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Thesis Control Fuzzy Uav ***2022-07-17***

GREYSON BECKER

Control and Systems Engineering Infinite Study
This book introduces a dynamic, on-line fuzzy inference system. In this system membership functions and control rules are not determined until the system is applied and each output of its lookup table is calculated based on current inputs. The book describes the real-world uses of new fuzzy techniques to simplify readers' tuning processes and enhance the performance of their control systems. It further contains application examples.
Proceedings of the Fifth International Conference on Fuzzy and Neuro Computing (FANCCO - 2015) Academic Press
This thesis is part of an ongoing research conducted at the Naval Post-graduate School to achieve the autonomous shipboard landing of Unmanned Aerial Vehicles (UAV). Two main problems are addressed in this thesis. The first is to establish communication between the UAV's ground station and the Autonomous Landing Flight Control Computer effectively. The second addresses the design and implementation of an autonomous landing controller using classical control techniques. Device drivers for the sensors and the communications protocol were developed in ANSI C. The overall system was implemented in a PC1O4 computer running a real-time operating system developed by The Math- works, Inc. Computer and hardware in the loop (HIL) simulation, as well as ground test results show the feasibility of the algorithm proposed here. Flight tests are scheduled to be performed in the near future.
Motion Control Library and Archives Canada = Bibliothèque et Archives Canada
This book features the latest theoretical results and techniques in the field of guidance, navigation, and control (GNC) of vehicles and aircraft. It covers a range of topics, including, but not limited to, intelligent computing communication and control; new methods of navigation, estimation, and tracking; control of multiple moving objects; manned and autonomous unmanned systems; guidance, navigation, and control of miniature aircraft; and sensor systems for guidance, navigation, and control. Presenting recent advances in the form of illustrations, tables, and text, it also provides detailed information of a number of the studies, to offer readers insights for their own research. In addition, the book addresses fundamental concepts and studies in the development of GNC, making it a valuable resource for both beginners and researchers wanting to further their understanding of guidance, navigation, and control.
Design Optimization of Unmanned Aerial Vehicles Springer
In recent years, the quadcopter has become a popular platform both in research activities and in industrial development. Its success is due to its increased performance and capabilities, where modeling and control synthesis play essential roles. These techniques have been used for stabilizing the quadcopter in different flight conditions such as hovering and climbing. The performance of the control system depends on parameters of the quadcopter which are often unknown and need to be estimated. The common approach to determine such parameters is to rely on accurate measurements from external sources, i.e., a motion capture system. In this work, only measurements from low-cost onboard sensors are used. This approach and the fact that the measurements are collected in closed-loop present additional challenges. First, a general overview of the quadcopter is given and a detailed dynamic model is presented, taking into account intricate aerodynamic phenomena. By projecting this model onto the vertical axis, a nonlinear vertical submodel of the quadcopter is obtained. The Instrumental Variable (IV) method is used to estimate the parameters of the submodel using real data. The result shows that adding an extra term in the thrust equation is essential. In a second contribution, a sensor-to-sensor estimation problem is studied, where only measurements from an onboard Inertial Measurement Unit (IMU) are used. The roll submodel is derived by linearizing the general model of the quadcopter along its main frame. A comparison is carried out based on simulated and experimental data. It shows that the IV method provides accurate estimates of the parameters of the roll submodel whereas some other common approaches are not able to do this. In a sensor-to-sensor modeling approach, it is sometimes not obvious which signals to select as input and output. In this case, several common methods give different results when estimating the forward and inverse models. However, it is shown that the IV method will give identical results when estimating the forward and inverse models of a single-input single-output (SISO) system using finite data. Furthermore, this result is illustrated experimentally when the goal is to determine the center of gravity of a quadcopter.
