Multi Body Simulation And Multi Objective Optimization

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Multi-body Dynamics: Advanced Multibody System Dynamics

Dynamics and Simulation of Flexible Rockets

Simulation of Multi-body Dynamics with Dry Friction

Sub-discretized Surface Model with Application to Contact Mechanics in Multi-body Simulation

Numerical Methods in Multibody Dynamics

Multi-body Systems Approach to Vehicle Dynamics

Multibody Dynamics

Multibody System Dynamics, Robotics and Control

2019 16th International Conference on Ubiquitous Robots (UR)

Modelling and Simulation of Multibody Systems with Unilateral Contact Dynamics of Underactuated Multibody Systems

Simulation of Multi-body Buoyant Flows

Understanding the Discrete Element Method

Simulation in Chassis Technology

Dynamic Simulation of Multi-body Systems in Motion for Virtual Prototyping

Modern Flexible Multi-body Dynamics

Modeling Methodology for Flapping Wing Vehicles

Flexible Multibody Dynamics

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Multibody Systems Handbook

IJUTAM Symposium on Intelligent Multibody Systems – Dynamics, Control, Simulation

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Kinematic and Dynamic Simulation of Multibody Systems

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Multi-body Dynamics with Unilateral Contacts

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Multibody Dynamics

Dynamic Simulation of Multi-body Systems

Multi-body dynamics describes the physics of motion of an assembly of constrained or restrained bodies. As such it encompasses the behaviour of nearly every living or inanimate object in the universe. Multi-body dynamics - Monitoring and Simulation Techniques III includes papers from leading academic researchers, professional code developers, and practising engineers, covering recent fundamental advances in the field, as well as applications to a host of problems in industry. They broadly cover the areas: Multi-body methodology Structural dynamics Engine dynamics Vehicle dynamics - ride and handling Machines and mechanisms Multi-body Dynamics is a unique volume, describing the latest developments in the field, supplemented by the latest enhancements in computer simulations, and experimental measurement techniques. Leading industrialists explain the importance attached to these developments in industrial problem solving.

Multi-body dynamics is an important and little published field of mechanical engineering. Contained in this volume are the refereed papers from the First International Symposium on Multi-body Dynamics: Monitoring and Simulation Techniques. In presenting their valuable experiences, leading researchers from all aspects of multi-body dynamics highlight and integrate the range of techniques employed in dealing with complex dynamic problems encountered in various industries. The papers, from leading academic researchers and professional engineers, cover applications in automotive, aerospace, machine tool, turbo-machinery, and other sectors of industry.

By having its origin in analytical and continuum mechanics, as well as in computer science and applied mathematics, multi-body dynamics provides a basis for analysis and virtual prototyping of innovative applications in many fields of contemporary engineering. With the utilization of computational models and algorithms that classically belonged to different fields of applied science, multi-body dynamics delivers reliable simulation platforms for diverse highly-developed industrial products such as vehicle and railway systems, aeronautical and space vehicles, robotic manipulators, smart structures, biomechanical applications and nano-technologies. The chapters of this volume are based on the revised and extended versions of the selected scientific papers from amongst 255 original contributions that have been accepted to be presented within the program of the distinguished international ECCOMAS conference. It reflects state-of-the-art in the advances of multi-body dynamics, providing excellent insight in the recent scientific developments in this prominent field of computational mechanics and contemporary engineering.

Arun K. Banerjee is one of the foremost experts in the world on the subject of flexible multibody dynamics. This book describes how to build mathematical models of multibody systems with elastic components. Examples of such systems include the human body itself, construction cranes, cares with trailers, helicopters, spacecraft deploying antennas, tethered satellites, and underwater maneuvering vehicles. This book provides methods of analysis of complex mechanical systems that can be simulated in less computer time than other methods. It equips the reader with knowledge of algorithms that provide accurate results in reduced simulation time.

