

THEORY OF **Ground Vehicles**

Third Edition



J. Y. Wong

Theory Ground Vehicles J Wong

Jingsheng Yu, Vladimir Vantsevich



Theory Ground Vehicles J Wong:

Theory of Ground Vehicles J. Y. Wong, 2008-08-04 Technology Engineering Automotive Engineering for advancing ground vehicle mobility A standard text and reference for both the educational and professional communities Theory of Ground Vehicles gives aspiring and practicing engineers a fundamental understanding of the critical factors affecting the performance handling and ride essential to the development and design of ground vehicles In view of the growing concerns over environmental impact energy efficiency and safety this new Fourth Edition has been revised and expanded to address these issues and other developments in the field Retaining the contents and format of previous editions the Fourth Edition introduces new material to reflect recent advances in ground transportation technology including Computer aided methods for design and performance evaluation of off road vehicles and their practical applications Emissions and fuel economy Hybrid electric drives and fuel cells and their operating principles Selection of vehicle configurations for off road operations Road vehicle stability control ISO 2631 1 1997 and its applications to evaluating vehicle ride characteristics As in previous editions this book focuses on applying engineering principles to the analysis of vehicle behavior A large number of practical examples and problems are included throughout to help readers bridge the gap between theory and practice With its broad coverage and pedagogical aids Theory of Ground Vehicles Fourth Edition remains the text of choice for students engineers and researchers wishing to master and apply basic theory to solve real world road and off road vehicle mobility problems

Theory of Ground Vehicles J. Y. Wong, 2001-03-20 An updated edition of the classic reference on the dynamics of road and off road vehicles As we enter a new millennium the vehicle industry faces greater challenges than ever before as it strives to meet the increasing demand for safer environmentally friendlier more energy efficient and lower emissions products Theory of Ground Vehicles Third Edition gives aspiring and practicing engineers a fundamental understanding of the critical factors affecting the performance handling and ride essential to the development and design of ground vehicles that meet these requirements As in previous editions this book focuses on applying engineering principles to the analysis of vehicle behavior A large number of practical examples and problems are included throughout to help readers bridge the gap between theory and practice Covering a wide range of topics concerning the dynamics of road and off road vehicles this Third Edition is filled with up to date information including The Magic Formula for characterizing pneumatic tire behavior from test data for vehicle handling simulations Computer aided methods for performance and design evaluation of off road vehicles based on the author s own research Updated data on road vehicle transmissions and operating fuel economy Fundamentals of road vehicle stability control Optimization of the performance of four wheel drive off road vehicles and experimental substantiation based on the author s own investigations A new theory on skid steering of tracked vehicles developed by the author Advances in Dynamics of Vehicles on Roads and Tracks III Wei Huang, Mehdi

Ahmadian, 2024-10-12 This book offers a timely snapshot of research and development in road vehicle dynamics Gathering a

set of peer reviewed contributions to the 28th Symposium of the International Association of Vehicle System Dynamics IAVSD which was held on August 21 25 2023 in Ottawa Canada this second volume of the proceedings covers a broad range of topics related to on and off road vehicles Topics covered include modelling and simulation design control performance monitoring and autonomous driving The papers in this volume also discuss strategies to improve safety performance and ride comfort among others Overall this book provides academics and professionals with a timely reference on state of the art theories and methods that can be used to understand analyze and improve on and off road vehicle safety and performance in a wide range of operating conditions

Theory of Ground Vehicles J. Y. Wong, 2022-07-13

THEORY OF GROUND VEHICLES

A leading and authoritative text for advancing ground vehicle mobility Theory of Ground Vehicles Fifth Edition presents updated and expanded coverage of the critical factors affecting the performance handling and ride essential to the development and design of road and off road vehicles Replacing internal combustion engines with zero emission powerplants in ground vehicles to eliminate greenhouse gas emissions for curbing climate change has received worldwide attention by both the vehicle industry and governmental agencies To enhance safety traffic flow and operating efficiency of road transport automated driving systems have been under active development With growing interest in the exploration of the Moon Mars and beyond research in terramechanics for guiding the development of extraterrestrial rovers has been intensified In this new edition these and other topics of interest in the field of ground vehicle technology are explored and technical data are updated New features of this edition include Expanded coverage of the fundamentals of electric drives hybrid electric drives and fuel cell technology Introduction to the classification and operating principles of the automated driving system and cooperative driving automation Applications of terramechanics to guiding the development of extraterrestrial rovers Elaboration on the approach to achieving the optimal operating efficiency of all wheel drive off road vehicles Introduction to updated ISO Standards for evaluating vehicle ride An updated and comprehensive text and reference for both the educational and professional communities Theory of Ground Vehicles Fifth Edition will prove invaluable to aspiring and practicing engineers seeking to solve real world road and off road vehicle mobility problems

