Motor Vehicle Dynamics

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Modeling and Dynamics Control for Distributed Drive Electric Vehicles
Springer Science & Business Media
This book deals with the analysis of off-road vehicle dynamics from kinetics and kinematics perspectives and the performance of vehicle traversing over rough and irregular terrain. The authors consider the wheel performance, soil-tire interactions and their interface, tractive performance of the vehicle, ride comfort, stability over maneuvering, transient and steady state conditions of the vehicle traversing, modeling the aforementioned aspects and optimization from energetic and vehicle mobility perspectives. This book brings novel figures for the transient dynamics and original wheel terrain dynamics at on-the-go condition.
Fundamentals of Vehicle Dynamics
Butterworth-Heinemann
Essentials of Vehicle Dynamics explains the essential mathematical basis of vehicle dynamics in a concise and clear way, providing engineers and students with the qualitative understanding of vehicle handling performance needed to underpin chassis-related research and development.Without a sound understanding of the mathematical tools and principles underlying the complex models in vehicle dynamics, engineers can end up with errors in their analyses and assumptions, leading to costly mistakes in design and virtual prototyping activities. Author Joop P. Pauwelussen looks to rectify this by drawing on his 15 years' experience of helping students and professionals understand the vehicle as a dynamic system. He begins as simply as possible before moving on to tackle models of increasing complexity, emphasizing the critical role played by tire-road contact and the different analysis tools required to consider non-linear dynamical systems.Providing a basic mathematical background that is ideal for students or those with practical experience who are struggling with the theory, Essentials of Vehicle Dynamics is also intended to help engineers from different disciplines, such as control and electronic engineering, move into the automotive sector or undertake multi-disciplinary vehicle dynamics work. - Focuses on the underlying mathematical fundamentals of vehicle dynamics, equipping engineers and students to grasp and apply more complex concepts with ease. - Written to help engineers avoid the costly errors in design and simulation brought about by incomplete understanding of modeling tools and approaches. - Includes exercises to help readers test their qualitative understanding and explain results in physical and vehicle dynamics terms.
Road and Off-Road Vehicle Dynamics
World Scientific
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.

Dynamics of Vehicle-Road Coupled System John Wiley & Sons

This book presents essential knowledge of car vehicle dynamics and control theory with NI LabVIEW software product application, resulting in a practical yet highly technical guide for designing advanced vehicle dynamics and vehicle system controllers. Presenting a clear overview of fundamental vehicle dynamics and vehicle system mathematical models, the book covers linear and non-linear design of model based controls such as wheel slip control, vehicle speed control, path following control, vehicle stability and rollover control, stabilization of vehicle-trailer system. Specific applications to autonomous vehicles are described among the methods. It details the practical applications of Kalman-Bucy filtering and the observer design for sensor signal estimation, alongside lateral vehicle dynamics and vehicle rollover dynamics. The book also discusses high level controllers, alongside a clear explanation of basic control principles for regenerative braking in both electric and hybrid vehicles, and wheel torque vectoring systems. Concrete LabVIEW simulation examples of how the models and controls are used in representative applications, along with software algorithms and LabVIEW block diagrams are illustrated. It will be of interest to engineering students, automotive engineering students and automotive engineers and researchers.

Motor Vehicle Dynamics: Modelling And Simulation CRC Press

Growing worldwide populations increasingly require faster, safer, and more efficient transportation systems. These needs have led to a renewed interest in high-speed guided ground transportation technology, inspired considerable research, and instigated the development of better analytical and experimental tools. A very significant body of knowledge currently exists, but has primarily remained scattered throughout the literature. Vehicle Dynamics consolidates information from a wide spectrum of sources in the area of guided ground transportation. Each chapter provides a concise, thorough statement of the fundamental theory, followed by illustrative worked examples and exercises. The author also includes a variety of unsolved problems designed to amplify and extend the theory and provide problem-solving experience. The subject of guided ground transportation is vast, but this book brings together the core topics, providing in-depth treatments of topics ranging from system classification, analysis, and response to lading dynamics and rail, air cushion, and maglev systems. In doing so, Vehicle Dynamics offers a singular opportunity for readers to build the solid background needed for solving practical vehicle dynamics problems or pursuing more advanced or specialized studies.

