Aircraft Control Systems Srm University

NEVEAH HESS

Automatic Flight Control Systems John Wiley & Sons
A treatment of automatic flight control systems (AFCS) for fixed wing and rotary wing aircraft. The text covers in detail the subject of stability and control theory. All the principal AFC modes are covered and the effects of atmospheric turbulance and structural flexibility are charted.

Stability and Control of Aircraft Systems Wiley-Interscience
Focuses on the first control systems course of BTech, JNTU, this book helps the student prepare for further studies in modern control system design. It offers a profusion of examples on various aspects of study.

Nonlinear Analysis and Synthesis Techniques for Aircraft Control Butterworth-Heinemann
Annotation Bridging the gap between academic research and real-world applications, this reference on modern flight control methods for fixed-wing aircraft deals with fundamentals of flight control systems design, then concentrates on applications based on the modern control methods used in the latest aircraft. The book is written for practicing engineers who are new to the aviation industry, postgraduate students in strategic or applied research, and advanced undergraduates. Some knowledge of classical control is assumed. Pratt is a member of IEEE and is UK Member for AIAA's Technical Committee on Guidance, Navigation and Control. Annotation c. Book News, Inc., Portland, OR (booknews.com)

Aircraft Control Allocation Springer Science & Business Media
Aircraft Control Allocation Wayne Durham, Virginia Polytechnic Institute and State University, USA Kenneth A. Bordignon, Embry-Riddle Aeronautical University, USA Roger Beck, Dynamic Concepts, Inc., USA An authoritative work on aircraft control allocation by its pioneers Aircraft Control Allocation addresses the problem of allocating supposed redundant flight controls. It provides introductory material on flight dynamics and control to provide the context, and then describes in detail the geometry of the problem. The book includes a large section on solution methods, including 'Banks' method', a previously unpublished

procedure. Generalized inverses are also discussed at length. There is an introductory section on linear programming solutions, as well as an extensive and comprehensive appendix dedicated to linear programming formulations and solutions. Discrete-time, or frame-wise allocation, is presented, including rate-limiting, nonlinear data, and preferred solutions. Key features: Written by pioneers in the field of control allocation. Comprehensive explanation and discussion of the major control allocation solution methods. Extensive treatment of linear programming solutions to control allocation. A companion web site contains the code of a MATLAB/Simulink flight simulation with modules that incorporate all of the major solution methods. Includes examples based on actual aircraft. The book is a vital reference for researchers and practitioners working in aircraft control, as well as graduate students in aerospace engineering.

Flight Control Systems DesignAerospace LLC

Introduction to Avionic Systems, Second Edition explains the principles and theory of modern avionic systems and how they are implemented with current technology for both civil and military aircraft. The systems are analysed mathematically, where appropriate, so that the design and performance can be understood. The book covers displays and man-machine interaction, aerodynamics and aircraft control, fly-by-wire flight control, inertial sensors and attitude derivation, navigation systems, air data and air data systems, autopilots and flight management systems, avionic systems integration and unmanned air vehicles. About the Author. Dick Collinson has had "hands-on" experience of most of the systems covered in this book and, as Manager of the Flight Automation Research Laboratory of GEC-Marconi Avionics Ltd. (now part of BAE Systems Ltd.), led the avionics research activities for the company at Rochester, Kent for many years. He was awarded the Silver Medal of the Royal Aeronautical Society in 1989 for his contribution to avionic systems research and development.

A Feasibility Study of Self-learning Adaptive Flight Control for High Performance Aircraft Kern Aerospace, LLC

This case study provides insight into the F-16 FBW FCS design, including discussion of the F-16 design philosophy, the implementation of the flight control system, and unique flight control system functional features.

Aircraft Control and Simulation AIAA (American Institute of Aeronautics & Astronautics)

Automation in air traffic control may increase efficiency, but it also raises questions about adequate human control over automated systems. Following on the panel's first volume on air traffic control automation, Flight to the Future (NRC, 1997), this book focuses on the interaction of pilots and air traffic controllers, with a growing network of automated functions in the airspace system. The panel offers recommendations for development of human-centered automation, addressing key areas such as providing levels of automation that are appropriate to levels of risk, examining procedures for recovery from emergencies, free flight versus ground-based authority, and more. The book explores ways in which technology can build on human strengths and compensate for human vulnerabilities, minimizing both mistrust of automation and complacency about its abilities. The panel presents an overview of emerging technologies and trends toward automation within the national airspace systemâ€"in areas such as global positioning and other aspects of surveillance, flight information provided to pilots an controllers, collision avoidance, strategic long-term planning, and systems for training and maintenance. The book examines how to achieve better integration of research and development, including the importance of user involvement in air traffic control. It also discusses how to harmonize the wide range of functions in the national airspace system, with a detailed review of the free flight initiative.