Robot and Multibody Dynamics: Analysis and Algorithms provides a comprehensive and detailed exposition of a new mathematical approach, referred to as the Spatial Operator Algebra (SOA), for studying the dynamics of articulated
multibody systems. The approach is useful in a wide range of applications including robotics, aerospace systems, articulated mechanisms, bio-mechanics and molecular dynamics simulation. The book also: treats algorithms for simulation, including an analysis of complexity of the algorithms, describes one universal, robust, and analytically sound approach to formulating the equations that govern the motion of complex multi-body systems, covers a range of more advanced topics including under-actuated systems, flexible systems, linearization, diagonalized dynamics and space manipulators. Robot and Multibody Dynamics: Analysis and Algorithms will be a valuable resource for researchers and engineers looking for new mathematical approaches to finding engineering solutions in robotics and dynamics.

The mechanics of contact between rough and imperfectly spherical adhesive powder grains are often complicated by a variety of factors, including several which vary over sub-grain length scales. These include several traction factors that vary spatially over the surface of the individual grains, including high energy electron and acceptor sites (electrostatic), hydrophobic and hydrophilic sites (electrostatic and capillary), surface energy (general adhesion), geometry (van der Waals and mechanical), and elasto-plastic deformation (mechanical). For mechanical deformation and reaction, coupled motions, such as twisting with bending and sliding, as well as surface roughness add an asymmetry to the contact force which invalidates assumptions for popular models of contact, such as the Hertzian and its derivatives, for the non-adhesive case, and the JKR and DMT models for adhesive contacts. Though several contact laws have been offered to ameliorate these drawbacks, they are often constrained to particular loading paths (most often normal loading) and are relatively complicated for computational implementation. This paper offers a simple and general computational method for augmenting contact law predictions in multi-body simulations through characterization of the contact surfaces using a hierarchically-defined surface sub-discretization. For the case of adhesive contact between powder grains in low stress regimes, this technique can allow a variety of existing contact laws to be resolved across scales, allowing for moments and torques about the contact area as well as normal and tangential tractions to be resolved. This is especially useful for multi-body simulation applications where the modeler desires statistical distributions and calibration for parameters in contact laws commonly used for resolving near-surface contact mechanics. The approach is verified against analytical results for the case of rough, elastic spheres.

Nowadays mathematical modeling and numerical simulations play an important role in life and natural science. Numerous researchers are working in developing different methods and techniques to help understand the behavior of very complex systems, from the brain activity with real importance in medicine to the turbulent flows with important applications in physics and engineering. This book presents an overview of some models, methods, and numerical computations that are useful for the applied research scientists and mathematicians, fluid tech engineers, and postgraduate students.

Filling the gaps between subjective vehicle assessment, classical vehicle dynamics and computer-based multibody approaches, The Multibody Systems Approach to Vehicle Dynamics offers unique coverage of both the virtual and practical aspects of vehicle dynamics from concept design to system analysis and handling development. The book provides valuable foundation knowledge of vehicle dynamics as well as drawing on laboratory studies, test-track work, and finished vehicle applications to get theory with practical examples and observations. Combined with insights into the capabilities and limitations of multibody simulation, this comprehensive mix provides the background understanding, practical reality and simulation know-how needed to make and interpret useful models. New to this edition you will find coverage of the latest tire models, changes to the modeling of light commercial vehicles, developments in active safety systems, torque vectoring, and examples in AView, as well as updates to theory, simulation, and modeling techniques throughout. Unique gelling of foundational theory, research findings, practical insights, and multibody systems modeling know-how, reflecting the mixed academic and industrial experience of this expert author team Coverage of the latest models, safety developments, simulation methods, and features bring the new edition up to date with advances in this critical and evolving field.

This volume brings together the proceedings of the 2nd International Symposium Multi-body Dynamics - Monitoring and Simulation Techniques. This collection of work is useful for all those involved in the field of dynamics analysis and experimentation.

