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Preface of the thematic issue on rolling contact mechanics for multibody system dynamics

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Rolling elements play a central role in almost all modern engineering systems characterised by large relative motion between its mechanical components. Multibody dynamics, being the best-suited discipline to deal with the computational dynamic aspects of the analysis and modelling of systems with very large motion, requires computationally efficient approaches and algorithms to deal with the rolling contact mechanics. The rolling contact mechanics is a fundamental part of the characterisation of the interaction between elements in rail-wheel contact, tyre-road contact, roller bearing contact dynamics or biomechanics of natural joints, among others. The fundamentals of the elastic or plastic rolling contact mechanics are also an inherent part of the tribology of rolling elements and wear being naturally involved in the development of models for Finite Element Analysis or Multibody Dynamics.

This Thematic Issue of Multibody System Dynamics includes a collection of papers that address the scientific topics that contribute to the mechanical and computational challenges to handle rolling contact mechanics in the context of multibody dynamics. The classic theories in elastic and plastic contact, the computational algorithms for their efficient use in the framework of multibody dynamics applications, the tribology aspects characteristic for many of the mechanical systems of interest, and the consequences of wear both in the response of the system and in the use of the background contact theories are just some of the topics of relevance addressed, either directly looking at their theoretical foundations or via applications. The application of the theories, methods and algorithms, and their inherent numerical issues to road and railway vehicle dynamics, mechanical systems with rolling elements, ball and roller bearings or biomechanical joints and systems are some of the areas addressed, in which the overview of the computational methods associated with rolling contact mechanics is of major importance. The numerical problems arising from the computational implementation of the rolling contact formulations, being mostly transversal to

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many different areas of application, deserve particular interest. Not only the influence of the formulation aspects of the performance of the numerical methods associated with the integration of ordinary differential equations and with the solution of nonlinear equations, but also the modelling issues associated with the description of the systems to take better advantage of the methodological description of the contact problem are discussed.

The papers being presented in this Thematic Issue result from an invitation to selected researchers in this area for submission to Multibody System Dynamics during the EUROMECH Colloquium 578 on Rolling Contact Mechanics for Multibody System Dynamics that took place in April 2017 in Madeira, Portugal. These manuscripts underwent the rigorous peer review, which is a hallmark of this journal, and were revised by the authors to reflect the recommendations and suggestions of the reviewers. Among the accepted submissions, seven high-quality papers that reflect novel advances in the thematic areas that involve rolling contact mechanics in multibody dynamics have been selected for publication in this thematic issue. We hope that the papers will be good references for your work and that you enjoy reading them.