Computational Kinematics
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Preface

Computational kinematics is an enthralling area of research with a rich spectrum of problems at the junction of mechanics, robotics, computer science, mathematics, and computer graphics. Its areas of application encompass such diverse fields as computational geometry, motion analysis and synthesis, mechanism design, robots and parallel manipulators, computer animation, up to biomechanics and molecular kinematics. The present book collects up-to-date methods as presented during the International Workshop on Computational Kinematics held in Duisburg, Germany, on May 6-8, 2009. This workshop is the fifth in a series of successful workshops with sites in Schloss Dagstuhl, Germany (1993), Sophia Antipolis, France (1995), Seoul, South Korea (2001) and Cassino, Italy (2005).

The contributions of this book - forty seven papers from authors from twenty one countries - were selected in a rigorous review process involving internationally renowned reviewers. The covered topics include design and optimization of cable-driven robots, analysis of parallel manipulators, motion planning, numerical methods for mechanism calibration and optimization, geometric approaches for mechanism analysis and design, synthesis of mechanisms, kinematical issues in biomechanics, balancing and construction of novel mechanical devices, detection and treatment of singularities, and computational methods for gear design.

The workshop was organized at the Faculty of Engineering of the University of Duisburg-Essen under the patronage of IFToMM, the International Federation for the Promotion of Mechanism and Machine Science, as well as of the Rector of the University of Duisburg-Essen and the Dean of the Faculty of Engineering. The conference chair included Prof. Torsten Bertram from the Technical University of Dortmund, Prof. Burkhard Corves from the RWTH Aachen, as well as Prof. Wojciech Kowalczyk, Prof. Hiller and Prof. Dieter Schramm from the University of Duisburg-Essen. The scientific committee consisted of leading researchers in the area of mechanism and machine theory, and the organizing committee embraced the members of the Technical Committee for Computational Kinematics of IFToMM.

We thank the authors for having contributed their valuable work to this conference, as well as all reviewers for having completed their review in a timely manner, allowing this book to be finished right on time for the workshop. Our special thanks go to Tectrum Duisburg for having put at disposition their formidable Norman Foster House as conference site, as well as to the sponsors of this conference. We thank also the publisher Springer, who paved the way to the timely implementation of this book with good and kind advices. Last, but not least, we thank our Ph.D. student Ms. Ye Ou for her infinite patience and diligence in solving all the small but numerous details of the final typesetting of this book.

Duisburg, May 2009

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