Satellite Orbits Models Methods And Applications With Cdrom Physics And Astronomy Online Library

The book describes the basic concepts of spaceflight operations, for both, human and unmanned missions. The basic subsystems of a space vehicle are explained in dedicated chapters, the relationship of spacecraft design and the very unique space environment are laid out. Flight dynamics are taught as well as ground segment requirements. Mission operations are divided into preparation including management aspects, execution and planning. Deep space missions and space robotic operations are included as special cases. The book is based on a course held at the German Space Operation Center (GSOC).

This book describes recent studies on modern control systems using various control techniques. The control systems cover large complex systems such as train operation systems to micro systems in nanotechnology. Various control trends and techniques are discussed from practically modern approaches such as Internet of Things, artificial neural networks, machine learning to theoretical approaches such as zero-placement, bang-bang, optimal control, predictive control, and fuzzy approach.

Teaching text developed by U.S. Air Force Academy and designed as a first course emphasizes the universal variable formulation. Develops the basic two-body and n-body equations of motion; orbit determination; classical orbital elements, coordinate transformations; differential correction; more. Includes specialized applications to lunar and interplanetary flight, example problems, exercises. 1971 edition.

Derelict satellites, equipment and other debris orbiting Earth (aka space junk) have been accumulating for many decades and could damage or even possibly destroy satellites and human spacecraft if they collide. During the past 50 years, various National Aeronautics and Space Administration (NASA) communities have contributed significantly to maturing meteoroid and orbital debris (MMOD) programs to their current state. Satellites have been redesigned to protect critical components from MMOD damage by moving critical components from exterior surfaces to deep inside a satellite's structure. Orbits are monitored and altered to minimize the risk of collision with tracked orbital debris. MMOD shielding added to the International Space Station (ISS) protects critical components and astronauts from potentially catastrophic damage that might result from smaller, untracked debris and meteoroid impacts. Limiting Future Collision Risk to Spacecraft: An Assessment of NASA's Meteoroid and Orbital Debris Program examines NASA's efforts to understand the meteoroid and orbital debris environment, identifies what NASA is and is not doing to mitigate the risks posed by this threat, and makes recommendations as to how they can improve their programs. While the report identified many positive aspects of NASA's MMOD programs and efforts including responsible use of resources, it recommends that the agency develop a formal strategic plan that provides the basis for prioritizing the allocation of funds and effort over various MMOD program needs. Other necessary steps include improvements in long-term modeling, better measurements, more regular updates of the debris environmental models, and other actions to better characterize the long-term evolution of the debris environment.

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.

This Handbook 0/ Geostationary Orbits is in principle an extension of the Introduction to Geostationary Orbits that was printed as a special publica tion by the European Space Agency (ESA) in 1983. The immediate purpose was to provide the theoretical background and some practical advice for the orbit control of geostationary spacecraft by means of the software package "PEPSOC". PEPSOC, short for "Portable ESOC Package for Synchronous Orbit Con trol" , was produced by the European Space Operations Centre (ESOC) to support spacecraft operations in the routine phase. The resulting publication was a handbook for engineers and spacecraft operators, rather than a clas sical textbook in celestial mechanics. During the past eleven years, the software system PEPSOC has found a wide application both within and outside the ESA member states. At the same time, the original Introduction found numerous readers also outside the group of PEPSOC operators. The continuing development and the in creasing use of the geostationary orbit has now created the need for a new, more detailed publication to include new aspects that have emerged. The present Handbook contains several additional subjects and more math ematics to describe the methods applied in PEPSOC. The geophysical and astronomical parameters have been updated to reflect the latest recom mended values. This results in small deviations of the numerical data compared to the Introduction.

Presents new algorithms for determining orbits; ideal for graduate students and researchers in applied mathematics, physics, astronomy and aerospace engineering.

Since the beginning of space flight, the collision hazard in Earth orbit has increased as the number of artificial objects orbiting the Earth has grown. Spacecraft performing communications, navigation, scientific, and other missions now share Earth orbit with spent rocket bodies, nonfunctional spacecraft, fragments from spacecraft breakups, and other debris created as a byproduct of space operations. Orbital Debris examines the methods we can use to characterize orbital debris, estimates the magnitude of the debris population, and assesses the hazard that this population poses to spacecraft. Potential methods to protect spacecraft are explored. The report also takes a close look at the projected future growth in the debris population and evaluates approaches to reducing that growth. Orbital Debris offers clear recommendations for targeted research on the debris population, for methods to improve the protection of spacecraft, on methods to reduce the creation of debris in the future, and much more.