As mechanical systems become more complex so do the mathematical models and simulations used to describe the interactions of their parts. One area of multibody theory that has received a great deal of attention in recent years is the dynamics of multiple contact situations occurring in continuous joints and couplings. Despite the rapid gains in our understanding of what occurs when continuous joints and couplings interact, until now there were no books devoted exclusively to this intriguing phenomenon. Focusing on the concerns of practicing engineers, Multibody Dynamics with Unilateral Contacts presents all theoretical and applied aspects of this subject relevant to a practical understanding of multiple unilateral contact situations in multibody mechanical systems. In Part 1, Professor Pfeiffer and Dr. Glocker provide an exhaustive review of the laws and principles governing the dynamics of unilateral contacts in multibody mechanical and technical systems. Among the topics covered are multibody and contact kinematics, the dynamics of rigid body systems, multiple contact configurations, detachment and stick-slip transitions, frictionless impacts, impacts with friction, and the Corner law of contact dynamics. In Part 2, the authors present numerous applications of the theories.
presented in Part 1. Each chapter in this part is devoted to a different law, theory, or model, such as discontinuous force laws, classical impact theory, Coulomb's friction law, and mechanical and mathematical models of impacts and friction. In addition, each chapter features several practical examples that allow engineers to observe the concepts described in action. Examples are drawn from a broad array of fields and range from hammering in gears as occurring in a synchronous generator to impacts and friction as observed in a child's woodpecker toy, from a demonstration of classical impact theory using an automobile gear box example, to Coulomb's friction law as applied to a turbine blade damper. Multibody Dynamics with Unilateral Contacts is an indispensable resource for mechanical engineers working on all types of multibody systems and the friction and vibration problems that can occur in them. It is also a valuable reference for researchers studying nonlinear dynamics. The only book devoted entirely to the theory and applications of one of the most crucial aspects of multibody system design. This is the first book to focus exclusively on the theory and applications of multiple contact situations occurring in continuous joints and couplings in multibody systems. As such, it is a valuable resource for engineers working on mechanical systems with interrelated multiple parts. Multibody Dynamics with Unilateral Contacts * Provides a comprehensive examination of the laws and principles governing the dynamics of unilateral contacts in multibody mechanical and technical systems. * Presents the latest mathematical models and simulation techniques for describing the interactions of joints and couplings in multibody systems. * Describes practical applications for all the concepts covered. * Includes numerous examples drawn from a wide range of fascinating and enlightening real-world demonstrations, including everything from an airplane’s landing gear to a child’s toy. Multibody Systems Approach to Vehicle Dynamics aims to bridge a gap between the subject of classical vehicle dynamics and the general-purpose computer-based discipline known as multibody systems analysis (MBS). The book begins by describing the emergence of MBS and providing an overview of its role in vehicle design and development. This is followed by separate chapters on the modeling, analysis, and post-processing capabilities of a typical simulation software; the modeling and analysis of the suspension system; tire force and moment generating characteristics and subsequent modeling of these in an MBS simulation; and the modeling and assembly of the rest of the vehicle, including the anti-roll bars and steering systems. The final two chapters deal with the simulation output and interpretation of results, and a review of the use of active systems to modify the dynamics in modern passenger cars. This book intended for a wide audience including not only undergraduate, postgraduate and research students working in this area, but also practicing engineers in industry who require a reference text dealing with the major relevant areas within the discipline. * Full of practical examples and applications * Uses industry standard ADAMS software based applications * Accompanied by downloadable ADAMS models and data sets available from the companion website that enable readers to explore the material in the book * Guides readers from modelling suspension movement through to full vehicle models able to perform handling manoeuvres The volume contains 19 contributions by international experts in the field of multibody system dynamics, robotics and control. The book aims to bridge the gap between the modeling of mechanical systems by means of multibody dynamics formulations and robotics. In the classical approach, a multibody dynamics model contains a very high level of detail, however, the application of such models to robotics or control is usually limited. The papers aim to connect the different scientific communities in multibody dynamics, robotics and control. Main topics are flexible multibody systems, humanoid robots, elastic robots, nonlinear control, optimal path planning, and identification. Gives readers a more thorough understanding of DEM and equips researchers for independent work and an ability to judge methods related to simulation of polygonal particles. Introduces DEM from the fundamental concepts (theoretical mechanics and solidstate physics), with 2D and 3D simulation methods for polygonal particles. Provides the fundamentals of coding discrete element method (DEM) requiring little advance knowledge of granular matter or numerical simulation. Highlights the numerical tricks and pitfalls that are usually only realized after years of experience, with relevant simple experiments as applications. Presents a logical approach starting with the mechanical and physical bases, followed by a description of the techniques and finally their applications. Written by a key author presenting ideas on how to model the dynamics of angular particles using polygons and polyhedral Accompanying website includes MATLAB-Programs providing the simulation code for two-dimensional polygons. Recommended for researchers and graduate students who deal with particle models in areas such as fluid dynamics, multi-body engineering, finite-element methods, the geosciences, and multi-scale physics. Robotics is the ultimate interdisciplinary field, and Ubiquitous Robots invites contributions from the entire foundational spectrum design, perception, manipulation, interfaces, mobility, intelligence and application domains industrial, social, transportation, medical, rehabilitation, healthcare, agriculture, construction, security, disaster, and many others. Multibody systems are the appropriate models for predicting and evaluating performance of a variety of dynamical systems such as spacecraft, vehicles, mechanisms, robots or biomechanical systems. This book addresses the general problem of analyzing the behavior of such multibody systems by digital simulation. This implies that pre-computer analytical methods for deriving the system equations must be replaced by systematic computer oriented formalisms, which can be translated
Dynamics of multibody systems is of great importance in the fields of robotics, biomechanics, spacecraft control, road and rail vehicle design, and dynamics of machinery. Many research problems have been solved and a considerable number of computer codes based on multibody formalisms is now available. With the present book it is intended to collect software systems for multibody system dynamics which are well established and have found acceptance in the users community. The Handbook will aid the reader in selecting the software system which is most appropriate to his needs. Altogether 17 research groups contributed to the Handbook. A compact summary of important capabilities of these software systems is presented in tabular form. All authors dealt with two typical test examples, a planar mechanism and a spatial robot. Thus, it is very easy to compare the results and to identify more clearly the advantages of one or the other formalism.