Driveline Systems of Ground Vehicles Alexandr F. Andreev, Viachaslau Kabanau, Vladimir Vantsevich, 2010-09-07

With this book Prof Dr Vantsevich brings a tremendous contribution to the field of Automotive Transmission and Driveline Engineering including his innovative methods for optimum driveline synthesis as well as his experience with the development of various hardware solutions from the basic limited slip differentials to the most sophisticated mechatronic systems Dr Ing Mircea Gradu Director Transmission and Driveline Engineering Head Virtual Analysis Tools Chrysler Group LLC Now that vehicles with four and more driving wheels are firmly ensconced in the consumer market they must provide energy fuel saving benefits and improved operational quality including terrain mobility traction and velocity properties turnability and stability of motion A first of its kind resource Driveline Systems of Ground Vehicles Theory and Design presents a comprehensive and analytical treatment of driveline

research design and tests based on energy efficiency vehicle dynamics and operational properties requirements This volume addresses fundamental engineering problems including how to investigate the effect of different driveline systems on the properties of vehicles and how to determine the optimal characteristics of the driveline system and its power dividing units PDUs and design it for a specific vehicle to ensure high level of vehicle dynamics energy efficiency and performance The authors develop an analytical apparatus for math modeling of driveline systems that can be compiled from different types of PDUs They also introduce methodologies for the synthesis of optimal characteristics of PDUs for different types of vehicles Structured to be useful to engineers of all levels of experience university professors and graduate students the book is based on the R D projects conducted by the authors It explores intriguing engineering dilemmas such as how to achieve higher energy and fuel efficiency by driving either all the wheels or not all the wheels solve oversteering issues by managing wheel power distribution and many other technical problems

A Solar Car Primer Eric F. Thacher, 2003 In the quixotic quest to reduce air pollution and fuel cars with alternative sources instead of gas solar powered cars have emerged as one option Although disagreements abound about the feasibility and practicality of these vehicles this book presents the basics behind the idea of solar cars From the construction of the engine to raising funds the book is a valuable introduction to the present and future of the emission free automobile

Management Information And Optoelectronic Engineering - Proceedings Of The 2016 International Conference Yongsheng Gao, 2017-03-14 This proceedings brings together 59 selected articles presented at the joint conferences of the International Conference on Management Information and Communication ICMIC2016 and the International Conference on Optics and Electronics Engineering ICOEE2016 which were held in Guilin China during May 28 29 2016 ICMIC2016 and ICOEE2016 provide a platform for researchers engineers academicians as well as industrial professionals from all over the world to present their latest findings and results in the development in Information Management Communication Optics and Electronics host by ICMIC2016 and ICOEE2016 The proceedings collected the latest research results and applications in the related areas We hope to enlighten readers with some latest developments in Information Management and Optics Electronics presented at the joint conferences

Advanced Autonomous Vehicle Design for Severe Environments V.V. Vantsevich, M.V. Blundell, 2015-10-20 Classical vehicle dynamics which is the basis for manned ground vehicle design has exhausted its potential for providing novel design concepts to a large degree At the same time unmanned ground vehicle UGV dynamics is still in its infancy and is currently being developed using general analytical dynamics principles with very little input from actual vehicle dynamics theory This technical book presents outcomes from the NATO Advanced Study Institute ASI Advanced Autonomous Vehicle Design for Severe Environments held in Coventry UK in July 2014 The ASI provided a platform for world class professionals to meet and discuss leading edge research engineering accomplishments and future trends in manned and unmanned ground vehicle dynamics terrain mobility and energy efficiency The outcomes of this collective effort serve as an analytical foundation for autonomous

vehicle design Topics covered include historical aspects pivotal accomplishments and the analysis of future trends in on and off road manned and unmanned vehicle dynamics terramechanics soil dynamic characteristics uncertainties and stochastic characteristics of vehicle environment interaction for agile vehicle dynamics modeling new methods and techniques in on line control and learning for vehicle autonomy fundamentals of agility and severe environments mechatronics and cyber physics issues of agile vehicle dynamics to design for control energy harvesting and cyber security and case studies of agile and inverse vehicle dynamics and vehicle systems design including optimisation of suspension and driveline systems The book targets graduate students who desire to advance further in leading edge vehicle dynamics topics in manned and unmanned ground vehicles PhD students continuing their research work and building advanced curricula in academia and industry and researchers in government agencies and private companies