Theory of Ground Vehicles Springer Nature

The book provides the essential features necessary to understand and apply the mathematical-mechanical characteristics and tools for vehicle dynamics including control mechanism. An introduction to passenger car modeling of different complexities provides the basics for the dynamical behavior and presents vehicle

models later used for the application of control strategies. The presented modeling of the tire behavior, also for transient changes of the contact patch properties, shows the necessary mathematical descriptions used for the simulation of the vehicle dynamics. The introduction to control for cars and its extension to complex applications using e.g. observers and state estimators is a main part of the book. Finally the formulation of proper multibody codes for the simulation leads to the integration of all parts. Examples of simulations and corresponding test verifications show the profit of such a theoretical support for the investigation of the dynamics of passenger cars.
Motor Vehicle Dynamics CRC Press
The book starts with an historical overview of road vehicles. The first part deals with the forces exchanged between the vehicle and the road and the vehicle and the air with the aim of supplying the physical facts and the relevant mathematical models about the forces which dominate the dynamics of the vehicle.The second part deals with the dynamic behaviour of the vehicle in normal driving conditions with some extensions towards conditions encountered in high-speed racing driving.
Off-road Vehicle Dynamics Elsevier
Vehicle Dynamics and Control provides a comprehensive coverage of vehicle control systems and the dynamic models used in the development of these control systems. The control system applications covered in the book include cruise control, adaptive cruise control, ABS, automated lane keeping, automated highway systems, yaw stability control, engine control, passive, active and semi-active suspensions, tire-road friction coefficient estimation, rollover prevention, and hybrid electric vehicles. In developing the dynamic model for each application, an effort is made to both keep the model simple enough for control system design but at the same time rich enough to capture the essential features of the dynamics. A special effort has been made to explain the several different tire models commonly used in literature and to interpret them physically. In the second edition of the book, chapters on roll dynamics, rollover prevention and hybrid electric vehicles have been added, and the chapter on electronic stability control has been enhanced. The use of feedback control systems on automobiles is growing rapidly. This book is intended to serve as a useful resource to researchers who work on the development of such control systems, both in the automotive industry and at universities. The book can also serve as a textbook for a graduate level course on Vehicle Dynamics and Control.
Vehicle Dynamics Society of Automotive Engineers
Road Vehicle Dynamics supplies students and technicians working in industry with both the theoretical background of mechanical and automotive engineering, and the know-how needed to perform numerical simulations. Bringing together the foundations of the discipline and its recent developments in a single text, the book is structured in three parts: it begins with a historical overview of road vehicles; then deals with the forces exchanged between the vehicle and the road, and the vehicle and the air; and finally, deals with the dynamic behavior of the vehicle in normal driving conditions with some extensions towards conditions encountered in high-speed racing. Coverage of contemporary automatic controls is included in this

edition.

Control Applications of Vehicle Dynamics Butterworth-Heinemann

An introduction to vehicle dynamics and the fundamentals of mathematical modeling Fundamentals of Vehicle Dynamics and Modeling is a student-focused textbook providing an introduction to vehicle dynamics, and covers the fundamentals of vehicle model development. It illustrates the process for construction of a mathematical model through the application of the equations of motion. The text describes techniques for solution of the model, and demonstrates how to conduct an analysis and interpret the results. A significant portion of the book is devoted to the classical linear dynamic models, and provides a foundation for understanding and predicting vehicle behaviour as a consequence of the design parameters. Modeling the pneumatic tire is also covered, along with methods for solving the suspension kinematics problem, and prediction of acceleration and braking performance. The book introduces the concept of multibody dynamics as applied to vehicles and provides insight into how large and high fidelity models can be constructed. It includes the development of a method suitable for computer implementation, which can automatically generate and solve the linear equations of motion for large complex models. Key features: ● Accompanied by a website hosting MATLAB® code. ● Supported by the Global Education Delivery channels. Fundamentals of Vehicle Dynamics and Modeling is an ideal textbook for senior undergraduate and graduate courses on vehicle dynamics.

