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Advances in
Industrial Control

Dry Clutch Control for Automotive Applications



Springer

Dry Clutch Control For Automotive Applications Advances In Industrial Control

Carlos Ocampo-Martinez



Dry Clutch Control For Automotive Applications Advances In Industrial Control:

Dry Clutch Control for Automotive Applications Pietro J. Dolcini, Carlos Canudas-de-Wit, Hubert Béchart, 2010-05-27
Dry Clutch Control for Automated Manual Transmission Vehicles analyses the control of a part of the powertrain which has a key role in ride comfort during standing start and gear shifting manoeuvres The mechanical conception of the various elements in the driveline has long since been optimised so this book takes a more holistic system oriented view of the problem featuring a comprehensive description of the driveline elements and their operation paying particular attention to the clutch a nonlinear model of the driveline for simulation and a simplified model for control design with a standing start driver automaton for closed loop simulation a detailed analysis of the engagement operation and the related comfort criteria different control schemes aiming at meeting these criteria friction coefficient and unknown input clutch torque observers practical implementation issues and solutions based on experience of implementing optimal engagement strategies on two Renault prototypes

Robust Control Design for Active Driver Assistance Systems Péter Gáspár, Zoltán Szabó, József Bokor, Balázs Nemeth, 2016-11-18 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

Modeling and Control of Engines and Drivelines Lars Eriksson, Lars Nielsen, 2014-02-27 Control systems have come to play an important role in the performance of modern vehicles with regards to meeting goals on low emissions and low fuel consumption To achieve these goals modeling simulation and analysis have become standard tools for the development of control systems in the automotive industry Modeling and Control of Engines and Drivelines provides an up to date treatment of the topic from a clear perspective of

systems engineering and control systems which are at the core of vehicle design This book has three main goals The first is to provide a thorough understanding of component models as building blocks It has therefore been important to provide measurements from real processes to explain the underlying physics to describe the modeling considerations and to validate the resulting models experimentally Second the authors show how the models are used in the current design of control and diagnosis systems These system designs are never used in isolation so the third goal is to provide a complete setting for system integration and evaluation including complete vehicle models together with actual requirements and driving cycle analysis Key features Covers signals systems and control in modern vehicles Covers the basic dynamics of internal combustion engines and drivelines Provides a set of standard models and includes examples and case studies Covers turbo and super charging and automotive dependability and diagnosis Accompanied by a web site hosting example models and problems and solutions Modeling and Control of Engines and Drivelines is a comprehensive reference for graduate students and the authors close collaboration with the automotive industry ensures that the knowledge and skills that practicing engineers need when analysing and developing new powertrain systems are also covered

Hybrid Systems, Optimal Control and Hybrid Vehicles Thomas J. Böhme, Benjamin Frank, 2017-02-01 This book assembles new methods showing the automotive engineer for the first time how hybrid vehicle configurations can be modeled as systems with discrete and continuous controls These hybrid systems describe naturally and compactly the networks of embedded systems which use elements such as integrators hysteresis state machines and logical rules to describe the evolution of continuous and discrete dynamics and arise inevitably when modeling hybrid electric vehicles They can throw light on systems which may otherwise be too complex or recondite Hybrid Systems Optimal Control and Hybrid Vehicles shows the reader how to formulate and solve control problems which satisfy multiple objectives which may be arbitrary and complex with contradictory influences on fuel consumption emissions and drivability The text introduces industrial engineers postgraduates and researchers to the theory of hybrid optimal control problems A series of novel algorithmic developments provides tools for solving engineering problems of growing complexity in the field of hybrid vehicles Important topics of real relevance rarely found in text books and research publications switching costs sensitivity of discrete decisions and there impact on fuel savings etc are discussed and supported with practical applications These demonstrate the contribution of optimal hybrid control in predictive energy management advanced powertrain calibration and the optimization of vehicle configuration with respect to fuel economy lowest emissions and smoothest drivability Numerical issues such as computing resources simplifications and stability are treated to enable readers to assess such complex systems To help industrial engineers and managers with project decision making solutions for many important problems in hybrid vehicle control are provided in terms of requirements benefits and risks

Active Braking Control Systems Design for Vehicles Sergio M. Savaresi, Mara Tanelli, 2010-09-24 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

Industrial Process Identification and Control Design Tao Liu, Furong Gao, 2011-11-16 Industrial Process Identification and Control Design is devoted to advanced identification and control methods for the operation of continuous time processes both with and without time delay in industrial and chemical engineering practice The simple and practical step or relay feedback test is employed when applying the proposed identification techniques which are classified in terms of common industrial process type open loop stable integrating and unstable respectively Correspondingly control system design and tuning models that follow are presented for single input single output processes Furthermore new two degree of freedom control strategies and cascade control system design methods are explored with reference to independently improving set point tracking and load disturbance rejection Decoupling multi loop and decentralized control techniques for the operation of multiple input multiple output processes are also detailed Perfect tracking of a desire output trajectory is realized using iterative learning control in uncertain industrial batch processes All the proposed methods are presented in an easy to follow style illustrated by examples and practical applications This book will be valuable for researchers in system identification and control theory and will also be of interest to graduate control students from process chemical and electrical engineering backgrounds and to practising control engineers in the process industry