"Models based on bodies that interact with each other are also known as multibody systems. Such models are proven to be very useful for representing the motion of many different kinds of systems, from industrial machinery to the human body. In many cases, rigid bodies can be employed if their deformation is negligible compared to their displacement, which significantly reduces the complexity of the model. Moreover, numerical simulations of multibody systems can be very efficient, and be used for real-time interactive applications in engineering and computer animation. The focus of this thesis is on the modelling and simulation of multibody systems, with special emphasis to unilateral contact and friction between the bodies. The inherent non-smooth nature of contact is approached using the concept of unilateral constraints, which leads the system dynamics to formulate linear complementarity problems. However, these formulations can present inconsistencies when Coulomb friction is used to model contact, which can compromise the solvability of the dynamic equations and the numerical simulation as well. Here, the contact problem is analyzed using a novel representation of the generalized friction cone that is able to capture different phenomena, such as the Painlevé paradox. The framework of this work largely relies on formulations at the impulse-momentum level of multibody system dynamics. Implicit integration schemes make the numerical simulation of such systems stable, as well as robust. Additionally, constraint regularization also helps the model to cope with redundancies of the contact forces. A new regularized friction model based on the bristle approach is presented, which models the flexibility of the system at the contact interface, and is able to capture the static behavior of friction, or sticking. Moreover, other techniques that facilitate the simulation of large scale systems are also proposed herein. Substructuring of multibody systems groups the bodies into subsystems, which allows the system dynamics to be solved in different processing units (CPUs), and reduces the computational time by performing the operations in parallel. This is achieved by means of formulating the effective mass of the system at the coupling interfaces, which can also be used to couple the simulation to other systems of different nature and time-scale, such as hydraulic systems. Interestingly, co-simulation of such multi-physics systems is currently in the spotlight of many engineering applications ranging from virtual prototyping to simulation with hardware in the loop."