The contribution of Satellite Laser Ranging (SLR) to the definition of the origin of the reference frame (geocenter coordinates), the global scale, and low degree coefficients of the Earth's gravity field is essential due to the remarkable orbit stability of geodetic satellites and the accuracy of laser observations at a level of a few millimeters. Considering these aspects, SLR has an exceptional potential in establishing global networks and deriving geodetic parameters of the supreme quality. SLR faces today the highest requirements of the Global Geodetic Observing System (GGOS) yielding 1 mm of long-term station coordinate and 0.1 mm/y of station velocity stability. The goal of this work is to assess the contribution of the latest models and corrections to the SLR-derived parameters, to enhance the quality and reliability of the SLR-derived products, and to propose a new approach of orbit parameterization for low orbiting geodetic satellites. The impact of orbit perturbations is studied in detail, including perturbing forces of gravitational origin (Earth's gravity field, ocean and atmosphere tides) and perturbing forces of non-gravitational origin (atmospheric drag, the Yarkovsky effect, albedo and Earth's infrared radiation pressure). A multi-satellite combined solution is obtained using SLR observations to LAGEOS-1, LAGEOS-2, Starlette, Stella, and AJISAI. The quality of the SLR-derived parameters from the combined solution is compared with external solutions. The Earth rotation parameters are compared to the IERS-08-C04 series and the GNSS-derived series, whereas the time variable Earth's gravity field coefficients are compared to the CHAMP and GRACE-derived results.

The Dynamics of Natural Satellites of the Planets is an accessible reference for understanding the celestial mechanics of planetary moons through the lens of both theory and observation. Based on decades of research by the author, the book utilizes state-of-the-art observations of the natural satellites in the solar system to establish models, measurements and calculations to better understand the theory of the satellite movement and dynamics. It presents an extensive set of study methods and results on the motion of natural satellites of the planets and includes reviews and references to related publication for further explanation. By relating observations to numerical theory, the book serves as a quick and comprehensive reference for applying the theory of orbital dynamics to observational data on orbits and physical properties of the natural satellites in order to formulate state-of-the-art explanations and models, particularly for determining the parameters of satellite motion. Combines astronomy and celestial mechanics, providing astrometric data from observations to inform methods and models for predicting natural satellite dynamics Includes both theory and observation in one place and presents new models based on observations Organized into small sections, each providing specific measurements, calculations or models, making it a quick and comprehensive reference

Get up to speed on GNSS for mobile applications with this practical guide, including step-by-step algorithms and key methods for future systems.

Orbital Mechanics for Engineering Students, Second Edition, provides an introduction to the basic concepts of space mechanics.

These include vector kinematics in three dimensions; Newton's laws of motion and gravitation; relative motion; the vector-based solution of the classical two-body problem; derivation of Kepler's equations; orbits in three dimensions; preliminary orbit determination; and orbital maneuvers. The book also covers relative motion and the two-impulse rendezvous problem; interplanetary mission design using patched conics; rigid-body dynamics used to characterize the attitude of a space vehicle; satellite attitude dynamics; and the characteristics and design of multi-stage launch vehicles. Each chapter begins with an outline of key concepts and concludes with problems that are based on the material covered. This text is written for undergraduates who are studying orbital mechanics for the first time and have completed courses in physics, dynamics, and mathematics, including differential equations and applied linear algebra. Graduate students, researchers, and experienced practitioners will also find useful review materials in the book. NEW: Reorganized and improved discusions of coordinate systems, new discussion on perturbations and quarternions NEW: Increased coverage of attitude dynamics, including new Matlab algorithms and examples in chapter 10 New examples and homework problems

