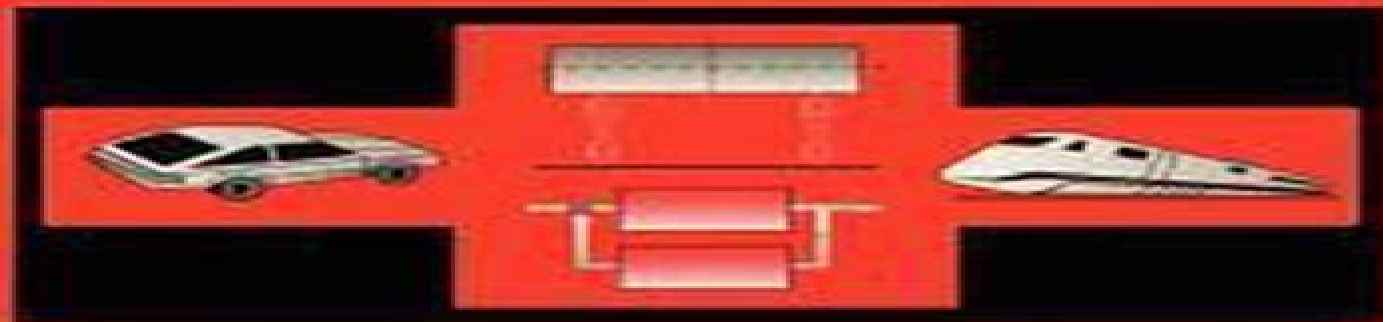


Willi Kortüm · Peter Lugner

Systemdynamik und Regelung von Fahrzeugen

Einführung und Beispiele



Springer-Verlag

Systemdynamik Und Regelung Von Fahrzeugen

Christoph Woernle



Systemdynamik Und Regelung Von Fahrzeugen:

Systemdynamik und Regelung von Fahrzeugen Willi Kortüm, Peter Lugner, 2013-03-13 Dieses Buch vermittelt die wesentlichen modernen Methoden der Systemdynamik und Reglerauslegung bei bodengebundenen Fahrzeugen Der Systemaspekt steht dabei im Vordergrund weshalb neben den mechanischen und regelungstechnischen Grundlagen Modellbildung Systemanalyse und Simulation notwendige Bestandteile dieser Verfahren sind Bei der Modellbildung und in den Anwendungsbeispielen werden Straßenfahrzeuge Schienenfahrzeuge und Magnetschwebebahnen behandelt In charakteristischen Problemstellungen werden insbesondere die Auswirkungen aktiver Komponenten auf das Fahrzeugverhalten demonstriert Darüber hinaus enthält das Buch adäquate Rechenverfahren für die auftretenden numerischen Aufgabenstellungen und Hinweise auf aktuelle Softwarepakete zur Systemanalyse und Reglerauslegung **Aspekte der Simulation und Regelung der Querdynamik von Kraftfahrzeugen** Yingnan Wang, 2011-05 Die Regelungsaufgabe des Fahrers im Straßenverkehr wird zunehmend komplexer Durch den Einsatz von modernen Regelungssystemen kann sich der Fahrer wieder auf die reine Fahraufgabe konzentrieren In dieser Forschungsarbeit werden Themen aus den Bereichen Lenkungssysteme Regelungskonzepte und Zustandsbeobachter bearbeitet Das dynamische Verhalten von Fahrzeugen stellt einen wichtigen Teil der aktiven Fahrzeugsicherheit dar Jedes Fahrzeug stellt zusammen mit seinem Fahrer und der Umwelt ein eigenes closed loop Regelssystem dar Der Forschungsschwerpunkt dieser Studie liegt auf der Beurteilung der Leistungsfähigkeit von Fahrzeugen mithilfe der Simulation und auf der Entwicklung neuer Regelungsstrategien für Lenkungssysteme Abschließend werden die gefundenen Ergebnisse nach ihrem spezifischen Nutzen zusammengefasst und verschiedene Systeme durch Mittelwertbildung miteinander verglichen Man vergleicht bergestellt Analytische Vorüberlegungen zu den verschiedenen Regelungssystemen ergaben dass nur eine Kaskadenregelung die Möglichkeit bietet die Kopplung der beiden querdynamischen Freiheitsgrade eines Fahrzeugs zu beeinflussen und dadurch z.B. den stationären Schwimmwinkel zu verringern Darüber hinaus wird das Zusammenwirken von Fahrer Fahrzeug und Regelungssystem beschrieben wobei auch die Grenzen der automatisierten Fahrzeugregelung deutlich werden die sich im Wesentlichen durch die Beschränkungen heutiger Sensoren begründen Deswegen ist ein Regelungssystem heute allenfalls in der Lage dem Fahrer die Aufgabe der Fahrzeugstabilisierung abzunehmen Lenkungstechnik ist eine neue Aufgabe für Elektrofahrzeuge Die klassischen Lenkungssysteme und die zugehörigen Assistenzsysteme basieren auf Mechanismus und Assistenzelektronik Die Struktur ist für ein reines Elektrofahrzeug nicht geeignet Deswegen ist eine neue Forschung für Lenksysteme erforderlich Die Studie kann nicht nur als Referenz für die Entwicklung sondern auch als Studienhilfe für Studenten die eine Prüfung bezüglich Fahrzeugdynamik oder Regelungstechnik für Fahrzeuge vorbereiten benutzt werden Simulation in Chassis Technology Dirk Adamski, 2020-10-22 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 Advances in Vibration Engineering and Structural Dynamics Francisco Beltran-Carbajal,2012-10-02 The aim of this book is to present recent and innovative advances on research studies and engineering applications in important areas of vibration engineering and structural dynamics The fourteen chapters of the book cover a wide range of interesting issues related to modelling rotordynamics vibration control estimation and identification modal analysis dynamic structures finite element analysis numerical methods and other practical engineering applications and theoretical developments on this very broad matter The audience of the book includes researchers professors engineers practitioners engineering students and new comers in a variety of disciplines seeking to know more about the state of the art challenging open problems and innovative solution proposals in vibration engineering and structural dynamics **Fast Solution of Discretized Optimization Problems** Karl-Heinz Hoffmann,Ronald W. Hoppe,Volker Schulz,2012-12-06 Differential equations partial as well as ordinary are one of the main tools for the modeling of real world application problems Pursuing the ultimate aim of influencing these systems in a desired way one is confronted with the task of optimizing discretized models This volume contains selected papers presented at the International Work shop on Fast Solution of Discretized Optimization Problems which took place at the Weierstrass Institute for Applied Analysis and Stochastics in Berlin from May 08 until May 12 2000 The conference was attended by 59 scientists from 10 countries The scientific program consisted of 8 invited lectures presented by H G Bock IWR Heidelberg M Heinkenschloss Rice University Houston K Kunisch University of Graz U Langer University Linz B Mohammadi University of Montpellier J Petersson University of Linkoping E Sachs University of Trier F Troltzsch Technical University of Chemnitz and 28 contributed talks The aim of this workshop was to foster the exchange of ideas between the still comparatively separated disciplines of nonlinear optimization on the one side and numerical methods for differential equations on the other side This is necessary for the successful solution of various current optimization problems in practical applications shape optimization topology optimization process optimization Therefore the organizing committee as well as the speakers have come from both these communities *Tire and Vehicle Dynamics* Hans Pacejka,2012-04-12 The definitive book on tire mechanics by the acknowledged world expert Covers everything you need to know about pneumatic tires and their impact on vehicle performance including mathematic modeling and its practical application Written by the acknowledged world authority on the topic and the name behind the most widely used model Pacejka s Magic Formula Updated with the latest information on new and evolving tire models to ensure you can select the right model for your needs apply it appropriately and understand

its limitations In this well known resource leading tire model expert Hans Pacejka explains the relationship between operational variables vehicle variables and tire modeling taking you on a journey through the effective modeling of complex tire and vehicle dynamics problems Covering the latest developments to Pacejka s own industry leading model as well as the widely used models of other pioneers in the field the book combines theory guidance discussion and insight in one comprehensive reference While the details of individual tire models are available in technical papers published by SAE FISITA and other automotive organizations Tire and Vehicle Dynamics remains the only reliable collection of information on the topic and the standard go to resource for any engineer or researcher working in the area New edition of the definitive book on tire mechanics by the acknowledged world authority on the topic Covers everything an automotive engineer needs to know about pneumatic tires and their impact on vehicle performance including mathematic modelling and its practical application Most vehicle manufacturers use what is commonly known as Pacejka s Magic Formula the tire model developed and presented in this book