Mechanical engineering, an engineering discipline born of the needs of the industrial revolution, is once again asked to do its substantial share in the call for industrial renewal. The general call is urgent as we face profound issues of productivity and competitiveness that require engineering solutions, among others. The Mechanical Engineering Series features graduate texts and research monographs intended to address the need for information in contemporary areas of mechanical engineering. The series is conceived as a comprehensive one that will cover a broad range of concentrations important to mechanical engineering graduate education and research. We are fortunate to have a distinguished roster of consulting editors, each an expert in one of the areas of concentration. The names of the consulting editors are listed on the front page of the volume. The areas of concentration are applied mechanics, biomechanics, computational mechanics, dynamic systems and control, energetics, mechanics of material, processing, thermal science, and tribology. Professor Leckie, the consulting editor for applied mechanics, and I are pleased to present this volume of the series: Kinematic and Dynamic Simulation of Multibody Systems: The Real-Time Challenge by Professors García de Jalón and Bayo. The selection of this volume underscores again the interest of the Mechanical Engineering Series to provide our readers with topical monographs as well as graduate texts. Austin Texas Frederick F. Ling v The first author dedicates this book to the memory of Prof F. Tegerizo (1988), who introduced him to kinematics.

This textbook — a result of the author’s many years of research and teaching — brings together diverse concepts of the versatile tool of multibody dynamics, combining the efforts of many researchers in the field of mechanics.

This book is intended to familiarize you with the basics of theory and practice in Adams Multibody Dynamics (MBD) modeling. The content has been developed to be beneficial to readers who are students or practicing engineers who are either completely new to MBD modeling or have some experience with MBD modeling. The author's lengthy experience...
using the Adams software adds a practical and, occasionally, humorous complement to standard documentation and training materials, intended to benefit you while learning Adams. The book features relatively small examples which you can readily build and execute. This book contains an introduction to Adams theory which provides the basics on how Adams models are formulated and then numerically solved. Finally, this book concludes with some success stories taken from industry.

Modern Flexible Multi-Body Dynamics Modeling Methodology for Flapping Wing Vehicles presents research on the implementation of a flexible multi-body dynamic representation of a flapping wing ornithopter that considers aerelasticity. This effort brings advances in the understanding of flapping wing flight physics and dynamics that ultimately leads to an improvement in the performance of such flight vehicles, thus reaching their high performance potential. In using this model, it is necessary to reduce body accelerations and forces of an ornithopter vehicle, as well as to improve the aerodynamic performance and enhance flight kinematics and forces which are the design optimization objectives. This book is a useful reference for postgraduates in mechanical engineering and related areas, as well as researchers in the field of multibody dynamics. Uses Lagrange equations of motion in terms of a generalized coordinate vector of the rigid and flexible bodies in order to model the flexible multi-body system. Provides flight verification data and flight physics of highly flexible ornithopter vehicles. Includes an online companion site with files/codes used in application examples.

The important interaction between modeling and solution techniques is demonstrated by using a simplified multibody model of a truck throughout the book to illustrate all key concepts.

This text deals with the simulation of the tyre/suspension dynamics by using recurrent dynamic neural networks. Recurrent neural networks are based on the multilayer feedforward neural networks, by adding feedback connections between output and input layers. The neural network can be trained with data obtained from the simulation of a physical model created using a multi-body simulation software (SIMPACK). The results obtained from the neural network demonstrate a good agreement that could be improved, depending on some factors, with the multi-body model simulation results. The neural network model can be applied as a part of vehicle system model to predict system dynamic behaviour. Although the neural network model does not provide a good insight of the physical behaviour of the system, it is a useful tool to help in vehicle ride dynamics performance due to its good efficiency and accuracy in computational terms.