In February 2009, the commercial communications satellite Iridium 33 collided with the Russian military communications satellite Cosmos 2251. The collision, which was not the first recorded between two satellites in orbit--but the most recent and alarming--produced thousands of pieces of debris, only a small percentage of which could be tracked by sensors located around the world. In early 2007, China tested a kinetic anti-satellite weapon against one of its own satellites, which also generated substantial amounts of space debris. These collisions highlighted the importance of maintaining accurate knowledge, and the associated uncertainty, of the orbit of each object in space. These data are needed to predict close approaches of space objects and to compute the probability of collision so that owners/operators can decide whether or not to make a collision avoidance maneuver by a spacecraft with such capability. The space object catalog currently contains more than 20,000 objects, and when the planned space fence radar becomes operational this number is expected to exceed 100,000. A key task is to determine if objects might come closer to each other, an event known as "conjunction," and the probability that they might collide. The U.S. Air Force is the primary U.S. government organization tasked with maintaining the space object catalog and data on all space objects. This is a complicated task, involving collecting data from a multitude of different sensors-many of which were not specifically designed to track orbiting objects-and fusing the tracking data along with other data, such as data from atmospheric models, to provide predictions of where objects will be in the future. The Committee for the Assessment of the U.S. Air Force's Astrodynamic Standards collected data and heard from numerous people involved in developing and maintaining the current astrodynamics standards for the Air Force Space Command (AFSPC), as well as representatives of the user community, such as NASA and commercial satellite owners and operators. Preventing collisions of space objects, regardless of their ownership, is in the national security interested of the United States. Continuing Kepler's Quest makes recommendations to the AFSPC in order for it to create and expand research programs, design and develop hardware and software, as well as determine which organizations to work with to achieve its goals.

Fifty years after Sputnik, artificial satellites have become indispensable monitors in many areas, such as economics, meteorology, telecommunications, navigation and remote sensing. The specific orbits are important for the proper functioning of the satellites. This book discusses the great variety of satellite orbits, both in shape (circular to highly elliptical) and properties (geostationary, Sun-synchronous, etc.). This volume starts with an introduction into geodesy. This is followed by a presentation of the fundamental equations of mechanics to explain and demonstrate the properties for all types of orbits. Numerous examples are included, obtained through IXION software developed by the author. The book also includes an exposition of the historical background that is necessary to help the reader understand the main stages of scientific thought from Kepler to GPS. This book is intended for researchers, teachers and students working in the field of satellite technology. Engineers, geographers and all those involved in space exploration will find this information valuable. Michel Capderou’s book is an essential treatise in orbital mechanics for all students, lecturers and practitioners in this field, as well as other aerospace systems engineers. —Charles Elachi, Director, NASA Jet Propulsion Laboratory

Satellite OrbitsModels, Methods and ApplicationsSpringer Science & Business Media

Statistical Orbit Determination presents fundmentals of orbit determination--from weighted least squares approaches (Gauss) to today's high-speed computer algorithms that provide accuracy within a few centimeters. Numerous examples and problems are provided to enhance readers' understanding of the material. Covers such topics as coordinate and time systems, square root filters, process noise techniques, and the use of fictitious parameters for absorbing un-modeled and incorrectly modeled forces acting on a satellite. Examples and exercises serve to illustrate the principles throughout each chapter.

This book explains the basic principles of satellite navigation technology with the bare minimum of mathematics and without complex equations. It helps you to conceptualize the underlying theory from first principles, building up your knowledge gradually using practical demonstrations and worked examples. A full range of MATLAB simulations is used to visualize concepts and solve problems, allowing you to see what happens to signals and systems with different configurations. Implementation and applications are discussed, along with some special topics such as Kalman Filter and Ionosphere. With this book you will learn: How a satellite navigation system works How to improve your efficiency when working with a satellite navigation system How to use MATLAB for simulation, helping to visualize concepts Various possible implementation approaches for the technologyThe most significant applications of satellite navigation systems Teaches the fundamentals of satellite navigation systems, using MATLAB as a visualization and problem solving tool Worked out numerical problems are provided to aid practical understanding On-line support provides MATLAB scripts for simulation exercises and MATLAB based solutions, standard algorithms, and PowerPoint slides

Aimed at engineering students and professionals working in the field of mechanics of space flight, this book examines space tether systems – one of the most forward-thinking directions of modern astronautics. The main advantage of this technology is the simplicity, profitability and ecological compatibility: space tethers allow the execution of various manoeuvers in orbit without costs of jet fuel due to the use of gravitational and electromagnetic fields of the Earth. This book will acquaint the reader with the modern state of the space tether's dynamics, with specific attention on the research projects of the nearest decades. This book presents the most effective mathematical models and the methods used for the analysis and prediction of space tether systems' motion; attention is also given to the influence of the tether on spacecraft's motion, to emergencies and chaotic modes. Written by highly qualified experts with practical experience in both the fields of mechanics of space flight, and in the teaching Contains detailed descriptions of mathematical models and methods, and their features, that allow the application of the material of the book to the decision of concrete practical tasks New approaches to the decision of problems of space flight mechanics are offered, and new problems are posed Spacecraft Collision Avoidance Technology presents the theory and practice of space collision avoidance. The title gives models of time and space environment, their impact on high-precision orbit prediction, considers optimal orbit determination methods and models in different warning stages, and establishes basic models for warning and avoidance. Chapters present an outline of spacecraft collision warning strategy, elaborate on the basics of orbital calculation for collision avoidance, consider space object detection technology, detail space environment and object orbit, give a method for spacecraft collision warning orbit calculation, and finally, demonstrate a strategy for spacecraft collision warning and avoidance. Presents strategies, methods and real-world examples relating to space collision avoidance Considers time and space environment models in orbit prediction Gives optimal orbit determination methods and models for various warning stages Establishes and elaborates basic models for warning and avoidance Takes note of the current space environment for object detection and collision avoidance

