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Sommario/riassunto

This book will help students, control engineers and flight dynamics analysts to model and conduct sophisticated and systemic analyses of early flight vehicle designs controlled with multiple types of effectors and to design and evaluate new vehicle concepts in terms of satisfying mission and performance goals. Performance Evaluation and Design of

Flight Vehicle Control Systems begins by creating a dynamic model of a generic flight vehicle that includes a range of elements from airplanes and launch vehicles to re-entry vehicles and spacecraft. The models may include dynamic effects dealing with structural flexibility, as well as dynamic coupling between structures and actuators, propellant sloshing, and aeroelasticity, and they are typically used for control analysis and design. The book shows how to efficiently combine different types of effectors together, such as aero-surfaces, TVC, throttling engines and RCS, to operate as a system by developing a mixing logic matrix. Methods of trimming a vehicle controlled by multiple effectors are presented for calculating the effector positions required to balance the vehicle moments and forces. Flight vehicle performance, stability, and controllability are also evaluated along a trajectory in terms of performance parameters and by means of vector diagrams and contour plots. The book concludes with control design examples of two flight vehicles and a space station, accompanied by graphical methods for analysing vehicle performance. This book also presents: Adjustable equations of motion for various types of vehicles and modeling complexities. Mixing-Logic Algorithms for optimally combining different types of control effectors. Algorithms for developing dynamic models used to analyze system robustness. Control Design Methodologies and Algorithms.This book presents a unified approach in modeling, effector trimming, and combining multiple types of flight vehicle control effectors.