This book introduces the techniques needed to produce realistic simulations and animations of particle and rigid body systems. It focuses on both the theoretical and practical aspects of developing and implementing physically based dynamic simulation engines that can be used to generate convincing animations of physical events involving particles and rigid bodies. It can also be used to produce accurate simulations of mechanical systems, such as a robotic parts feeder. The book is intended for researchers in computer graphics, computer animation, computer-aided mechanical design and modeling software developers.

Dynamics and Simulation of Flexible Rockets provides a full state, multiaxis treatment of launch vehicle flight mechanics and provides the state equations in a format that can be readily coded into a simulation environment. Various forms of the mass matrix for the vehicle dynamics are presented. The book also discusses important forms of coupling, such as between the nozzle motions and the flexible body. This book is designed to help practicing aerospace engineers create simulations that can accurately verify that a space launch vehicle will successfully perform its mission. Much of the open literature on rocket dynamics is based on analysis techniques developed during the Apollo program of the 1960s. Since that time, large-scale computational analysis techniques and improved methods for generating Finite Element Models (FEMs) have been developed. The art of the problem is to combine the FEM with dynamic models of separate elements such as sloshing fuel and moveable engine nozzles. The pitfalls that may occur when making this marriage are examined in detail. Covers everything the dynamics and control engineer needs to analyze or improve the design of flexible launch vehicles. Provides derivations using Lagrange's equation and Newton/Euler approaches, allowing the reader to assess the importance of nonlinear terms. Details the development of linear models and introduces frequency-domain stability analysis techniques. Presents practical methods for transitioning between finite element models, incorporating actuator dynamics, and developing a preliminary flight control design.

Anyone who wants to simulate the behavior of vehicles must think about how they want to model the vehicle’s chassis. Depending on the question (vehicle dynamics, ride comfort, load data prediction) there are a variety of possibilities. This book should help to find and implement the right models and processes. In addition to a short introduction to simulation technology, the most important types of modelling for the assemblies of the chassis using the method of multi-body systems are presented. However, successful simulation does not only mean the assembly of suitable models, but always represents a well thought-out process that goes from data acquisition to the validation of the models. This will be discussed using
suitable examples for concrete questions. This book is a translation of the original German edition "Simulation in der Fahrwerktechnik" by "Dirk Adamski", published by Springer Fachmedien Wiesbaden in 2014. The translation was done with the help of artificial intelligence (machine translation by the service DeepL.com). A subsequent human revision was done primarily in terms of content, so that the book will read stylistically different from a conventional translation. Springer Nature works continuously to further the development of tools for the production of books and on the related technologies to support the authors. The Content Introduction to Simulation: Simulation Methods - Systems Engineering - Modeling - Numerical Analysis - Simulation Process - Simulation in Chassis Technology: Modeling of Chassis Components - Kinematics and Compliance - Springs - Damping and Friction - Steering - Tires and Roads - Drive Train - Brake System - Vehicle Body - The Simulated Driver - The Vehicle Model as a Controlled System The Target Groups Beginners, but also experienced vehicle simulation engineers who need to use or extend an existing or newly acquired simulation environment. Decision makers who need to set up a simulation process or purchase a simulation environment or want to understand what their calculators are doing. About the Author Prof. Dr.-Ing. Dirk Adamski worked in the passenger car development department of Daimler AG as a test and computational engineer. Since 2009, he has been Professor for Testing and Simulation in Chassis at the University of Applied Sciences in Hamburg.

