Design And Control Of Automotive Propulsion Systems Mechanical And Aerospace Engineering

Design and Advanced Robust Chassis Dynamics Control for X-by-Wire Unmanned Ground Vehicle
Design of a Process Control System for Automotive Assembly Process
For Engine, Driveline, and Vehicle
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Design and Advanced Robust Chassis Dynamics Control for X-by-Wire Unmanned Ground Vehicle IntechOpen
Automotive control has developed over the decades from an auxiliary te- nology to a key element without which the actual performances, emission, safety and consumption targets could not be met. Accordingly, automotive control has been increasing its authority and responsibility – at the price of complexity and di?cult tuning. The progressive evolution has been mainly ledby speci?capplicationsandshorttermtargets,withthe consequencethat automotive control is to a very large extent more heuristic than systematic. Product requirements are still increasing and new challenges are coming from potentially huge markets like India and China, and against this ba- ground there is wide consensus both in the industry and academia that the current state is not satisfactory. Model-based control could be an approach to improve performance while reducing development and tuning times and possibly costs. Model predictive control is a kind of model-based control design approach which has experienced a growing success since the middle of the 1980s for “slow” complex plants, in particular of the chemical and process industry. In the last decades, severaldevelopments haveallowedusing these methods also for “fast”systemsandthis hassupporteda growinginterestinitsusealsofor automotive applications, with several promising results reported. Still there is no consensus on whether model predictive control with its high requi- ments on model quality and on computational power is a sensible choice for automotive control.
Design of a Process Control System for Automotive Assembly Process Cambridge University Press
The auto industry is facing tough competition and severe economic constraints. Their products need to be designed "right the first time" with the right combinations of features that not only satisfy the customers but continually please and delight them by providing increased functionality, comfort, convenience, safety, and craftsmanship. Based on t
For Engine, Driveline, and Vehicle Elsevier
Written by two of the most respected, experienced and well-known researchers and developers in the field (e.g., Kiencke worked at Bosch where he helped develop anti-breaking system and engine control; Nielsen has lead joint research projects with Scania AB, Mecel AB, Saab Automobile AB, Volvo AB, Fiat GM Powertrain AB, and DaimlerChrysler. Reflecting the trend to optimization through integrative approaches for engine, driveline and vehicle control, this valuable book enables control engineers to understand engine and vehicle models necessary for controller design and also introduces mechanical engineers to vehicle-specific signal processing and automatic control. Emphasis on measurement, comparisons between performance and modelling, and realistic examples derive from the authors’ unique industrial experience . The second edition offers new or expanded topics such as diesel-engine modelling, diagnosis and anti-jerking control, and vehicle modelling and parameter estimation. With only a few exceptions, the approaches
Automotive Control Systems Springer Science & Business Media
Design and Control of Automotive Propulsion SystemsCRC Press
Hybrid Electric Vehicle Design and Control: Intelligent Omnidirectional Hybrids Now Publishers
Presenting the latest research in the control of fuel cell technology, this book will contribute to the commercial viability of the technology. The authors’ background in automotive technology gives the work added authority as a vital element of future planning.
Automotive Model Predictive Control Elsevier
"This book presents analytical and experimental methods and achievements in designing mechanical and mechatronic driveline systems. Examples include various power dividing units, including symmetric and non-symmetric varieties, as well as open and lockable differentials, various limited slip differentials, no spins, and viscous clutches. The text presents logic control algorithms used to control vehicle power dividing units and designs of torque/power managing devices. The authors' approach to designing driveline systems is that characteristics and parameters of a driveline system and a set of power dividing units are established through vehicle performance and energy-fuel efficiency analysis and optimization"--
Resource-aware Automotive Control Systems Design Springer Science & Business Media
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.
Design, Modeling, and Control of Automotive Power Transmission Systems McGraw Hill Professional
This monograph focuses on control methods that influence