Autonomous Vehicle Maneuvering at the Limit of Friction
Victor Fors, 2020-10-23

Without a driver to fall back on a fully self driving car needs to be able to handle any situation it can encounter With the perspective of future safety systems this research studies autonomous maneuvering at the tire road friction limit In these situations the dynamics is highly nonlinear and the tire road parameters are uncertain To gain insights into the optimal behavior of autonomous safety critical maneuvers they are analyzed using optimal control Since analytical solutions of the studied optimal control problems are intractable they are solved numerically An optimization formulation reveals how the optimal behavior is influenced by the total amount of braking By studying how the optimal trajectory relates to the attainable forces throughout a maneuver it is found that maximizing the force in a certain direction is important This is like the analytical solutions obtained for friction limited particle models in earlier research and it is shown to result in vehicle behavior close to the optimal also for a more complex model Based on the insights gained from the optimal behavior controllers for autonomous safety maneuvers are developed These controllers are based on using acceleration vector references obtained from friction limited particle models Exploiting that the individual tire forces tend to be close to their friction limits the desired tire slip angles are determined for a given acceleration vector reference This results in controllers capable of operating at the limit of friction at a low computational cost and reduces the number of vehicle parameters used For straight line braking ABS can intervene to reduce the braking distance without prior information about the road friction Inspired by this a controller that uses the available actuation according to the least friction necessary to avoid a collision is developed resulting in autonomous collision avoidance without any estimation of the tire road friction Investigating time optimal lane changes it is found that a simple friction limited particle model is insufficient to determine the desired acceleration vector but including a jerk limit to account for the yaw dynamics is sufficient To enable a tradeoff between braking and avoidance with a more general obstacle representation the acceleration vector reference is computed in a receding horizon framework The controllers developed in this thesis show great promise with low computational cost and performance not far from that obtained offline by using numerical optimization when evaluated in high fidelity simulation

Real-Time Road Profile Identification and Monitoring Yechen Qin,Hong Wang,YanJun Huang,Xiaolin Tang,2022-05-31

Ever stringent vehicle safety legislation and consumer expectations inspire the improvement of vehicle dynamic performance which result in a rising number of control strategies for vehicle dynamics that rely on driving conditions Road profiles as the primary excitation source of vehicle systems play a critical role in vehicle dynamics and also in public transportation Knowledge of precise road conditions can thus be of great assistance for vehicle companies and government departments to develop proper dynamic control algorithms and to fix roads in a timely manner and at the minimum cost respectively As a result developing easy to use and accurate road estimation methods are of great importance in terms of reducing the cost related to vehicles and road maintenance as well as improving passenger comfort and handling capacity A few books have already been published on road profile modeling and the influence of road unevenness on vehicle response However there is still room to discuss road assessment methods based on vehicle response and how road conditions can be used to improve vehicle dynamics In this book we use several generalized vehicle models to demonstrate the concepts methods and applications of vehicle response based road estimation algorithms In addition necessary tools algorithms and methods are illustrated and the benefits of the road estimation algorithms are evaluated Furthermore several case studies of controllable suspension systems to improve vehicle vertical dynamics are presented *Road and Off-Road Vehicle System Dynamics*

Handbook Gianpiero Mastinu,Manfred Ploechl,2014-01-06 Featuring contributions from industry leaders in their respective fields this volume presents comprehensive authoritative coverage of all the major issues involved in road vehicle dynamic behavior It begins with a short history of road and off road vehicle dynamics followed by thorough detailed state of the art chapters on modeling analysis and optimization in vehicle system dynamics vehicle concepts and aerodynamics pneumatic tires and contact wheel road off road modeling vehicle subsystems vehicle dynamics and active safety man vehicle interaction intelligent vehicle systems and road accident reconstruction and passive safety **Handbook of Materials Failure**