Flight-determined Benefits of Integrated Flight-propulsion Control Systems John Wiley & Sons

The history of flight control is inseparably linked to the history of aviation itself. Since the early days, the concept of automatic flight control systems has evolved from mechanical control systems to highly advanced automatic fly-by-wire flight control systems which can be found nowadays in military jets and civil airliners. Even today, many research efforts are made for the further development of these flight control systems in various aspects. Recent new developments in this field focus on a wealth of different aspects. This book focuses on a selection of key research areas, such as inertial navigation, control of unmanned aircraft and helicopters, trajectory control of an unmanned space re-entry vehicle, aeroservoelastic control, adaptive flight control, and fault tolerant flight control. This book consists of two major sections. The first section focuses on a literature review and some recent theoretical developments in flight control systems. The second section discusses some concepts of adaptive and fault-tolerant flight control systems. Each technique discussed in this book is illustrated by a relevant example.

Automatic Flight Control Systems Routledge

This book provides a single comprehensive resource that reviews many of the current aircraft flight control programmes from the perspective of experienced practitioners directly involved in the projects. Each chapter discusses a specific aircraft flight programme covering the control system design considerations, control law architecture, simulation and analysis, flight test optimization and handling qualities evaluations. The programmes described have widely exploited modern interdisciplinary tools and techniques and the discussions include extensive flight test results. Many important `lessons learned' are included from the experience gained when design methods and requirements were tested and optimized in actual flight demonstration.

The Evaluation of a Digital Hardware Voter/monitor in an Aircraft Control System New Age International

The problem of fault diagnosis and reconfigurable control is a new and actually developing field of science and engineering. The subject becomes more interesting since there is an increasing demand for the navigation and control systems of aerospace vehicles, automated actuators etc. to be more safe and reliable. Nowadays, the problems of fault detection and isolation and reconfigurable control attract the attention the scientists in the world. The subject is emphasized in the recent international congresses such as IF AC World Congresses (San Francisco-1996, Beijing-1999, and Barcelona-2002) and IMEKO World Congresses (Tampere-1997, Osaka-1999, Vienna-2000), and also in the international conferences on fault diagnosis such as SAFEPROCESS Conferences (Hull-1997, Budapest-2000). The presented methods in the book are based on linear and nonlinear dynamic mathematical models of the systems. Technical objects and systems stated by these models are very large, and include various control systems, actuators, sensors, computer systems, communication systems, and mechanical, hydraulic, pneumatic, electrical and electronic devices. The analytical fault diagnosis techniques of these objects have been developed for several decades. Many of those techniques are based on the use of the results of modem control theory. This is natural, because it is known that fault diagnosis process in control systems is considered as a part of general control process. xxii In organization of fault diagnosis of control systems, the use of the concepts and methods of modem control theory including concepts of state space, modeling, controllability, observability, estimation, identification, and filtering is very efficient.