vehicle dynamics to assist the driver in enhancing passenger comfort, road holding, efficiency and safety of transport, etc., while maintaining the driver's ability to override that assistance. On individual-vehicle-component level the control problem is formulated and solved by a unified modelling and design method provided by the linear parameter varying (LPV) framework. The global behaviour desired is achieved by a judicious interplay between the individual components, guaranteed by an integrated control mechanism. The integrated control problem is also formalized and solved in the LPV framework. Most important among the ideas expounded in the book are: application of the LPV paradigm in the modelling and control design methodology; application of the robust LPV design as a unified framework for setting control tasks related to active driver assistance; formulation and solution proposals for the integrated vehicle control problem; proposal for a reconfigurable and fault-tolerant control architecture; formulation and solution proposals for the plug-and-play concept; detailed case studies. Robust Control Design for Active Vehicle Assistance Systems will be of interest to academic researchers and graduate students interested in automotive control and to control and mechanical engineers working in the automotive industry. Advances in Industrial Control aims to report and encourage the transfer of technology in control engineering. The rapid development of control technology has an impact on all areas of the control discipline. The series offers an opportunity for researchers to present an extended exposition of new work in all aspects of industrial control.

System Design and Control Considerations of Automotive Continuously Variable Transmissions CRC Press

New results, fresh ideas and new applications in automotive and flight control systems are presented in this second edition of Robust Control. The book presents parametric methods and tools for the simultaneous design of several representative operating conditions and several design specifications in the time and frequency domains. It also covers methods for robustness analysis that guarantee the desired properties for all possible values of the plant uncertainty. A lot of practical application experience enters into the case studies of driver support systems that avoid skidding and rollover of cars, automatic car steering systems, flight controllers for unstable aircraft and engine-out controllers. The book also shows the historic roots of the methods, their limitations and research needs in robust control.

Control Applications of Vehicle Dynamics Elsevier

This book explains the topology behind automotive electronics architectures and examines how they can be profoundly augmented with embedded controllers. These controllers serve as the core building blocks of today's vehicle electronics. Rather than simply teaching electrical basics, this unique resource focuses on the fundamental concepts of vehicle electronics architecture, and details the wide variety of Electronic Control Modules (ECMs) that enable the increasingly sophisticated "bells & whistles" of modern designs. A must-have for automotive design engineers, technicians working in automotive electronics repair centers and students taking automotive electronics courses, this guide bridges the gap between academic instruction and industry practice with clear, concise advice on how to design and optimize automotive electronics with embedded controllers.

The Design and Control Strategies for Automotive Air Conditioning Systems Using Motor Driven, Variable Speed Centrifugal Compressors Morgan & Claypool Publishers

As the automotive industry faces into the smart era through advances in sensing, computation, storage, communication, and actuation technologies, a larger number of more complex control applications with better performances are expected to be on board. This requires an implementation platform with abundant resources, which is a major challenge in the cost-sensitive automotive domain. The implementation platform, often embedded in an Electronic Control Unit (ECU) and shared by multiple applications to save cost, is mainly comprised of a processor for computation, memory for storing instructions and data, and bus for internal and external communication. Conventionally, automotive control systems are designed using model-based approaches, where the details of the implementation platform are ignored. Techniques that integrate the characteristics of implementation resources into control algorithms design are largely missing. Such a separate design paradigm is too conservative in resources dimensioning and utilization for modern vehicles. This monograph presents recently developed approaches in automotive control systems design that take implementation resources into consideration, aiming to improve the control performances for a given amount of resources, or equivalently, realize the required control performances with fewer resources. While communication resources have been extensively explored in the literature of networked embedded control systems, this book focuses on memory and computation resources, which have started to receive attention from the academic community and industry just recently. As Electric Vehicles (EVs) have become a new trend in the automotive industry, energy resources of EVs are also investigated. A number of real-world applications validate the resource-aware automotive systems design techniques presented in the monograph. This text will be of interest to researchers and engineers in the automotive, embedded system and control domains.