Analysis With Case Studies from the Construction Industries Abdel Salam Hamdy Makhlouf,Mahmood

Aliofkhazraei,2018-04-27 Handbook of Materials Failure Analysis With Case Studies from the Construction Industry provides a thorough understanding of the reasons materials fail in certain situations covering important scenarios including material defects mechanical failure due to various causes and improper material selection and or corrosive environment The book begins with a general overview of materials failure analysis and its importance and then logically proceeds from a discussion of the failure analysis process types of failure analysis and specific tools and techniques to chapters on analysis of materials failure from various causes Failure can occur for several reasons including materials defects related failure materials design related failure or corrosion related failures The suitability of the materials to work in a definite environment is an important issue The results of these failures can be catastrophic in the worst case scenarios causing loss of life This important reference covers the most common types of materials failure and provides possible solutions Provides the most up to date

and balanced coverage of failure analysis combining foundational knowledge and current research on the latest developments and innovations in the field Offers an ideal accompaniment for those interested in materials forensic investigation failure of materials static failure analysis dynamic failure analysis and fatigue life prediction Presents compelling new case studies from key industries to demonstrate concepts and to assist users in avoiding costly errors that could result in catastrophic events Soil and Root Damage in Forestry Iwan Wasterlund,2020-08-26 Agroforestry has significantly impacted our forests but an often overlooked issue is the effect of harvesting on soils and root systems Soil and Root Damage in Forestry explains how soil and roots might be damaged through logging activities or silvicultural activities how resulting root diseases impact the root and soil systems and the impacts of chemical applications on the soil and root system This book goes beyond the why to also provide methods to reduce the impacts of machines on soils and offers solutions to minimize the impacts of machines on soils Soil and Root Damage in Forestry serves as a valuable resource not only for those already working in soil science and forest ecology but also provides insights for advanced students seeking an entrance to the hidden half of the planet Combines damages to soil and roots in one volume for the first time Includes calculations related to soil strength providing soil scientists and ecologists with methods to estimate root damage Provides suggestions on how to reduce the impact of harvesting on soil and root systems *Optimal Braking Patterns and Forces in Autonomous Safety-Critical Maneuvers* Victor Fors,2019-05-02 The trend of more advanced driver assistance features and the development toward autonomous vehicles enable new possibilities in the area of active safety With more information available in the vehicle about the surrounding traffic and the road ahead there is the possibility of improved active safety systems that make use of this information for stability control in safety critical maneuvers Such a system could adaptively make a trade off between controlling the longitudinal lateral and rotational dynamics of the vehicle in such a way that the risk of collision is minimized To support this development the main aim of this licentiate thesis is to provide new insights into the optimal behavior for autonomous vehicles in safety critical situations The knowledge gained have the potential to be used in future vehicle control systems which can perform maneuvers at the limit of vehicle capabilities Stability control of a vehicle in autonomous safety critical at the limit maneuvers is analyzed by the use of optimal control Since analytical solutions of the studied optimal control problems are intractable they are discretized and solved numerically A formulation of an optimization criterion depending on a single interpolation parameter is introduced which results in a continuous family of optimal coordinated steering and braking patterns This formulation provides several new insights into the relation between different braking patterns for vehicles in at the limit maneuvers The braking patterns bridge the gap between optimal lane keeping control and optimal yaw control and have the potential to be used for future active safety systems that can adapt the level of braking to the situation at hand A new illustration named attainable force volumes is introduced which effectively shows how the trajectory of a vehicle maneuver relates to the attainable forces over the duration of the maneuver It is shown

that the optimal behavior develops on the boundary surface of the attainable force volume Applied to lane keeping control this indicates a set of control principles similar to those analytically obtained for friction limited particle models in earlier research but is shown to result in vehicle behavior close to the globally optimal solution also for more complex models and scenarios *RoboCup 2007: Robot Soccer World Cup XI* Ubbo Visser, Fernando Ribeiro, Takeshi Ohashi, Frank

Dellaert, 2008-07-18 This book constitutes the proceedings of the 11th RoboCup International Symposium held in Atlanta GA USA in July 2007 immediately after the 2007 RoboCup Soccer RoboCup Rescue and RoboCup Junior competitions Papers presented at the symposium focused on topics related to these three events and to artificial intelligence and robotics in general The 18 revised full papers and 42 revised poster papers included in the book were selected from 133 submissions Each paper was reviewed by at least three program committee members The program committee also nominated two papers for the Best Paper and Best Student Paper awards respectively The book provides a valuable source of reference and inspiration for R D professionals and educationalists active or interested in robotics and artificial intelligence Green,

