



Spacecraft Dynamics

Vladimir A. Chobotov



Spacecraft Dynamics:

Spacecraft Dynamics and Control Marcel J. Sidi, 1997 Satellites are used increasingly in telecommunications scientific research surveillance and meteorology and these satellites rely heavily on the effectiveness of complex onboard control systems This book explains the basic theory of spacecraft dynamics and control and the practical aspects of controlling a satellite The emphasis throughout is on analyzing and solving real world engineering problems For example the author discusses orbital and rotational dynamics of spacecraft under a variety of environmental conditions along with the realistic constraints imposed by available hardware

Spacecraft Dynamics and Control Anton H. de Ruiter, Christopher Damaren, James R. Forbes, 2012-12-05 Provides the basics of spacecraft orbital dynamics plus attitude dynamics and control using vectrix notation Spacecraft Dynamics and Control An Introduction presents the fundamentals of classical control in the context of spacecraft attitude control This approach is particularly beneficial for the training of students in both of the subjects of classical control as well as its application to spacecraft attitude control By using a physical system a spacecraft that the reader can visualize rather than arbitrary transfer functions it is easier to grasp the motivation for why topics in control theory are important as well as the theory behind them The entire treatment of both orbital and attitude dynamics makes use of vectrix notation which is a tool that allows the user to write down any vector equation of motion without consideration of a reference frame This is particularly suited to the treatment of multiple reference frames Vectrix notation also makes a very clear distinction between a physical vector and its coordinate representation in a reference frame This is very important in spacecraft dynamics and control problems where often multiple coordinate representations are used in different reference frames for the same physical vector Provides an accessible practical aid for teaching and self study with a layout enabling a fundamental understanding of the subject Fills a gap in the existing literature by providing an analytical toolbox offering the reader a lasting rigorous methodology for approaching vector mechanics a key element vital to new graduates and practicing engineers alike Delivers an outstanding resource for aerospace engineering students and all those involved in the technical aspects of design and engineering in the space sector Contains numerous illustrations to accompany the written text Problems are included to apply and extend the material in each chapter Essential reading for graduate level aerospace engineering students aerospace professionals researchers and engineers

Fundamental Spacecraft Dynamics and Control Weiduo Hu, 2015-11-02 An extensive text reference includes around an asteroid a new and important topic Covers the most updated contents in spacecraft dynamics and control both in theory and application Introduces the application to motion around asteroids a new and important topic Written by a very experienced researcher in this area

Spacecraft Dynamics and Control Yongchun Xie, Yongjun Lei, Jianxin Guo, Bin Meng, 2021-07-13 This book presents up to date concepts and design methods relating to space dynamics and control including spacecraft attitude control orbit control and guidance navigation and control GNC summarizing the research advances in control theory and methods and

engineering practice from Beijing Institute of Control Engineering over the years The control schemes and systems based on these achievements have been successfully applied to remote sensing satellites communication satellites navigation satellites new technology test satellites Shenzhou manned spacecraft Tianzhou freight spacecraft Tiangong 1 2 space laboratories Chang e lunar explorers and many other missions Further the research serves as a guide for follow up engineering developments in manned lunar engineering deep space exploration and on orbit service missions

Spacecraft Dynamics
Thomas R. Kane, Peter W. Likins, David A. Levinson, 1983 Good No Highlights No Markup all pages are intact Slight Shelfwear may have the corners slightly dented may have slight color changes slightly damaged spine *Flexible Spacecraft Dynamics, Control and Guidance* Leonardo Mazzini, 2015-10-27 This book is an up to date compendium on spacecraft attitude and orbit control AOC that offers a systematic and complete treatment of the subject with the aim of imparting the theoretical and practical knowledge that is required by designers engineers and researchers After an introduction on the kinematics of the flexible and agile space vehicles the modern architecture and functions of an AOC system are described and the main AOC modes reviewed with possible design solutions and examples The dynamics of the flexible body in space are then considered using an original Lagrangian approach suitable for the control applications of large space flexible structures Subsequent chapters address optimal control theory attitude control methods and orbit control applications including the optimal orbital transfer with finite and infinite thrust The theory is integrated with a description of current propulsion systems with the focus especially on the new electric propulsion systems and state of the art sensors and actuators

Spacecraft Dynamics and Control Enrico Canuto, Carlo Novara, Donato Carlucci, Carlos Perez-Montenegro, Luca Massotti, 2018-03-08 Spacecraft Dynamics and Control The Embedded Model Control Approach provides a uniform and systematic way of approaching space engineering control problems from the standpoint of model based control using state space equations as the key paradigm for simulation design and implementation The book introduces the Embedded Model Control methodology for the design and implementation of attitude and orbit control systems The logic architecture is organized around the embedded model of the spacecraft and its surrounding environment The model is compelled to include disturbance dynamics as a repository of the uncertainty that the control law must reject to meet attitude and orbit requirements within the uncertainty class The source of the real time uncertainty estimation prediction is the model error signal as it encodes the residual discrepancies between spacecraft measurements and model output The embedded model and the uncertainty estimation feedback noise estimator in the book constitute the state predictor feeding the control law Asymptotic pole placement exploiting the asymptotes of closed loop transfer functions is the way to design and tune feedback loops around the embedded model state predictor control law reference generator The design versus the uncertainty class is driven by analytic stability and performance inequalities The method is applied to several attitude and orbit control problems The book begins with an extensive introduction to attitude geometry and algebra and ends with the core themes state space

dynamics and Embedded Model Control Fundamentals of orbit attitude and environment dynamics are treated giving emphasis to state space formulation disturbance dynamics state feedback and prediction closed loop stability Sensors and actuators are treated giving emphasis to their dynamics and modelling of measurement errors Numerical tables are included and their data employed for numerical simulations Orbit and attitude control problems of the European GOCE mission are the inspiration of numerical exercises and simulations The suite of the attitude control modes of a GOCE like mission is designed and simulated around the so called mission state predictor Solved and unsolved exercises are included within the text and not separated at the end of chapters for better understanding training and application Simulated results and their graphical plots are developed through MATLAB Simulink code