Some results on closed-loop identification of quadcopters Springer Nature
There are two basic ways to control an Unmanned Combat Aerial Vehicle (UCAV) as it searches for targets: allow the UCAV to act autonomously or employ man-in-the-loop control. There are also two target sets of interest: fixed or mobile targets. This research focuses on UCAV-based targeting of mobile targets using man-in-the-loop control. In particular, the interest is in how levels of satellite signal latency or signal degradation affect the ability to accurately track, target, and attack mobile targets. This research establishes a weapon effectiveness model assessing targeting inaccuracies as a function of signal latency and/or signal degradation. The research involved three phases. The first phase in the research was to identify the levels of signal latency associated with satellite communications. A literature review, supplemented by interviews with UAV operators, provided insight into the expected range latency values. The second phase of the research identified those factors whose value, in the presence of satellite signal latency, could influence targeting errors during UCAV employment. The final phase involved developing and testing a weapon effectiveness model explicitly modeling satellite signal latency in UCAV targeting against mobile targets. This phase included an effectiveness analysis study.
Robot Operating System (ROS) Springer Science & Business Media
Model Based Fuzzy Control uses a given conventional or fuzzy open loop model of the plant under control to derive the set of fuzzy rules for the fuzzy controller. Of central interest are the stability, performance, and robustness of the resulting closed loop system. The major objective of model based fuzzy control is to use the full range of linear and nonlinear design and analysis methods to design such fuzzy controllers with better stability, performance, and robustness properties than non-fuzzy controllers designed using the same techniques. This objective has already been achieved for fuzzy sliding mode controllers and fuzzy gain schedulers - the main topics of this book. The primary aim of the book is to serve as a guide for the practitioner and to provide introductory material for courses in control theory.
UAV-Based Remote Sensing Volume 1 CRC Press
Unmanned Aerial Systems: Theoretical Foundation and Applications presents some of the latest innovative approaches to drones from the point-of-view of dynamic modeling, system analysis, optimization, control, communications, 3D-mapping, search and rescue, surveillance, farmland and construction monitoring, and more. With the emergence of low-cost UAS, a vast array of research works in academia and products in the industrial sectors have evolved. The book covers the safe operation of UAS, including, but not limited to, fundamental design, mission and path planning, control theory, computer vision, artificial intelligence, applications requirements, and more. This book provides a unique reference of the state-of-the-art research and development of unmanned aerial systems, making it an essential resource for researchers, instructors and practitioners. Covers some of the most innovative approaches to drones Provides the latest state-of-the-art research and development surrounding unmanned aerial systems Presents a comprehensive reference on unmanned aerial systems, with a focus on cutting-edge technologies and recent research trends in the area
Unmanned Rotorcraft Systems ISTE Press - Elsevier
In this thesis, a multi-objective control for a research uninhabited aerial vehicle is presented. Using the eigenstructure assignment approach, a flight controller is developed to meet multiple design specifications during a flight mission. The controller is implemented into a digital control system with commercial off-the-shelf actuators. Real-time simulations and hardware-in-the-loop experiments are performed to verify the feasibility of this design. In addition, a comparative analysis of different digital implementation are made. The Kalman filter is further employed to improve the performance of the digital control system.
Networked Control Systems for Connected and Automated Vehicles Springer Science & Business Media