Vehicle Dynamics, Stability, and Control Dean Karnopp, 2016-04-19 Anyone who has experience with a car bicycle motorcycle or train knows that the dynamic behavior of different types of vehicles and even different vehicles of the same class varies significantly For example stability or instability is one of the most intriguing and mysterious aspects of vehicle dynamics Why do some motorcycles sometimes exhibit a wobble of the front wheel when ridden no hands or a dangerous weaving motion at high speed Why does a trailer suddenly begin to oscillate over several traffic lanes just because its load distribution is different from the usual Other questions also arise How do humans control an inherently unstable vehicle such as a bicycle and how could a vehicle be designed or modified with an automatic control system to improve its dynamic properties Using mainly linear vehicle dynamic models as well as discussion of nonlinear limiting effects Vehicle Dynamics Stability and Control Second Edition answers these questions and more It illustrates the application of techniques from kinematics rigid body dynamics system dynamics automatic control stability theory and aerodynamics to the study of the dynamic behavior of a number of vehicle types In addition it presents specialized topics dealing specifically with vehicle dynamics such as the force generation by pneumatic tires railway wheels and wings The idea that vehicles can exhibit dangerous behavior for no obvious reason is in itself fascinating Particularly obvious in racing situations or in speed record attempts dynamic problems are also ubiquitous in everyday life and are often the cause of serious accidents Using relatively simple mathematical models the book offers a satisfying introduction to the dynamics stability and control of vehicles

Progress in Industrial Mathematics at ECMI 2002 Andris Buikis, Raimondas Ciegis, Alistair D. Fitt, 2013-04-17 This volume contains the proceedings of the twelfth conference of the Euro pean Consortium for Mathematics in Industry ECMI was founded in 1986 in to foster research and education in Mathematics in Industry in Europe order and these biannual conferences are the show case for ECMI s research It is a pleasure to see that six of the plenary speakers have submitted papers for this volume Their contributions illustrate the breadth of applica tions and the variety of

mathematical and computational techniques that are embraced by ECMI ECMI is also committed to the education of students and it is encouraging that a number of the papers are given by students The Wacker Prize which is offered for a Masters Level thesis on an industrial problem always attracts excellent entries and this year s winner Nicole Marheineke is no exception This is the first time that an ECMI conference has been held in Eastern Europe and the ECMI Council is very grateful to Professor Andris Buikis and his colleagues in Latvia and Lithuania for the excellent job they have done Thanks too go to the European Union which supported 30 delegates at this conference via TMR Contract No ERBFMRXCT 97 0117

Differential Equations in Industry and Commerce The final meeting of this network was held during this conference which provided a platform for network members to describe their work to a wider audience *Road Vehicle Dynamics* Georg Rill, Abel Arrieta Castro, 2020-05-01 Road Vehicle Dynamics Fundamentals and Modeling with MATLAB Second Edition combines coverage of vehicle dynamics concepts with MATLAB v9 4 programming routines and results along with examples and numerous chapter exercises Improved and updated the revised text offers new coverage of active safety systems rear wheel steering race car suspension systems airsprings four wheel drive mechatronics and other topics Based on the lead author s extensive lectures classes and research activities this unique text provides readers with insights into the computer based modeling of automobiles and other ground vehicles Instructor resources including problem solutions are available from the publisher *Vehicle Stability* Dean Karnopp, 2004-03-11 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 **MultiBody System SIMulation** Reinhold von Schwerin, 2012-12-06

users on the other side of the fence have long said that until we numerical analysts take time to write good software and get it out to the users our ideas will not be put into action C W GEAR IN AIKE85 This monograph is based on my doctoral thesis which I wrote during my work at the Interdisciplinary Center for Scientific Computing IWR at the Ruprecht Karls University of Heidelberg One of my intentions was and still is to stress the practical aspects leading from the conception of mathematical methods to their effective and efficient realization as scientific software In my own experience I had always wished there had been something to guide me through this engineering process which accompanies the basic research for which there were numerous treatises dealing e g with mathematical theory for descriptor systems Therefore I felt that writing this monograph provided a good opportunity to try to fill this gap by looking at software engineering from a scientific computing angle Thus this monograph contains a chapter on software engineering with numerous examples from the work on MBSSIM This is meant as a beacon for those of us who really do want to produce scientific software instead of just hacking some code On the other hand for those more interested in the theory of differential algebraic equations many bibliographical references have been included where appropriate *Rail Vehicle Dynamics* Klaus Knothe, Sebastian

