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# Spacecraft Attitude Dynamics

**Marcel J. Sidi**



## **Spacecraft Attitude Dynamics:**

Spacecraft Attitude Dynamics Peter C. Hughes, 2012-05-23 Comprehensive coverage includes environmental torques energy dissipation motion equations for four archetypical systems orientation parameters illustrations of key concepts with on orbit flight data and typical engineering hardware 1986 edition      **Spacecraft Attitude Determination and Control** J.R. Wertz, 2012-12-06 Roger D Werking Head Attitude Determination and Control Section National Aeronautics and Space Administration Goddard Space Flight Center Extensive work has been done for many years in the areas of attitude determination attitude prediction and attitude control During this time it has been difficult to obtain reference material that provided a comprehensive overview of attitude support activities This lack of reference material has made it difficult for those not intimately involved in attitude functions to become acquainted with the ideas and activities which are essential to understanding the various aspects of spacecraft attitude support As a result I felt the need for a document which could be used by a variety of persons to obtain an understanding of the work which has been done in support of spacecraft attitude objectives It is believed that this book prepared by the Computer Sciences Corporation under the able direction of Dr James Wertz provides this type of reference This book can serve as a reference for individuals involved in mission planning attitude determination and attitude dynamics an introductory textbook for students and professionals starting in this field an information source for experimenters or others involved in spacecraft related work who need information on spacecraft orientation and how it is determined but who have neither the time nor the resources to pursue the varied literature on this subject and a tool for encouraging those who could expand this discipline to do so because much remains to be done to satisfy future needs      Fundamentals of Spacecraft Attitude Determination and Control F. Landis Markley, John L. Crassidis, 2014-05-31 This book explores topics that are central to the field of spacecraft attitude determination and control The authors provide rigorous theoretical derivations of significant algorithms accompanied by a generous amount of qualitative discussions of the subject matter The book documents the development of the important concepts and methods in a manner accessible to practicing engineers graduate level engineering students and applied mathematicians It includes detailed examples from actual mission designs to help ease the transition from theory to practice and also provides prototype algorithms that are readily available on the author's website Subject matter includes both theoretical derivations and practical implementation of spacecraft attitude determination and control systems It provides detailed derivations for attitude kinematics and dynamics and provides detailed description of the most widely used attitude parameterization the quaternion This title also provides a thorough treatise of attitude dynamics including Jacobian elliptical functions It is the first known book to provide detailed derivations and explanations of state attitude determination and gives readers real world examples from actual working spacecraft missions The subject matter is chosen to fill the void of existing textbooks and treatises especially in state and dynamics attitude determination MATLAB code of all examples will be provided through an

external website     **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     *Spacecraft Attitude Dynamics and Control* Vladimir A. Chobotov, 1991 Written for aerospace engineering courses of senior undergraduate or graduate level this work presents basic concepts methods and mathematical developments in spacecraft attitude dynamics and control Topics covered include rigid body dynamics environmental effects and linear control theory     *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 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 Attitude Dynamics and Control** Fabio Bacconi, 2006

**Spacecraft Attitude Control** Chuang Liu, Xiaokui Yue, Keke Shi, Zhaowei Sun, 2022-01-31 Spacecraft Attitude Control A Linear Matrix Inequality Approach solves problems for spacecraft attitude control systems using convex optimization and specifically through a linear matrix inequality LMI approach High precision pointing and improved robustness in the face of external disturbances and other uncertainties are requirements for the current generation of spacecraft This book presents an LMI approach to spacecraft attitude control and shows that all uncertainties in the maneuvering process can be solved numerically It explains how a model like state space can be developed through a mathematical presentation of attitude control systems allowing the controller in question to be applied universally The authors describe a wide variety of novel and robust controllers applicable both to spacecraft attitude control and easily extendable to second order systems Spacecraft Attitude Control provides its readers with an accessible introduction to spacecraft attitude control and robust systems giving an extensive survey of current research and helping researchers improve robust control performance Considers the control requirements of modern spacecraft Presents rigid and flexible spacecraft control systems with inherent uncertainties mathematically leading to a model like state space Develops a variety of novel and robust controllers directly applicable to spacecraft control as well as extendable to other second order systems Includes a systematic survey of recent research in spacecraft attitude control

**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

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