Computer Applications in the Automotive Industry/advanced Control in Automotive Technology : Proceedings of the Fifth IAVD Conference, Geneva, 6-9 March 1989 Springer Science & Business Media

Ohio State University (OSU) is uniquely poised to establish such a center, with interdisciplinary emphasis on modeling, simulation, design and control of hybrid-electric drives for a number of reasons, some of which are: (1) The OSU Center for Automotive Research (CAR) already provides an infrastructure for interdisciplinary automotive research and graduate education; the facilities available at OSU-CAR in the area of vehicle and powertrain research are among the best in the country. CAR facilities include 31,000 sq. feet of space, multiple chassis and engine dynamometers, an anechoic chamber, and a high bay area. (2) OSU has in excess of 10 graduate level courses related to automotive systems. A graduate level sequence has already been initiated with GM. In addition, an Automotive Systems Engineering (ASE) program cosponsored by the mechanical and electrical engineering programs, had been formulated earlier at OSU, independent of the GATE program proposal. The main objective of the ASE is to provide multidisciplinary graduate education and training in the field of automotive systems to Masters level students. This graduate program can be easily adapted to fulfill the spirit of the GATE Center of Excellence. (3) A program in Mechatronic Systems Engineering has been in place at OSU since 1994; this program has a strong emphasis on automotive system integration issues, and has emphasized hybrid-electric vehicles as one of its application areas. (4) OSU researchers affiliated with CAR have been directly involved in the

development and study of: HEV modeling and simulation; electric drives; transmission design and control; combustion engines; and energy storage systems. These activities have been conducted in collaboration with government and automotive industry sponsors; further, the same researchers have been actively involved in continuing education programs in these areas with the automotive industry. The proposed effort will include: (1) The development of a laboratory facility that will include: electric drive and IC engine test benches; a test vehicle designed for rapid installation of prototype drives; benches for the measurement and study of HEV energy storage components (batteries, ultra-capacitors, flywheels); hardware-in-the-loop control system development tools. (2) The creation of new courses and upgrades of existing courses on subjects related to: HEV modeling and simulation; supervisory control of HEV drivetrains; engine, transmission, and electric drive modeling and control. Specifically, two new courses (one entitled HEV Component Analysis: and the other entitled HEV System Integration and Control) will be developed. Two new labs, that will be taught with the courses (one entitled HEV Components Lab and one entitled HEV Systems and Control lab) will also be developed. (3) The consolidation of already existing ties among faculty in electrical and mechanical engineering departments. (4) The participation of industrial partners through: joint laboratory development; internship programs; continuing education programs; research project funding. The proposed effort will succeed because of the already exceptional level of involvement in HEV research and in graduate education in automotive engineering at OSU, and because the PIs have a proven record of interdisciplinary collaboration as evidenced by joint proposals, joint papers, and co-advising of graduate students. OSU has been expanding its emphasis in Automotive Systems for quite some time. This has led to numerous successes such as the establishment of the Center of Automotive Research, a graduate level course sequence with GM, and numerous grants and contracts on automotive research. The GATE Center of Excellence is a natural extension of what educators at OSU already do well.

Advances in Automotive Climate Control Design Springer

Semi-Active Suspension Control Design for Vehicles presents a comprehensive discussion of designing control algorithms for semi-active suspensions. It also covers performance analysis and control design. The book evaluates approaches to different control theories, and it includes methods needed for analyzing and evaluating suspension performances, while identifying optimal performance bounds. The structure of the book follows a classical path of control-system design; it discusses the actuator or the variable-damping shock absorber, models and technologies. It also models and discusses the vehicle that is equipped with semi-active dampers, and the control algorithms. The text can be viewed at three different levels: tutorial for novices and students; application-oriented for engineers and practitioners; and methodology-oriented for researchers. The book is divided into two parts. The first part includes chapters 2 to 6, in which fundamentals of modeling and semi-active control design are discussed. The second part includes chapters 6 to 8, which cover research-oriented solutions and case studies. The text is a comprehensive reference book for research engineers working on ground vehicle systems; automotive and design engineers working on suspension systems; control engineers; and graduate students in control theory and ground vehicle systems. Appropriate as a tutorial for students in automotive systems, an application-oriented reference for engineers, and a control design-oriented text for researchers that introduces semi-active suspension theory and practice Includes explanations of two innovative semi-active suspension strategies to enhance either comfort or road-holding performance, with complete analyses of both Also features a case study showing complete implementation of all the presented strategies and summary descriptions of classical control algorithms for controlled dampers

The Automotive Body Springer

Better Understand the Relationship between Powertrain System Design and Its Control IntegrationWhile powertrain system design and its control integration are traditionally divided into two different functional groups, a growing trend introduces the integration of more electronics (sensors, actuators, and controls) into the powertrain system.