Control of large-scale distributed energy systems over communication networks is an important topic with many application domains. The book presents novel concepts of distributed control for networked and cyber-physical systems (CPS), such as smart industrial production lines, smart energy grids, and autonomous vehicular systems. It focuses on new solutions in managing data and connectivity to support connected and automated vehicles (CAV). The book compiles original research papers presented at the conference "Networked Control Systems for Connected and Automated Vehicles" (Russia). The latest connected and automated vehicle technologies for next generation autonomous vehicles are presented. The book sets new goals for the standardization of the scientific results obtained and the advancement to the level of full autonomy and full self-driving (FSD). The book presents the latest research in artificial intelligence, assessing virtual environments, deep learning systems, and sensor fusion for automated vehicles. Particular attention is paid to new safety standards, safety and security systems, and control of epidemic spreading over networks. The issues of building modern transport infrastructure facilities are also discussed in the articles presented in this book. The book is of considerable interest to scientists, researchers, and graduate students in the field of transport systems, as well as for managers and employees of companies using or producing equipment for these systems.
Model Based Fuzzy Control Springer
With the extraordinary growth of Unmanned Aerial Vehicles (UAV) in research, military, and commercial contexts, there has been a need for a reference that provides a comprehensive look at the latest research in the area. Filling this void, Smart Autonomous Aircraft: Flight Control and Planning for UAV introduces the advanced methods of flight contr
Dynamic Modeling, Fuzzy Control and Stabilization of Quadrotor Vehicle Springer Science & Business Media
"This thesis addresses optimal control of a helicopter unmanned aerial vehicle (UAV). Helicopter UAVs may be widely used for both military and civilian operations. Because these helicopters are underactuated nonlinear mechanical systems, high-performance controller design for them presents a challenge. This thesis presents an optimal controller design via both state and output feedback for trajectory tracking of a helicopter UAV using a neural network (NN). The state and output-feedback control system utilizes the backstepping methodology, employing kinematic and dynamic controllers while the output feedback approach uses an observer in addition to these controllers. The online approximator-based dynamic controller learns the Hamilton-Jacobi-Bellman (HJB) equation in continuous time and calculates the corresponding optimal control input to minimize the HJB equation forward-in-time. Optimal tracking is accomplished with a single NN utilized for cost function approximation. The overall closed-loop system stability is demonstrated using Lyapunov analysis. Simulation results are provided to demonstrate the effectiveness of the proposed control design for trajectory tracking. A description of the hardware for confirming the theoretical approach, and a discussion of material pertaining to the algorithms used and methods employed specific to the hardware implementation is also included. Additional attention is devoted to challenges in implementation as well as to opportunities for further research in this field. This thesis is presented in the form of two papers"--Abstract, leaf iv.
Optimal Control of a Helicopter Unmanned Aerial Vehicle (UAV) Springer Nature
Fuzzy Control Systems explores one of the most active areas of research involving fuzzy set theory. The contributors address basic issues concerning the analysis, design, and application of fuzzy control systems. Divided into three parts, the book first devotes itself to the general theory of fuzzy control systems. The second part deals with a variety of methodologies and algorithms used in the analysis and design of fuzzy controllers. The various paradigms include fuzzy reasoning models, fuzzy neural networks, fuzzy expert systems, and genetic algorithms. The final part considers current applications of fuzzy control systems. This book should be required reading for researchers, practitioners, and students interested in fuzzy control systems, artificial intelligence, and fuzzy sets and systems.
Robust Discrete-Time Flight Control of UAV with External Disturbances Springer Nature
Earth Systems Protection and Sustainability authorises imperatives to achieve sustainability and protect our threatened and vulnerable Earth. Mathematical advances in context incorporate operational and Boolean, as well as linguistic, logic-based Bayesian, and generative methods for scenario formation. Functional areas and deeper learning enable the use of searching algorithms, proffering optimal solutions for the circular nature of sustainability in natural ecosystems and human dominated settings. Key informative nodes are provided in the hope that we may moderate the very real dangers facing planet Earth and its biodiversity. An arena of insightful chapters is blended with