Stichel,2016-11-23 This book on the dynamics of rail vehicles is developed from the manuscripts for a class with the same name at TU Berlin It is directed mainly to master students with pre knowledge in mathematics and mechanics and engineers that want to learn more The important phenomena of the running behaviour of rail vehicles are derived and explained Also recent research results and experience from the operation of rail vehicles are included One focus is the description of the complex wheel rail contact phenomena that are essential to understand the concept of running stability and curving A reader should in the end be able to understand the background of simulation tools that are used by the railway industry and universities today

Numerical Methods in Multibody Dynamics Claus Führer,2013-11-11 Numerical Analysis is an interdisciplinary topic which develops its strength only when viewed in close connection with applications Nowadays mechanical engineers having computer simulation as a daily engineering tool have to learn more and more techniques from that field Mathematicians on the other hand are increasingly confronted with the need for developing special purpose methods and codes This requires a broad interdisciplinary understanding and a sense for model method interactions With this monograph we give an introduction to selected topics of Numerical Analysis based on these facts We dedicate our presentations to an interesting discipline in computational engineering multibody dynamics Though the basic ideas and methods apply to other engineering fields too we emphasize on having one homogeneous class of applications Both authors worked through many years in teams developing multibody codes Interdisciplinary work also includes transferring ideas from one field to the other and a big amount of teaching and that was the idea of this book This book is intended for students of mathematics engineering and computer science as well as for people already concerned with the solution of related topics in university and industry After a short introduction to multibody systems and the mathematical formulation of the equations of motion different numerical methods used to solve simulation tasks are presented The presentation is supported by a simple model of a truck This truck model will follow the reader from the title page to the appendix in various versions specially adapted to the topics

Fundamentals of Multibody Dynamics Farid Amirouche,2007-05-24 Because of its versatility in analyzing a broad range of applications multibody dynamics has grown in the past two decades to be an important tool for designing prototyping and simulating complex articulated mechanical systems This textbook brings together diverse concepts and bridges the gap between dynamics and engineering applications such as microrobotics virtual reality simulation of interactive mechanical systems nanomechanics flexible biosystems crash simulation and biomechanics The book puts into perspective the importance of modeling in the dynamic simulation and problem solving in the above mentioned fields Facilitating the understanding of rigid body dynamics the author presents a compiled overview of particle dynamics and Newton's second law of motion A particular strength of the book is its use of matrices to generate kinematic coefficients that help formulate the governing equations of motion

Interaction of Railway Vehicles with the Track and Its Substructure J.A. Elkins,2018-05-02 First published in 1995 CRC Press is an imprint of Taylor Francis IUTAM

Symposium on Optimization of Mechanical Systems D. Bestle, Werner Schiehlen, 2012-12-06 The International Union of Theoretical and Applied Mechanics IUTAM initiated and sponsored an International Symposium on Optimization of Mechanical Systems held in 1995 in Stuttgart Germany The Symposium was intended to bring together scientists working in different fields of optimization to exchange ideas and to discuss new trends with special emphasis on multi body systems A Scientific Committee was appointed by the Bureau of IUTAM with the following members S Arimoto Japan EL Chernousko Russia M Geradin Belgium E J Haug U S A C A M Soares Portugal N Olhoff Denmark W O Schiehlen Germany Chairman K Schittkowski Germany R S Sharp U K W Stadler U S A H B Zhao China This committee selected the participants to be invited and the papers to be presented at the Symposium As a result of this procedure 90 active scientific participants from 20 countries followed the invitation and 49 papers were presented in lecture and poster sessions