Advanced Methodologies Design and Control of Automotive Propulsion Systems

Vehicle Dynamics and Control: Advanced Methodologies features the latest information on advanced dynamics and vehicle motion control, including a comprehensive overview of passenger cars and articulated vehicles, fundamentals, and emerging developments. This book provides a unified, balanced treatment of advanced approaches to vehicle dynamics and control. It proceeds to cover advanced vehicle control strategies, such as identification and estimation, adaptive nonlinear control, new robust control techniques, and soft computing. Other topics, such as the integrated control of passenger cars and articulated heavy vehicles, are also discussed with a significant amount of material on engineering methodology, simulation, modeling, and mathematical verification of the systems. This book discusses and solves new challenges in vehicle dynamics and control problems and helps graduate students in the field of automotive engineering as well as researchers and engineers seeking theoretical/practical design procedures in automotive control systems. Provides a vast spectrum of advanced vehicle dynamics and control systems topics and current research trends Provides an extensive discussion in some advanced topics on commercial vehicles, such as dynamics and control of semitrailer carrying liquid, integrated control system design, path planning and tracking control in the autonomous articulated vehicle

A Linear-Parameter-Varying Approach Springer Science & Business Media

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.

The Parameter Space Approach SAE International

The main objective of this book is to present important challenges and paradigms in the field of applied robust control design and implementation. Book contains a broad range of well worked out, recent application studies which include but are not limited to H-infinity, sliding mode, robust PID and fault tolerant based control systems. The contributions enrich the current state of the art, and encourage new applications of robust control techniques in various engineering and non-engineering systems.

Automotive Electronics Design Fundamentals Springer Science & Business Media

Active Braking Control Design for Road Vehicles focuses on two main brake system technologies: hydraulically-activated brakes with on–off dynamics and electromechanical brakes, tailored to brake-by-wire control. The physical differences of such actuators enjoin the use of different control schemes so as to be able fully to exploit their characteristics. The authors show how these different control approaches are complementary, each having specific peculiarities in terms of either performance or of the structural properties of the closed-loop system. They also consider other problems related to the design of braking control systems, namely: • longitudinal vehicle speed estimation and its relationship with braking control system design; • tire–road friction estimation; • direct estimation of tire–road contact forces via in-tire sensors, providing a treatment of active vehicle braking control from a wider perspective linked to both advanced academic research and industrial reality.

Design Elements in Automotive Climate Control Systems CRC Press

X-by-wire Unmanned Ground Vehicles (UGVs) have been attracting increased attention for various civilian or military applications. The x-by-wire techniques (drive-by-wire, steer-by-wire, and brake-by-wire techniques) provide the possibility of achieving novel vehicle design and advanced dynamics control, which can significantly improve the overall performance, maneuverability, and mobility of the UGVs. However, there are few full x-by-wire UGVs prototype models reported in the world. Therefore, there is no book that can fully describe the design, configuration, and dynamics control approach of full x-by-wire UGVs, which makes it difficult for readers to study this hot and interesting topic. In this book, we use a full x-by-wire UGV, developed by our group, as the example. This UGV is completely x-by-wire with four in-wheel motors driven and a four-wheel independent steer steer. In this book, the overall design of the UGV, the design of the key subsystems (battery pack system, in-wheel motor-driven system, independent steer system, remote and autonomous control system), and the dynamics control approach will be introduced in detail, and the experiment's results will be provided to validate the proposed dynamics control approach.

Vehicle Dynamics and Control Springer Science & Business Media

'An Introduction to Modern Vehicle Design' provides a thorough introduction to the many aspects of passenger car design in one volume. Starting with basic principles, the author builds up analysis procedures for all major aspects of vehicle and component design. Subjects of current interest to the motor industry, such as failure prevention, designing with modern materials, ergonomics and control systems are covered in detail, and the author concludes with a discussion on the future trends in automobile design. With contributions from both academics lecturing in motor vehicle engineering and those working in the industry, "An Introduction to Modern Vehicle Design" provides students with an excellent overview and background in the design of vehicles before they move on to specialised areas. Filling the niche between the more descriptive low level books and books which focus on specific areas of the design process, this unique volume is essential for all students of automotive engineering. Only book to cover the broad range of topics for automobile design and analysis procedures Each topic written by an expert with many years experience of the automotive industry

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