social resilience and socio-economic development coverage, accentuating integrity, protection and sustainability within divergent climatic forces and species dynamics on Earth. Volume 2 focuses on bioaccumulation; climate change and resilience for co-operative socio-economic and ecosystem management via policy frameworks across sectors; mathematical modelling of freshwater in coastal regions in arid and semi-arid zones; decision making in natural disasters; peat solidification for environmentally sustainable geotechnical engineering; green energy conversion; flood risk mapping; rainfall analysis; exposure, safety, and security amidst increasing environmental contamination; remote handling vehicles; wind turbines; and deep learning and its environmental applications. Earth Systems Protection and Sustainability is addressed globally to communities, schools and researchers in professional, governmental and unit operations; descriptive and illustrative sections include all sectors to ensure Earth Systems Protection as our capacity reaches an unsustainable climax.

An Examination of Latency and Degradation Issues in Unmanned Combat Aerial Vehicle Environments Springer Science & Business Media

This book offers a comprehensive reference guide for the theory and practice of intelligent and fuzzy techniques in Aviation 4.0. It provides readers with the necessary intelligent and fuzzy tools for Aviation 4.0 when incomplete, vague, and imprecise information or insufficient data exist in hand, where classical modeling approaches cannot be applied. The respective chapters, written by prominent researchers, explain a wealth of both basic and advanced concepts including baggage services, catering services, check-in and boarding services, maintenance and cargo management, security, etc. To foster reader comprehension, all chapters include relevant numerical examples or case studies. Taken together, they form an excellent reference guide for researchers, lecturers, and postgraduate students pursuing research on Aviation 4.0. Moreover, by extending all the main aspects of Aviation 4.0 to its intelligent and fuzzy counterparts, the book presents a dynamic snapshot of the field that is expected to stimulate new directions, ideas, and developments.

Flight Formation Control Academic Press

In the last decade the development and control of UnmannedAerial Vehicles (UAVs) has attracted a lot of interest. Bothresearchers and companies have a growing interest in improving thistype of vehicle given their many civilian and militaryapplications. This book presents the state of the art in the area of UAV FlightFormation. The coordination and robust consensus approaches arepresented in detail as well as formation flight control strategieswhich are validated in experimental platforms. It aims at helpingstudents and academics alike to better understand what coordinationand flight formation control can make possible. Several novel methods are presented: - controllability and observability of multi-agent systems; - robust consensus; - flight formation control; - stability of formations over noisy networks; which generate solutions of guaranteed performance for UAV FlightFormation. Contents 1. Introduction, J.A. Guerrero. 2. Theoretical Preliminaries, J.A. Guerrero. 3. Multiagent Coordination Strategies, J.A. Guerrero, R. Lozano,M.W. Spong, N. Chopra. 4. Robust Control Design for Multiagent Systems with ParametricUncertainty, J.A. Guerrero, G. Romero. 5. On Adaptive and Robust Controlled Synchronization of NetworkedRobotic Systems on Strongly Connected Graphs, Y.-C. Liu, N.Chopra. 6. Modeling and Control of Mini UAV, G. Flores Colunga, J.A.Guerrero, J. Escareño, R. Lozano. 7. Flight Formation Control Strategies for Mini UAVs, J.A.Guerrero. 8. Formation Based on Potential Functions, L. García, A.Dzul. 9. Quadrotor Vision-Based Control, J.E. Gomez-Balderas, J.A.Guerrero, S. SALAZAR, R. Lozano, P. Castillo. 10. Toward Vision-Based Coordination of Quadrotor Platoons, L.R.García Carrillo, J.A. Guerrero, R. Lozano. 11. Optimal Guidance for Rotorcraft Platoon Formation Flying inWind Fields, J.A. Guerrero, Y. Bestaoui, R. Lozano. 12. Impact of Wireless Medium Access Protocol on the QuadrotorFormation Control, J.A. Guerrero, Y. Challal, P. Castillo. 13. MAC Protocol for Wireless Communications, A. Mendez, M.Panduro, O. Elizarraras, D. Covarrubias. 14. Optimization of a Scannable Pattern for Bidimensional AntennaArrays to Provide Maximum Performance, A. Reyna, M.A. Panduro, A.Mendez.