Flight Control Systems John Wiley & Sons
A state-of-the-art computational facility for aircraft flight control design, evaluation, and integration called CONDUIT (Control Designer's Unified Interface) has been developed. This paper describes the CONDUIT tool and case study applications to complex rotary- and fixed- wing fly-by-wire flight control problems. Control system analysis and design optimization methods are presented, including definition of design specifications and system models within CONDUIT, and the multi-objective function optimization (CONSOL-OPTCAD) used to tune the selected design parameters. Design examples are based on flight test programs for which extensive data are available for validation. CONDUIT is used to analyze baseline control laws against pertinent military handling qualities and control system specifications. In both case studies, CONDUIT successfully exploits trade-offs between forward loop and feedback dynamics to significantly improve the expected handling qualities and minimize the required actuator authority. The CONDUIT system provides a new environment for integrated control system analysis and design, and has potential for significantly reducing the time and cost of control system flight test optimization.
Integrity in Electronic Flight Control Systems DesignAerospace LLC
The #1 guide to understanding the "why and how" of fly-by-wire flight control systems. This book is an approachable and easily understandable must-read for aviation professionals! Why don't new aircraft designs allow the pilots a mechanical control connection? This book explains how fly-by-wire fixes the top 5 problems with mechanical controls for high performance aircraft. Rather than describe a particular aircraft’s design with confusing acronyms, readers will get a "behind the scenes" understanding for the critical concepts that apply to any modern aircraft. Because these design principles are easily described and understood, readers of this book will be armed with knowledge as they approach their flight manual procedures. Including: - Problems with mechanical flight controls - Advantages of fly-by-wire - How and why can fly-by-wire control systems fail? - Why are four computers better than one or two? - Explanations of the control laws used by business jets, fighters, and airliners - What sensors are needed, and how the system maintains control when sensors are lost - Design considerations for risk mitigation in case of component failures Buy this book to read on your next layover!
CONDUIT: A New Multidisciplinary Integration Environment for Flight Control Development National Academies Press
A study of the feasibility of a self-learning adaptive system for the flight control of high performance aircraft has been performed. A flight control system was developed for the investigation of the stability augmentation of the longitudinal axis of the F101B aircraft using self-learning adaptive control. The learning adaptive controller developed employs a three-loop concept. The innermost loop comprises a linear feedback control system in which a set of control gains is adjusted by a second (adaptive) loop employing a parameter identifier and a trainable function generator (automation). The automation provides the correct values of feedback gain in response to patterns derived from the identified aircraft parameters. The third loop (the learning loop) measures control system performance, and continually retrains the automation to improve the performance. Experiments were performed with a digital simulation of the aircraft and the learning adaptive control system. Results of the experiments indicate that learning adaptive control is feasible. However, a number of significant technical problems must be overcome prior to the use of such a control system in tactical aircraft. Studies of sensitivity must be performed to assess the effect of small perturbations in the identification parameters on system performance. Extended studies of property extraction from the identified parameters is required, and means for further simplifying the control structure is of importance in a real system. (Author).
The General Dynamics Case Study on the F-16 Fly-By-Wire Flight Control System Springer Nature
This book covers aerospace flight control systems. Both primary and secondary flight control systems are covered in the book. The first chapters cover basic mechanism fundamentals that are relevant to flight control systems. Next is chapters on cable systems, gearing systems and power screws. Hydraulic and electromechanical actuation are also discussed. From here, the book addresses general aspects of flight control systems, including fly by wire systems. After this secondary systems (high lift, spoilers, trim) and primary flight control for each axis are discussed - each in stand-alone chapters. Reversible, irreversible and fly by wire systems are discussed for each axis. The final chapter goes into system fault detection. Version 2 adds some material to existing chapters, adds a design example and fixes some typos.
Automatic Flight Control Systems IET
This is the first book to focus on the use of nonlinear analysis and synthesis techniques for aircraft control. It is also the first book to address in detail closed-loop control problems for aircraft "on-ground" – i.e. speed and directional control of aircraft before take-off and after touch down. The book will be of interest to engineers, researchers, and students in control engineering, and especially aircraft control.
Fundamentals of Design of Piloted Aircraft Flight Control Systems BoD – Books on Demand
The book aims to build on the fundamentals of flight dynamics and flight control and embellish these principles by assigning their relevance to the development of flight control systems in the aircraft industry. The book comprises 9 chapters and deals with the following subjects: industrial considerations for flight control; aircraft modelling; actuation systems; handling qualities; automatic flight control system design considerations; ground and flight testing of digital flight control systems; aeroservoelasticity; eigenstructure assignment applied to the design of an autopilot function for a civil aircraft; and H & infin; loop-shaping design for the VAAC Harrier
The Interpretation of Flying Qualities Requirements for Flight Control System Design Springer
A study was conducted to design an experimental flight test program for the Total In-Flight Simulator CTIFS) directed toward the interface between flying qualities requirements and flight control system design criteria. The eventual goal is to provide an interpretation or translation of flying qualities requirements for use by the flight control system designer. Specifically, an angle of attack and pitch rate command system matrix involving both short term and long term dynamics are specified for evaluation. A major objective of the research was to demonstrate that flying qualities criteria and flight control system configuration or architecture can be independent. Finally, additional configurations are proposed to evaluate the efficacy of dynamic decoupling.
Fault Tolerant Flight Control Springer Science & Business Media
With the increased use of electronics flight-control systems for better aircraft performance and cost-efectiveness, development and test techniques which can insure the integrity of such systems have become critically important. Rapid advances in solid-state electronics have permitted a hundred-fold decrease in control computer size, power and cost over the past two decades. Designers have capitalized on these gains primarily by

incorporating additional control functions to improve aircraft capabilities. Resulting control systems have become very complex and reliability requirements have mushroomed. This paper summarizes the evolution of these requirements, outlines the current status of flight control reliability, and hihglights promising methods of achieving integrity in future flight control systems. (Author).

Flight Dynamics Principles Springer

This report describes an evaluation and presents the test results of a Digital Hardware Voter/Monitor used as an input signal selector and fault detector when used in conjunction with an electro-hydraulic control system. The DHVM operated as intended by design although asynchronous operation caused the failure detection to be frequency dependent. A digital filter could be incorporated to reduce the frequency dependency of the failure detection circuitry. (Author).

Aerospace Flight Control Systems - Version 2

Written by leading experts in the field, this book provides the state-of-the-art in terms of fault tolerant control applicable to civil aircraft. The book consists of five parts and includes online material.

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