Modern Spacecraft Dynamics and Control Marshall H. Kaplan, 2020-11-18 Topics include orbital and attitude maneuvers orbit establishment and orbit transfer plane rotation interplanetary transfer and hyperbolic passage lunar transfer reorientation with constant momentum attitude determination more Answers to selected exercises 1976 edition

Space Vehicle Dynamics and Control Bong Wie, 1998 A textbook that incorporates the latest methods used for the analysis of spacecraft orbital attitude and structural dynamics and control Spacecraft dynamics is treated as a dynamic system with emphasis on practical applications typical examples of which are the analysis and redesign of the pointing control system of the Hubble Space Telescope and the analysis of an active vibrations control for the COFS Control of Flexible Structures Mast Flight System In addition to the three subjects mentioned above dynamic systems modeling analysis and control are also discussed Annotation copyrighted by Book News Inc Portland OR

Chaos in Attitude Dynamics of Spacecraft Yanzhu Liu, Liqun Chen, 2013-04-13 Attitude dynamics is the theoretical basis of attitude control of spacecrafts in aerospace engineering With the development of nonlinear dynamics chaos in spacecraft attitude dynamics has drawn great attention since the 1990 s The problem of the predictability and controllability of the chaotic attitude motion of a spacecraft has a practical significance in astronautic science This book aims to summarize basic concepts main approaches and recent progress in this area It focuses on the research work of the author and other Chinese scientists in this field providing new methods and viewpoints in the investigation of spacecraft attitude motion as well as new mathematical models with definite engineering backgrounds for further analysis Professor Yanzhu Liu was the Director of the Institute of Engineering Mechanics Shanghai Jiao Tong University China Dr Liqun Chen is a Professor at the Department of Mechanics Shanghai University China

Spacecraft Dynamics as Related to Laboratory Experiments in Space, 1981

Spaceflight Dynamics William E. Wiesel, 1997 Designed for undergraduate courses in Spacecraft Dynamics and Orbital Mechanics this new edition offers a three dimensional treatment of dynamics discussions of rigid body dynamics rocket trajectories and the space environment An expert in his field author William E Wiesel presents a wealth of information in an easy to understand manner without the daunting mathematical rigor of graduate texts Reference is made to actual flight vehicles and satellites to give students background on the type of work currently being done in this field

Spacecraft

Dynamics as Related to Laboratory Experiments in Space George H. Fichtl, B. N. Antar, Frank G. Collins, 1981 The Control Handbook William S. Levine, 1996-02-23 This is the biggest most comprehensive and most prestigious compilation of articles on control systems imaginable Every aspect of control is expertly covered from the mathematical foundations to applications in robot and manipulator control Never before has such a massive amount of authoritative detailed accurate and well organized information been available in a single volume Absolutely everyone working in any aspect of systems and controls must have this book *Control System Applications* William S. Levine, 2018-10-24 Control technology permeates every aspect of our lives We rely on them to perform a wide variety of tasks without giving much thought to the origins of the technology or how it became such an important part of our lives Control System Applications covers the uses of control systems both in the common and in the uncommon areas of our lives From the everyday to the unusual it s all here From process control to human in the loop control this book provides illustrations and examples of how these systems are applied Each chapter contains an introduction to the application a section defining terms and references and a section on further readings that help you understand and use the techniques in your work environment Highly readable and comprehensive Control System Applications explores the uses of control systems It illustrates the diversity of control systems and provides examples of how the theory can be applied to specific practical problems It contains information about aspects of control that are not fully captured by the theory such as techniques for protecting against controller failure and the role of cost and complexity in specifying controller designs *Asteroid and Spacecraft Dynamics* COSPAR. Plenary Meeting, 1991 Scientific and Technical Aerospace Reports , 1993 *Essential Spaceflight Dynamics and Magnetospherics V*. Rauschenbakh, M. Y. Ovchinnikov, Susan M.P. McKenna-Lawlor, 2002-12-31 *Essential Spaceflight Dynamics and Magnetospherics* describes in the first instance some of the key aspects of celestial mechanics and spaceflight dynamics It begins with classical two and three body problems illustrative of the aesthetic aspects of applying analytical methods of investigation to celestial mechanics Then osculating orbital elements are introduced as well as analysis techniques sufficient to evaluate the influence of various disturbing forces on spacecraft Next a theory of manoeuvres is outlined and the methodology of making interplanetary trajectory corrections Ideas involving various approaches to orbital element determinations using measured data are also considered The forces applied to a spacecraft can result in the development of torques that influence attitude motion and the effects of the most important of these are described in terms of equilibrium positions periodic motions steady state and transient motions Also considered is the problem of attitude control of a spacecraft using active and or passive methods of orientation and stabilization In addition a more advanced treatment of the development of attitude control systems is provided **Dynamics and Control of Technical Systems** José Manoel Balthazar, Paulo Batista Gonçalves, Stefan Kaczmarczyk, André Fenili, Marcos Silveira, Ignacio Herrera Navarro, 2014-12-17 Special topic volume with invited peer reviewed papers only **Spacecraft Attitude Dynamics and Control** Vladimir A.

Chobotov, 2008 Presents the basic concepts methods and mathematical developments which are necessary to understand spacecraft attitude dynamics and control This book contains essential elements of kinematics rigid body dynamics linear control theory environmental effects and the theory of the stability of motion

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