The Multibody Systems Approach to Vehicle Dynamics Taylor & Francis

This book provides a detailed and well-rounded overview of the dynamics of road vehicle systems. Readers will come to understand how physical laws, human factor considerations, and design choices come together to affect a vehicle's ride, handling, braking, and acceleration. Following an introduction and general review of dynamics, topics include: analysis of dynamic systems; tire dynamics; ride dynamics; vehicle rollover analysis; handling dynamics; braking; acceleration; and total vehicle dynamics.

The Dynamics of Vehicles on Roads and on Tracks CRC Press

This textbook is appropriate for senior undergraduate and first year graduate students in mechanical and automotive engineering. The contents in this book are presented at a theoretical-practical level. It explains vehicle dynamics concepts in detail, concentrating on their practical use. Related theorems and formal proofs are provided, as are real-life applications. Students, researchers and practicing engineers alike will appreciate the user-friendly presentation of a wealth of topics, most notably steering, handling, ride, and related components. This book also: Illustrates all key concepts with examples Includes exercises for each chapter Covers front, rear, and four wheel steering systems, as well as the advantages and disadvantages of different steering schemes Includes an emphasis on design throughout the text, which provides a practical, hands-on approach

Vehicle Handling Dynamics World Scientific

A world-recognized expert in the science of vehicle dynamics, Dr. Thomas Gillespie has created an ideal reference book that has been used by engineers for 30 years, ranging from an

introduction to the subject at the university level to a common sight on the desks of engineers throughout the world. As with the original printing, Fundamentals of Vehicle Dynamics, Revised Edition, strives to find a middle ground by balancing the need to provide detailed conceptual explanations of the engineering principles involved in the dynamics of ground vehicles with equations and example problems that clearly and concisely demonstrate how to apply such principles. A study of this book will ensure that the reader comes away with a solid foundation and is prepared to discuss the subject in detail. Ideal as much for a first course in vehicle dynamics as it is a professional reference, Fundamentals of Vehicle Dynamics, Revised Edition, maintains the tradition of the original by being easy to read and while receiving updates throughout in the form of modernized graphics and improved readability. Inasmuch as the first edition proved to be so popular, the Revised Edition intends to carry on that tradition for a new generation of engineers.

Vehicle Dynamics, Stability, and Control Stanford University
Comprehensively covers the fundamentals of vehicle dynamics with application to automotive mechatronics Presents a number of different design, analysis and implementation considerations related to automobiles, including power requirements, converters, performance, fuel consumption and vehicle dynamic models Covers the dynamics, modeling and control of not only the entire vehicle system, but also of key elements of the vehicle such as transmissions, and hybrid systems integration Includes exercise problems and MATLAB® codes Accompanied by a website hosting animations

Advanced Vehicle Dynamics Springer
Proceedings of the 12th International Association for Vehicle System Dynamics (IAVSD) Symposium held in Lyon, France, Aug. 1991 (and a supplement to Vehicle system dynamics; v.20 . The main theme is the application of math modeling to the problems of road and rail vehicle dynamics. Many papers deal

Applications of Model Predictive Control to Vehicle Dynamics for Active Safety and Stability Springer
Vehicle dynamics are vital for optimizing a vehicle's drivability, efficiency, and safety. Understanding the forces and motions on a vehicle (both theoretical aspects, like basic equations of motion, and practical ones, like tire mechanics and human vehicle control) is integral in the design and development of all vehicles. Masato Abe's Vehicle Handling Dynamics, Second Edition, provides comprehensive coverage of vehicle dynamics, enabling readers to visualize and invent better vehicles. Vehicle Handling Dynamics begins with an overview of the fundamental theories of vehicle handling dynamics, based on simple equations of motion. The book then extends to driver-vehicle behavior, handling quality and active vehicle motion control. In addition, this new edition includes two new chapters. Chapter 9 covers vehicle motion control for electric vehicles, crucial in this new era of automobiles. Chapter 12 studies the classic issue of model-based handling quality evaluations (challenging the traditional dependencies on test drivers for determining a vehicle's drivability). Written by one of the most distinguished authorities in the area, Vehicle Handling Dynamics, Second Edition, lends equal and careful consideration to both theory and

application, providing valuable insights for students of and engineers working in vehicle dynamics and control. - Discusses the fundamentals of vehicle dynamics from basic theory to hands-on applications, using Newton's equations of motion to show the link between mechanics and vehicle behavior - Provides practical examples and real-life details to ensure thorough understanding of vehicle handling dynamics and control - Includes case studies and worked examples using MATLAB® and Simulink® - Covers all variables of vehicle dynamics, including tire and vehicle motion, control aspects, human control, and external disturbances

