

Preface

Thematic Issue on Multibody Dynamics 2015

Josep M. Font-Llagunes¹ · José J. Muñoz² ·
Jorge A.C. Ambrósio³

Received: 10 November 2016 / Accepted: 10 November 2016
© Springer Science+Business Media Dordrecht 2016

Multibody system dynamics is a branch of computational mechanics that deals with modeling principles and computational methods for the dynamic analysis, simulation, and control of complex mechanical systems. These appear in a large spectrum of domains ranging, for example, from standard industrial production of vehicles, rotational machines and mechatronic devices to emerging application fields where biomolecular structures and smart materials are studied at the nanodimensional level. Such versatility of applications is rooted in the basic modeling principles of the discipline, which, being based on the kinematical and dynamical coupling of rigid and flexible bodies with different characteristics and mechanical properties, serve as a powerful tool to study the mechanical and multiphysics behavior of a broad class of systems in engineering and applied sciences.

To cope with increasingly challenging scenarios in the context of more demanding materials and design requirements, the discipline had to develop and incorporate different modeling methods that found their successful coexistence within the framework of multibody system dynamics. Indeed, since its establishment in the 1970s as a discipline primarily focusing on rigid body mechanisms, multibody system dynamics has grown today into a field that offers solutions for various modeling, optimization and control tasks of quite complex highly developed industrial products; which often include multiphysics approaches, computational coupling techniques, geometric integrators and multiscale modeling techniques.

✉ J.M. Font-Llagunes
josep.m.font@upc.edu

J.J. Muñoz
j.muñoz@upc.edu

J.A.C. Ambrósio
jorge.ambrosio@tecnico.ulisboa.pt

¹ Department of Mechanical Engineering, Universitat Politècnica de Catalunya (UPC), Diagonal 647, 08028 Barcelona, Catalonia, Spain

² Universitat Politècnica de Catalunya, Jordi Girona 1-3, Edifici C2, 08034 Barcelona, Catalonia, Spain

³ Instituto Superior Técnico, Av. Rovisco Pais 1, 1049-001 Lisboa, Portugal

All these aspects, and many more relevant topics related to multibody system dynamics, were discussed during the ECCOMAS Thematic Conference on Multibody Dynamics 2015 that was organized by the Biomechanical Engineering Lab of the Universitat Politècnica de Catalunya (UPC) from June 29th to July 2nd, 2015 in Barcelona, Catalonia, Spain. The objective of the conference was to present the state-of-the-art in theory and applications of multibody system dynamics, to provide a forum for discussion on relevant research issues, and to serve as a meeting point for the international researchers, scientists, and experts from academia, research laboratories, and industry working in the area of multibody dynamics; well demonstrated by the 360 participants from 35 countries, spanning the 5 continents.

The organizers of the different thematic sessions at the Multibody Dynamics 2015 were challenged to identify the communications that better described the contribution of multibody dynamics to the state-of-the-art of the various areas in which multibody approaches play an important role. The authors of the identified communications were invited to submit a paper to the journal *Multibody System Dynamics* to be part of this thematic issue, after being peer-reviewed and properly revised, and then accepted. Their topics span the study of multibody systems of asteroids, theoretical reformulations of Hamiltonian and contact dynamics, order reduction techniques, the use of these techniques in topology optimization, estimation of state variables using filters, or the analyses of a disc break and a compliant humanoid robot as multibody systems.

We want to take this opportunity to thank all the authors for the time and effort they devoted to the completion of their excellent contributions. We also want to thank all the reviewers for their expert work during the review process. Their assistance has been very valuable in shaping the final version of the papers now published in this thematic issue. Last but not least, we would like to express our gratitude to Springer and the Editors for accepting the publication of this thematic issue in the journal *Multibody System Dynamics*.

January 2017
Barcelona, Catalonia, Spain