Extremum-Seeking Control and Applications Chunlei Zhang, Raúl Ordóñez, 2011-10-26 Extremum seeking control tracks a varying maximum or minimum in a performance function such as output or cost It attempts to determine the optimal performance of a control system as it operates thereby reducing downtime and the need for system analysis Extremum seeking Control and Applications is divided into two parts In the first the authors review existing analog optimization based extremum seeking control including gradient perturbation and sliding mode based control designs They then propose a novel numerical optimization based extremum seeking control based on optimization algorithms and state regulation This control design is developed for simple linear time invariant systems and then extended for a class of feedback linearizable nonlinear systems The two main optimization algorithms line search and trust region methods are analyzed for robustness Finite time and asymptotic state regulators are put forward for linear and nonlinear systems respectively Further design flexibility is achieved using the robustness results of the optimization algorithms and the asymptotic state regulator by which existing nonlinear adaptive control techniques can be introduced for

robust design The approach used is easier to implement and tends to be more robust than those that use perturbation based extremum seeking control The second part of the book deals with a variety of applications of extremum seeking control a comparative study of extremum seeking control schemes in antilock braking system design source seeking formation control collision and obstacle avoidance for groups of autonomous agents mobile radar networks and impedance matching MATLAB Simulink code which can be downloaded from www.springer.com ISBN helps readers to reproduce the results presented in the text and gives them a head start for implementing the algorithms in their own applications Extremum seeking Control and Applications will interest academics and graduate students working in control and industrial practitioners from a variety of backgrounds systems automotive aerospace communications semiconductor and chemical engineering

Optimal Control of Hybrid Vehicles Bram de Jager, Thijs van Keulen, John Kessels, 2013-04-05 Optimal Control of Hybrid Vehicles provides a description of power train control for hybrid vehicles The background environmental motivation and control challenges associated with hybrid vehicles are introduced The text includes mathematical models for all relevant components in the hybrid power train The power split problem in hybrid power trains is formally described and several numerical solutions detailed including dynamic programming and a novel solution for state constrained optimal control problems based on the maximum principle Real time implementable strategies that can approximate the optimal solution closely are dealt with in depth Several approaches are discussed and compared including a state of the art strategy which is adaptive for vehicle conditions like velocity and mass Three case studies are included in the book a control strategy for a micro hybrid power train experimental results obtained with a real time strategy implemented in a hybrid electric truck and an analysis of the optimal component sizes for a hybrid power train Optimal Control of Hybrid Vehicles will appeal to academic researchers and graduate students interested in hybrid vehicle control or in the applications of optimal control Practitioners working in the design of control systems for the automotive industry will also find the ideas propounded in this book of interest

Drives and Control for Industrial Automation Kok Kiong Tan, Andi Sudjana Putra, 2010-11-16 Drives and Control for Industrial Automation presents the material necessary for an understanding of servo control in automation Beginning with a macroscopic view of its subject treating drives and control as parts of a single system the book then pursues a detailed discussion of the major components of servo control sensors controllers and actuators Throughout the mechatronic approach a synergistic integration of the components is maintained in keeping with current practice The authors holistic approach does not preclude the reader from learning in a step by step fashion each chapter contains material that can be studied separately without compromising understanding Drives are described in several chapters according to the way they are usually classified in industry each comprised of its actuators and sensors The controller is discussed alongside Topics of recent and current interest piezoelectricity digital communications and future trends are detailed in their own chapters

Nonlinear Control of Vehicles and Robots Béla Lantos, Lőrinc Márton, 2010-12-01 Nonlinear Control of Vehicles and

Robots develops a unified approach to the dynamic modeling of robots in terrestrial aerial and marine environments The main classes of nonlinear systems and stability methods are summarized and basic nonlinear control methods useful in manipulator and vehicle control are presented Formation control of ground robots and ships is discussed The book also deals with the modeling and control of robotic systems in the presence of non smooth nonlinearities Robust adaptive tracking control of robotic systems with unknown payload and friction in the presence of uncertainties is treated Theoretical and practical aspects of the control algorithms under discussion are detailed Examples are included throughout the book allowing the reader to apply the control and modeling techniques in their own research and development work Some of these examples demonstrate state estimation based on the use of advanced sensors as part of the control system

