, focusing on the accuracy of muscle force estimation, determination of musculotendon parameters, and on the joint stability after total knee arthroplasty. Nine papers present theoretical models on different topics. Three of them are on the knee-joint modeling and analysis from both kinematic and dynamic points of view. One paper deals with the dynamic modeling and analysis of the upper limb. The remaining papers focus on the topics hip contact forces and muscle activations during walking, distance-field-based joint-limits for biomechanical joint models, implications of the anatomical kinematic constraints on the musculotendon forces and joint reactions, real-time EMG-driven musculoskeletal models, and muscle forces and orthosis actuation in powered assisted walking.

We hope that the present set of papers can serve as a sample to offer a panoramic view of the current state of the art and of the valuable connection between biomechanics and multibody dynamics. The guest editors deeply appreciate the publication effort made by all the authors in writing the papers in time, allowing this issue to be a reality in a short period of time. Finally, we thank all reviewers for their outstanding work, and the journal editorial secretariat, in the person of Paula Jorge, for the helpful and most efficient job, which allowed this thematic issue to be published as scheduled.

Guest Editors