Solution's Manual - Road Vehicle Dynamics Springer

Due to the improvements on electric motors and motor control technology, alternative vehicle power system layouts have been considered. One of the latest is known as distributed drive electric vehicles (DDEVs), which consist of four motors that are integrated into each drive and can be independently controllable. Such an innovative design provides packaging advantages, including short transmission chain, fast and accurate torque response, and so on. Based on these advantages and features, this book takes stability and energy-saving as cut-in points, and conducts investigations from the aspects of Vehicle State Estimation, Direct Yaw Moment Control (DYC), Control Allocation (CA). Moreover, lots of advanced algorithms, such as general regression neural network, adaptive sliding mode control-based optimization, as well as genetic algorithms, are applied for a better control performance.

Road Vehicle Dynamics: Fundamentals Of Modeling And Simulation John Wiley & Sons

This reference offers a systematic approach to the dynamics and stability of vehicles such as cars, bicycles, trailers, motorcycles, and trains and shows how mathematical models of varying degrees of complexity can be used to suggest design guidelines for assurance of vehicle stability. Based on more than 30 years of teaching experience from a reno

Vehicle Stability Springer

The International Symposium on Dynamics of Vehicles on Roads and Tracks is the leading international gathering of scientists and engineers from academia and industry in the field of ground vehicle dynamics to present and exchange their latest innovations and breakthroughs. Established in Vienna in 1977, the International Association of Vehicle System Dynamics (IAVSD) has since held its biennial symposia throughout Europe and in the USA, Canada, Japan, South Africa and China. The main objectives of IAVSD are to promote the development of the science of vehicle dynamics and to encourage engineering applications of this field of science, to inform scientists and engineers on the current state-of-the-art in the field of vehicle dynamics and to broaden contacts among persons and organisations of the various countries engaged in scientific research and development in the field of vehicle dynamics and related areas. IAVSD 2017, the 25th Symposium of the International Association of Vehicle System Dynamics was hosted by the Centre for Railway Engineering at Central Queensland University, Rockhampton, Australia in August 2017. The symposium focused on the following topics related to road and rail vehicles and trains: dynamics and stability;

vibration and comfort; suspension; steering; traction and braking; active safety systems; advanced driver assistance systems; autonomous road and rail vehicles; adhesion and friction; wheel-rail contact; tyre-road interaction; aerodynamics and crosswind; pantograph-catenary dynamics; modelling and simulation; driver-vehicle interaction; field and laboratory testing; vehicle control and mechatronics; performance and optimization; instrumentation and condition monitoring; and environmental considerations. Providing a comprehensive review of the latest innovative developments and practical applications in road and rail vehicle dynamics, the 213 papers now published in these proceedings will contribute greatly to a better understanding of related problems and will serve as a reference for researchers and engineers active in this specialised field. Volume 2 contains 135 papers under the subject heading Rail.

Road Vehicle Dynamics World Scientific Vehicle dynamics and road dynamics are usually considered to be two largely independent subjects. In vehicle dynamics, road surface roughness is generally regarded as random excitation of the vehicle, while in road dynamics, the vehicle is generally regarded as a moving load acting on the pavement. This book suggests a new research concept to integrate the vehicle and the road system with the help of a tire model, and establishes a cross-subject research framework dubbed vehicle-pavement coupled system dynamics. In this context, the dynamics of the vehicle, road and the vehicle-road coupled system are investigated by means of theoretical analysis, numerical simulations and field tests. This book will be a valuable resource for university professors, graduate students and engineers majoring in automotive design, mechanical engineering, highway engineering and other related areas. Shaopu Yang is a professor and deputy president of Shijiazhuang Tiedao University, China; Liqun Chen is a professor at Shanghai University, Shanghai, China; Shaohua Li is a professor at Shijiazhuang Tiedao University, China.