Networked and Distributed Predictive Control Panagiotis D. Christofides, Jinfeng Liu, David Muñoz de la Peña, 2011-04-07 Networked and Distributed Predictive Control presents rigorous yet practical methods for the design of networked and distributed predictive control systems the first book to do so The design of model predictive control systems using Lyapunov based techniques accounting for the influence of asynchronous and delayed measurements is followed by a treatment of networked control architecture development This shows how networked control can augment dedicated control systems in a natural way and takes advantage of additional potentially asynchronous and delayed measurements to maintain closed loop stability and significantly to improve closed loop performance The text then shifts focus to the design of distributed predictive control systems that cooperate efficiently in computing optimal manipulated input trajectories that achieve desired stability performance and robustness specifications but spend a fraction of the time required by centralized control systems Key features of this book include new techniques for networked and distributed control system design insight into issues associated with networked and distributed predictive control and their solution detailed appraisal of industrial relevance using computer simulation of nonlinear chemical process networks and wind and solar energy generation systems and integrated exposition of novel research topics and rich resource of references to significant recent work A full understanding of Networked and Distributed Predictive Control requires a basic knowledge of differential equations linear and nonlinear control theory and optimization methods and the book is intended for academic researchers and graduate students studying control and for process control engineers The constant attention to practical matters associated with implementation of the theory discussed will help each of these groups understand the application of the book's methods in greater depth

Control of Integral Processes with Dead Time Antonio Visioli, Qingchang Zhong, 2010-11-18 Control of Integral Processes with Dead Time provides a unified and coherent review of the various approaches devised for the control of integral processes addressing the problem from different standpoints In particular the book treats the following topics How to tune a PID controller and assess its performance How to design a two degree of freedom control scheme in order to deal with both the set point following and load disturbance rejection tasks How to modify the basic Smith predictor control

scheme in order to cope with the presence of an integrator in the process and how to address the presence of large process dead times The methods are presented sequentially highlighting the evolution of their rationale and implementation and thus clearly characterising them from both academic and industrial perspectives

Control and Monitoring of Chemical Batch Reactors Fabrizio Caccavale, Mario Iamarino, Francesco Pierri, Vincenzo Tufano, 2010-12-07 The Chemical Batch Reactor is aimed at tackling the above problems from a blending of academic and industrial perspectives Advanced solutions i.e. those based on recent research results to the four fundamental problems of modeling identification control and fault diagnosis for batch processes are developed in detail in four distinct chapters In each chapter a general overview of foundational concepts is also given together with a review of recent and classical literature on the various subjects To provide a unitary treatment of the different topics and give a firm link to the underlying practical applications a single case study is developed as the book progresses a batch process of industrial interest i.e. the phenol formaldehyde reaction for the production of phenolic resins is adopted to test the various techniques developed In this way a roadmap of the solutions to fundamental problems ranging from the early stages of the production process to the complete design of control and diagnosis systems is provided for both industrial practitioners and academic researchers

Unmanned Rotorcraft Systems Guowei Cai, Ben M. Chen, Tong Heng Lee, 2011-06-01 Unmanned Rotorcraft Systems explores the research and development of fully functional miniature UAV unmanned aerial vehicle rotorcraft and provides a complete treatment of the design of autonomous miniature rotorcraft UAVs The unmanned system is an integration of advanced technologies developed in communications computing and control areas and is an excellent testing ground for trialing and implementing modern control techniques Included are detailed expositions of systematic hardware construction software systems integration aerodynamic modeling and automatic flight control system design Emphasis is placed on the cooperative control and flight formation of multiple UAVs vision based ground target tracking and landing on moving platforms Other issues such as the development of GPS less indoor micro aerial vehicles and vision based navigation are also discussed in depth utilizing the vision based system for accomplishing ground target tracking attacking and landing cooperative control and flight formation of multiple unmanned rotorcraft and future research directions on the related areas

Reset Control Systems Alfonso Baños, Antonio Barreiro, 2011-10-14 Reset Control Systems addresses the analysis for reset control treating both its basic form and some useful variations of the reset action and reset condition The issues regarding reset control concepts and motivation analysis tools and the application of design methodologies to real world examples are given thorough coverage The text opens with a historical perspective which moves from the seminal work of the Clegg integrator and Horowitz FORE to more recent approaches based on impulsive hybrid control systems and explains the motivation for reset compensation Preliminary material is also included The focus then turns to stability analysis for systems using techniques which account for various time and frequency domain criteria The final section of the book is centered on control systems design and application The PI CI compensator is detailed as are a

proposed frequency domain approach using quantitative feedback theory and ideas for design improvement Design examples are given

