

## **EUROMECH Colloquium 578**

### **“Rolling Contact Mechanics for Multibody System Dynamics”**

*10 – 13 April, 2017, Funchal, Madeira, Portugal*

*Chairperson: Jorge Ambrosio*

*Co-Chairperson: Werner Schiehlen*

Rolling elements play a pivotal role in almost all modern engineering systems characterized by large relative motion between their 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 evaluate rolling contact mechanics. These rolling contact mechanics are fundamental to characterization of the interaction between elements in rail-wheel contact, tyre-road contact, roller bearing contact dynamics and 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.

EUROMECH Colloquium 578 covered the scientific topics that are needed to address the mechanical and computational challenges in handling rolling contact mechanics in the context of multibody dynamics. The following list shows some key aspects that were reviewed during Colloquium 578, through both their theoretical foundations and practical applications.

- Classic theories in elastic and plastic contact;
- Efficient computational algorithms for use in multibody dynamics applications;
- Tribology characteristics of the mechanical systems of interest;
- Consequences of wear in system response;
- Use of background contact theories.

Numerical problems arising from the computational implementation of the rolling contact formulations, being mostly transversal to the different areas of application, were of particular interest during the colloquium. Not only the performance of numerical methods associated with the integration of ordinary differential equations and solution of nonlinear equations, but also the modelling of systems to take advantage of improved understanding of the contact problem were discussed thoroughly.

A small scientific committee, including the organizers and 10 other leading scientists: E. Vollebregt, VORtech, The Netherlands; G. Rill, University of Regensburg, Germany; J. Dominguez, University of Seville, Spain; J. Awrejcewicz, The Lodz University of Technology, Poland; J. Seabra, FEUP, University of Porto, Portugal; M. Rosenberger, Virtual Vehicle Research Center, Austria; P. Flores, University of Minho, Portugal; R. Lewis, University of Sheffield, United Kingdom; S. Bruni, Politecnico Milano, Italy; U. Nackenhurst, Leibniz University, Hanover, Germany. The presentations were selected from about 70 submissions. They were organized in a thematic form not only to ensure the consistent flow of the different topics but also to foster discussion and exchange of ideas.

Colloquium 578 took place over 2½ working days, with 53 participants from 18 countries and 47 presentations. All presentations were supported by abstracts. Many full-length papers were contributed on a voluntary basis. The colloquium was run without parallel sessions, so that the time for discussion could be managed flexibly to maximise the effective exchange of ideas.

The formal scientific programme was complemented by a social programme. Lunch periods of 1½ hours and tables of 10-14 encouraged continuation of scientific discussion and development of collaboration. The Tour and Banquet for all the participants and accompanying persons on the third day of the event helped to strengthen relationships.

Resulting from the excellent scientific quality of the Colloquium, the authors of selected presentations have been offered the opportunity to produce full-length papers for publication in a Thematic Issue of "Multibody System Dynamics" (ISI Impact factor 1.4), guest edited by J. Pombo, W. Schiehlen and J. Ambrósio. The papers will be peer-reviewed and, if accepted, published in 2018.

.