Multibody Dynamics is an area of Computational Mechanics which blends together various disciplines such as structural dynamics, multi-physics - channics, computational mathematics, control theory and computer science, in order to deliver methods and tools for the virtual prototyping of complex mechanical systems. Multibody dynamics plays today a central role in the modeling, analysis, simulation and optimization of mechanical systems in a variety of fields and for a wide range of industrial applications. The ECCOMAS Thematic Conference on Multibody Dynamics was initiated in Lisbon in 2003, and then continued in Madrid in 2005 with the goal of providing researchers in Multibody Dynamics with appropriate venues for exchanging ideas and results. The third edition of the Conference was held at the Politecnico di Milano, Milano, Italy, from June 25 to June 28, 2007. The Conference saw the participation of over 250 researchers from 32 different countries, presenting 209 technical papers, and proved to be an excellent forum for discussion and technical exchange on the most recent advances in this rapidly growing field.

Underactuated multibody systems are intriguing mechatronic systems, as they possess fewer control inputs than degrees of freedom. Some examples are modern light-weight flexible robots and articulated manipulators with passive joints. This book investigates such underactuated multibody systems from an integrated perspective. This includes all major steps from the modeling of rigid and flexible multibody systems, through nonlinear control theory, to optimal system design. The underlying theories and techniques from these different fields are presented using a self-contained and unified approach and notation system. Subsequently, the book focuses on applications to large multibody systems with multiple degrees of freedom, which require a combination of symbolic and numerical procedures. Finally, an integrated, optimization-based design procedure is proposed, whereby both structural and control design are considered concurrently. Each chapter is supplemented by illustrated examples.

The German Research Council (DFG) decided 1987 to establish a nationwide five year research project devoted to dynamics of multibody systems. In this project universities and research centers cooperated with the goal to develop a general purpose multibody system software package. This concept provides the opportunity to use a modular structure of the software, i.e. different multibody formalisms may be combined with different simulation programmes via standardized interfaces. For the DFG project the database RSYST was chosen using standard FORTRAN 77 and an object oriented multibody system datamodel was defined. The project included research on the fundamentals of the method of multibody systems, concepts for new formalisms of dynamical analysis, development of efficient numerical algorithms and realization of a powerful software package of multibody systems. These goals required an interdisciplinary cooperation between mathematics, computer science, mechanics, and control theory. After a rigorous reviewing process the following research institutions participated in the project (under the responsibility of leading scientists): Technical University of Aachen (Prof. G. Sedlacek) Technical University of Darmstadt (Prof. P. Hagedorn) University of Duisburg M. Hillel (Prof).

This volume, which brings together research presented at the IUTAM Symposium Intelligent Multibody Systems – Dynamics, Control, Simulation, held at Sozopol, Bulgaria, September 11-15, 2017, focuses on preliminary virtual simulation of the dynamics of motion, and analysis of loading of the devices and of their behaviour caused by the working conditions and natural phenomena. This requires up-to-date methods for dynamics analysis and simulation, novel methods for numerical solution of ODE and DAE, real-time simulation, passive, semi-passive and active control algorithms. Applied examples in mechatronic (intelligent) multibody systems, autonomous vehicles, space structures, structures exposed to external and seismic excitations, large flexible structures and wind generators, robots and bio-robots. The book covers the following subjects: - Novel methods in multibody system dynamics; - Real-time dynamics; - Dynamic models of passive and active mechatronic devices; - Vehicle dynamics and control; - Structural dynamics; - Deflection and vibration suppression;
- Numerical integration of ODE and DAE for large scale and stiff multibody systems; - Model reduction of large-scale flexible systems. The book will be of interest for scientists and academicians, PhD students and engineers at universities and scientific institutes.

The authors examine in detail the fundamentals and mathematical descriptions of the dynamics of automobiles. In this context, different levels of complexity are presented, starting with basic single-track models up to complex three-dimensional multi-body models. A particular focus is on the process of establishing mathematical models based on real cars and the validation of simulation results. The methods presented are explained in detail by means of selected application scenarios. In addition to some corrections, further application examples for standard driving maneuvers have been added for the present second edition. To take account of the increased use of driving simulators, both in research, and in industrial applications, a new section on the conception, implementation and application of driving simulators has been added.