Internet-based Control Systems Shuang-Hua Yang, 2011-02-09 The Internet plays a significant and growing role in real time industrial manufacturing scheduling and management A considerable research effort has led to the development of new technologies that make it possible to use the Internet for supervision and control of industrial processes Internet based Control Systems addresses the challenges that need to be overcome before the Internet can be beneficially used not only for monitoring of but also remote control industrial plants New design issues such as requirement specification architecture selection and user interface design are dealt with Irregular data transmission and data loss and in extreme cases whole system instability may result from Internet time delay this book guards against such phenomena from both computer science and control engineering perspectives Security breaches and safety risks in an Internet based control system could have very serious consequences and the author gives specific advice for avoiding them This book is unique in bringing together multiple strands of research mainly from computer science and control engineering into an over arching study of the entire subject Practical perspectives are explored both through case studies in several chapters and through real applications including robot arm control web based simulator for a catalytic reactor virtual supervision parameter control of a water tank system model predictive control for a process control unit remote control performance monitoring and maintenance remote control system design and implementation Internet based Control Systems is a useful introduction and guide for researchers in control engineering and computer science and developers of real time Internet enabling software It can also be used for teaching a final year option or elective on Internet enabled real time system design or as an advanced example of real time software design for graduates

Fault Detection and Fault-Tolerant Control Using Sliding

Modes Halim Alwi, Christopher Edwards, Chee Pin Tan, 2011-06-07 Fault Detection and Fault tolerant Control Using Sliding Modes is the first text dedicated to showing the latest developments in the use of sliding mode concepts for fault detection and isolation FDI and fault tolerant control in dynamical engineering systems It begins with an introduction to the basic concepts of sliding modes to provide a background to the field This is followed by chapters that describe the use and design of sliding mode observers for FDI using robust fault reconstruction The development of a class of sliding mode observers is described from first principles through to the latest schemes that circumvent minimum phase and relative degree conditions Recent developments have shown that the field of fault tolerant control is a natural application of the well known robustness properties of sliding mode control A family of sliding mode control designs incorporating control allocation which can deal with actuator failures directly by exploiting redundancy is presented Various realistic case studies specifically highlighting aircraft systems and including results from the implementation of these designs on a motion flight simulator are described A reference and guide for researchers in fault detection and fault tolerant control this book will also be of interest to graduate students working with nonlinear systems and with sliding modes in particular 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

Induction Motor Control Design Riccardo Marino, Patrizio Tomei, Cristiano M. Verrelli, 2010-08-20 This book provides the most important steps and concerns in the design of estimation and control algorithms for induction motors A single notation and modern nonlinear control terminology is used to make the book accessible although a more theoretical control viewpoint is also given Focusing on the induction motor with the concepts of stability and nonlinear control theory given in appendices this book covers speed sensorless control design of adaptive observers and parameter estimators a discussion of nonlinear adaptive controls containing parameter estimation algorithms and comparative simulations of different control algorithms The book sets out basic assumptions structural properties modelling state feedback control and estimation algorithms then moves to more complex output feedback control algorithms based on stator current measurements and modelling for speed sensorless control The induction motor exhibits many typical and unavoidable nonlinear features

Control of Solar Energy Systems Eduardo F. Camacho, Manuel Berenguel, Francisco R. Rubio, Diego Martínez, 2012-01-02 Control of Solar Energy Systems details the main solar energy systems problems involved with their control and how control systems can help in increasing their efficiency Thermal energy systems are explored in depth as are photovoltaic generation and other solar energy applications such as solar furnaces and solar refrigeration systems This second and updated edition of Advanced Control of Solar Plants includes new material on solar towers and solar tracking heliostat calibration characterization and offset correction solar radiation estimation prediction and computation and integrated control of solar plants This new edition contains worked examples in the text as well as proposed exercises and simulation models and so will be of great use to the student and academic as well as the industrial practitioner

Model Predictive Control of Wastewater Systems Carlos Ocampo-Martinez, 2010-10-01 The series Advances in Industrial Control aims to report and encourage technology transfer in control engineering The rapid development of control technology has an impact on all areas of the control discipline New theory new controllers actuators sensors new industrial processes computer methods new applications new philosophies new challenges Much of this development work resides in industrial reports feasibility study papers and the reports of advanced collaborative projects The series offers an opportunity for researchers to present an extended exposition of such new work in all aspects of industrial control for wider and rapid dissemination The water and wastewater industry has undergone many changes in recent years Of particular importance has been a renewed emphasis on improving resource management with tighter regulatory controls setting new targets on pricing industry efficiency and loss reduction for both water and wastewater with more stringent environmental discharge conditions for wastewater Meantime the demand for water and wastewater services grows as the population increases and wishes for improved living conditions involving among other items domestic appliances that use

water Consequently the installed infrastructure of the industry has to be continuously upgraded and extended and employed more effectively to accommodate the new demands both in throughput and in meeting the new regulatory conditions Investment in fixed infrastructure is capital intensive and slow to come on stream One outcome of these changes and demands is that the industry is examining the potential benefits of and in many cases using more advanced control systems

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