Smart and Connected Transportation Systems Wuhong Wang, Martin Baumann, Xiaobei Jiang, 2020-03-23 These proceedings gather selected papers from the 9th International Conference on Green Intelligent Transportation Systems and Safety held in Guilin China on July 1-3, 2018 They feature cutting edge studies on Green Intelligent Mobility Systems the guiding motto being to achieve green intelligent and safe transportation systems The contributions presented here can help promote the development of green mobility and intelligent transportation technologies to improve interconnectivity resource sharing flexibility and efficiency Given its scope the book will benefit researchers and engineers in the fields of Transportation Technology and Traffic Engineering Automotive and Mechanical Engineering Industrial and System Engineering and Electrical Engineering alike **Nonlinear Dynamics of Longitudinal Ground Vehicle Traction** Brian John Olson, 2001

Control Applications of Vehicle Dynamics Jingsheng Yu, Vladimir Vantsevich, 2021-12-24 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 **Springer Handbook of Robotics**

Bruno Siciliano, Oussama Khatib, 2016-07-27 The second edition of this handbook provides a state of the art overview on the various aspects in the rapidly developing field of robotics Reaching for the human frontier robotics is vigorously engaged in the growing challenges of new emerging domains Interacting exploring and working with humans the new generation of robots will increasingly touch people and their lives The credible prospect of practical robots among humans is the result of the scientific endeavour of a half a century of robotic developments that established robotics as a modern scientific discipline The ongoing vibrant expansion and strong growth of the field during the last decade has fueled this second edition of the Springer Handbook of Robotics The first edition of the handbook soon became a landmark in robotics publishing and won the American Association of Publishers PROSE Award for Excellence in Physical Sciences Mathematics as well as the organization's Award for Engineering Technology The second edition of the handbook edited by two internationally renowned scientists with the support of an outstanding team of seven part editors and more than 200 authors continues to be an authoritative reference for robotics researchers newcomers to the field and scholars from related disciplines The contents have been restructured to achieve four main objectives the enlargement of foundational topics for robotics the enlightenment of design of various types of robotic systems the extension of the treatment on robots moving in the environment and the enrichment of advanced robotics applications Further to an extensive update fifteen new chapters have been introduced on emerging topics and a new generation of authors have joined the handbook's team A novel addition to the second edition is a comprehensive collection of multimedia references to more than 700 videos which bring valuable insight into the contents The videos can be viewed directly augmented into the text with a smartphone or tablet using a unique and specially designed app Springer Handbook of Robotics Multimedia Extension Portal <http://handbookofrobotics.org> Vibration Engineering and Technology of Machinery

Jyoti K. Sinha, 2014-08-14 The VETOMAC X Conference covered a holistic plethora of relevant topics in vibration and engineering technology including condition monitoring machinery and structural dynamics rotor dynamics experimental techniques finite element model updating industrial case studies vibration control and energy harvesting and signal processing These proceedings contain not only all of the nearly one hundred peer reviewed presentations from authors representing more than twenty countries but also include six invited lectures from renowned experts Professor K Gupta Mr W Hahn Professor A W Lees Professor John Mottershead Professor J S Rao and Dr P Russhard This work is of interest to researchers and practitioners alike and is an essential book for most of libraries of higher academic institutes

Whispering the Techniques of Language: An Mental Journey through **Theory Ground Vehicles J Wong**

In a digitally-driven earth wherever screens reign great and quick transmission drowns out the subtleties of language, the profound secrets and emotional subtleties hidden within phrases usually move unheard. However, located within the pages of **Theory Ground Vehicles J Wong** a captivating fictional value pulsing with fresh feelings, lies a fantastic journey waiting to be undertaken. Penned by an experienced wordsmith, this enchanting opus invites readers on an introspective journey, softly unraveling the veiled truths and profound influence resonating within the very fabric of every word. Within the psychological depths of this moving evaluation, we can embark upon a honest exploration of the book is key subjects, dissect its interesting writing style, and yield to the powerful resonance it evokes heavy within the recesses of readers hearts.

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Theory Ground Vehicles J Wong Introduction

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