Neural Network Control of a Parallel Hybrid-electric Propulsion System for a Small Unmanned Aerial Vehicle John Wiley & Sons

Unmanned Aircraft Systems (UAS) have seen unprecedented levels of growth during the last decade in both military and civilian domains. It is anticipated that civilian applications will be dominant in the future, although there are still barriers to be overcome and technical challenges to be met. Integrating UAS into, for example, civilian space, navigation, autonomy, see-detect-and-avoid systems, smart designs, system integration, vision-based navigation and training, to name but a few areas, will be of prime importance in the near future. This special volume is the outcome of research presented at the International Symposium on Unmanned Aerial Vehicles, held in Orlando, Florida, USA, from June 23-25, 2008, and presents state-of-the-art findings on topics such as: UAS operations and integration into the national airspace system; UAS navigation and control; micro-, mini-, small UAVs; UAS simulation testbeds and frameworks; UAS research platforms and applications; UAS applications. This book aims at serving as a guide tool on UAS for engineers and practitioners, academics, government agencies and industry. Previously published in the Journal of Intelligent and Robotic Systems, 54 (1-3, 2009).

Multi-rotor Platform Based UAV Systems Springer

This book introduces a comprehensive and mathematically rigorous controller design for families of nonlinear systems with time-varying parameters and unstructured uncertainties. Although the presented methodology is general, the specific family of systems considered is the latest, NextGen, unconventional fixed-wing unmanned aircraft with circulation control or morphing wings, or a combination of both. The approach considers various sources of model and parameter uncertainty, while the controller design depends not on a nominal plant model, but instead on a family of admissible plants. In contrast to existing controller designs that consider multiple models and multiple controllers, the proposed approach is based on the ‘one controller fits all models’ within the unstructured uncertainty interval. The book presents a modeling-based analysis and synthesis approach with additive uncertainty weighting functions for accurate realization of the candidate systems. This differs significantly from existing designs in that it is capable of handling time-varying characteristics. This research monograph is suitable for scientists, engineers, researchers and graduate students with a background in control system theory who are interested in complex engineering nonlinear systems.

Nonlinear Control of Fixed-Wing UAVs with Time-Varying and Unstructured Uncertainties Springer

This book studies selected discrete-time flight control schemes for fixed-wing unmanned aerial vehicle (UAV) systems in the presence of system uncertainties, external disturbances and input saturation. The main contributions of this book for UAV systems are as follows: (i) the proposed integer-order discrete-time control schemes are based on the designed discrete-time disturbance observers (DTDOs) and the neural network (NN); and (ii) the fractional-order discrete-time control schemes are developed by using the fractional-order calculus theory, the NN and the DTDOs. The book offers readers a good understanding of how to establish discrete-time tracking control schemes for fixed-wing UAV systems subject to system uncertainties, external wind disturbances and input saturation. It represents a valuable reference guide for academic research on uncertain UAV systems, and can also support advanced / Ph.D. studies on control theory and engineering.

Smart Autonomous Aircraft MDPI

Parallel hybrid-electric propulsion systems would be beneficial for small unmanned aerial vehicles (UAVs) used for military, homeland security, and disaster monitoring missions involving intelligence, surveillance, or reconnaissance (ISR). The benefits include increased time-on-station and range than electric-powered UAVs and stealth modes not available with gasoline-powered UAVs. A conceptual design of a small UAV with a parallel hybrid-electric propulsion system, an optimization routine for the energy use, the application of a neural network to approximate the optimization results, and simulation results are provided. The two-point conceptual design includes an internal combustion engine sized for cruise and an electric motor and lithium-ion battery pack sized for endurance speed. The flexible optimization routine allows relative importance to be assigned between the use of gasoline, electricity, and recharging. The Cerebellar Model Arithmetic Computer (CMAC) neural network approximates the optimization results and is applied to the control of the parallel hybrid-electric propulsion system. The CMAC controller saves on the required memory compared to a large look-up table by two orders of magnitude. The energy use for the hybrid-electric UAV with the CMAC controller during a one-hour and a three-hour ISR mission is 58% and 27% less, respectively, than for a gasoline-powered UAV.

Hardware-in-the-loop Simulation for a Research Uninhabited Aerial Vehicle Control [microform] Linköping University Electronic Press

An authoritative reference on cooperative decision and control of unmanned aerial vehicles.