Sliding Mode Control in Electro-Mechanical Systems Vadim Utkin, Juergen Guldner, Jingxin Shi, 2017-12-19 Apply Sliding Mode Theory to Solve Control Problems Interest in SMC has grown rapidly since the first edition of this book was published This second edition includes new results that have been achieved in SMC throughout the past decade relating to both control design methodology and applications In that time Sliding Mode Control SMC has continued to gain increasing importance as a universal design tool for the robust control of linear and nonlinear electro mechanical systems Its strengths result from its simple flexible and highly cost effective approach to design and implementation Most importantly SMC promotes inherent order reduction and allows for the direct incorporation of robustness against system uncertainties and disturbances These qualities lead to dramatic improvements in stability and help enable the design of high performance control systems at low cost Written by three of the most respected experts in the field including one of its originators this updated edition of Sliding Mode Control in Electro Mechanical Systems reflects developments in the field over the past decade It builds on the solid fundamentals presented in the first edition to promote a deeper understanding of the conventional SMC methodology and it examines new design principles in order to broaden the application potential of SMC SMC is particularly useful for the design of electromechanical systems because of its discontinuous structure In fact where the hardware of many electromechanical systems such as electric motors prescribes discontinuous inputs SMC becomes the natural choice for direct implementation This book provides a unique combination of theory implementation issues and examples of real life applications reflective of the authors own industry leading work in the development of robotics automobiles and other technological breakthroughs

Mathematics - Key Technology for the Future Willi Jäger, Hans-Joachim Krebs, 2011-06-28 Efficient transfer between science and society is crucial for their future development The rapid progress of information technology and computer systems offers a large potential and new perspectives for solving complex problems Mathematical modelling and simulation have become important tools not only in scientific investigations but also in analysing planning and controlling technological and economic processes Mathematics imbedded in an interdisciplinary concept has become a key

technology The book covers the results of a variety of major projects in industrial mathematics following an initiative of the German Federal Ministry of Education and Research All projects are collaborations of industrial companies and university based researchers and range from automotive industry to computer technology and medical visualisation In general the projects presented in this volume prove that new mathematical ideas and methods can be decisive for the solution of industrial and economic problems

Multibody Systems Christoph Woernle, 2024-07-23 The book Multibody Systems guides the reader from the fundamentals of engineering mechanics to the formulations of the kinematic and dynamic equations of systems of rigid bodies suitable for computational generation Multibody systems are used for the numerical simulation of complex mechanical systems in mechanical engineering automotive engineering aerospace engineering and biomechanics The presentation focuses on the implicit and explicit mathematical formulations of the bonds that geometrically constrain the motion of the partial bodies and define the directions of the reaction forces and reaction moments This results in a consistent and common approach to the various known forms of the equations of motion of multibody systems In addition to open multibody systems with a tree structure closed multibody systems with kinematic loops are also treated in detail In the third edition planar multibody systems are presented in a separate chapter to facilitate the transition from mass point systems to spatial multibody systems

Lectures on Applied Mathematics Hans-Joachim Bungartz, Ronald W. Hoppe, Christoph Zenger, 2012-12-06 When the DFG Deutsche Forschungsgemeinschaft launched its collaborative research centre or SFB Sonderforschungsbereich 438 Mathematical Modelling Simulation and Verification in Material Oriented Processes and Intelligent Systems in July 1997 at the Technische Universität München and at the Universität Augsburg southern Bavaria got its second nucleus of the still young discipline scientific computing Whereas the first and older one FORTWIHR the Bavarian Consortium for High Performance Scientific Computing had put its main emphasis on the supercomputing aspect this new initiative was now expected to focus on the mathematical part Consequently throughout all of the five main research topics A adaptive materials and thin layers B adaptive materials in medicine C robotics aeronautics and automobile technology D microstructured devices and systems and E transport processes in flows mathematical aspects play a predominant role The formation of the SFB 438 and its scientific program are inextricably linked with the name of Karl Heinz Hoffmann As full professor for applied mathematics in Augsburg 1981 1991 and in München since 1992 and as dean of the faculty of mathematics at the TU München he was the driving force of this fascinating but not always easy to realize idea of bringing together scientists from mathematics physics engineering informatics and medicine for joint efforts in modern applied mathematics However scarcely work had begun when the successful captain was called to take command on a bigger boat

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Systemdynamik Und Regelung Von Fahrzeugen Introduction

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