This volume is designed as an introductory text and reference book for graduate students, researchers and practitioners in the fields of astronomy, astrodynamics, satellite systems, space sciences and astrophysics. The purpose of the book is to emphasize the similarities between celestial mechanics and astrodynamics, and to present recent advances in these two fields so that the reader can understand the inter-relations and mutual influences. The juxtaposition of celestial mechanics and astrodynamics is a unique approach that is expected to be a refreshing attempt to discuss both the mechanics of space flight and the dynamics of celestial objects. "Celestial Mechanics and Astrodynamics: Theory and Practice" also presents the main challenges and future prospects for the two fields in an elaborate, comprehensive and rigorous manner. The book presents homogenous and fluent discussions of the key problems, rendering a portrayal of recent advances in the field together with some basic concepts and essential infrastructure in orbital mechanics. The text contains introductory material followed by a gradual development of ideas interweaved to yield a coherent presentation of advanced topics.

For over half a century, an increasing number of satellites have fragmented in orbit, creating a large amount of hazardous orbital debris which threaten the safety of useful functioning satellites and space missions. This book discusses the theory behind these fragmentations followed by studies of actual cases.The book begins with a survey of satellite fragmentations in orbit and the consequent formation of orbital debris in chronological order. Next, the fundamental physical processes underlying satellite fragmentations are outlined and the methods of analyzing satellite fragmentations presented. The rest of the book presents analyses of the major satellite fragmentation events including accidental and intentional breakups, those due to explosions and collisions, as well as those belonging to the unknown category.

Modern Orbit Determination is an introduction to the applications of estimation theory to orbit determination. Beginning with the deterministic point of view, the author moves towards the more modern stochastic viewpoint. The fact that the degree of determinism present is an engineering decision is emphasized.

Roger D. Werking Head, Attitude Determination and Control Section National Aeronautics and Space Administration/ Goddard Space Flight Center Extensiye 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 stu dents and professionals starting in this field; an information source for experimen ters 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.

This textbook covers fundamental and advanced topics in orbital mechanics and astrodynamics to expose the student to the basic dynamics of space flight. The engineers and graduate students who read this class-tested text will be able to apply their knowledge to mission design and navigation of space missions. Through highlighting basic, analytic and computer-based methods for designing interplanetary and orbital trajectories, this text provides excellent insight into astronautical techniques and tools. This book is ideal for graduate students in Astronautical or Aerospace Engineering and related fields of study, researchers in space industrial and governmental research and development facilities, as well as researchers in astronautics. This book also: · Illustrates all key concepts with examples · Includes exercises for each chapter · Explains concepts and engineering tools a student or experienced engineer can apply to mission design and navigation of space missions · Covers fundamental principles to expose the student to the basic dynamics of space flight

The investigation of minor solar system bodies, such as comets and asteroids, using spacecraft requires an understanding of orbital motion in strongly perturbed environments. The solutions to a wide range of complex and challenging problems in this field are reviewed in this comprehensive and authoritative work.

Satellite positioning techniques, particularly global navigation satellite systems (GNSS), are capable of measuring small changes of the Earths shape and atmosphere, as well as surface characteristics with an unprecedented accuracy. This book is devoted to presenting recent results and development in satellite positioning technique and applications, including GNSS positioning methods, models, atmospheric sounding, and reflectometry as well their applications in the atmosphere, land, oceans and cryosphere. This book provides a good reference for satellite positioning techniques, engineers, scientists as well as user community.

This modern presentation guides readers through the theory and practice of satellite orbit prediction and determination. Starting from the basic principles of orbital mechanics, it covers elaborate force models as well as precise methods of satellite tracking. The accompanying CD-ROM includes source code in C++ and relevant data files for applications. The result is a powerful and unique spaceflight dynamics library, which allows users to easily create software extensions. An extensive collection of frequently updated Internet resources is provided through WWW hyperlinks.

Newton's laws of motion and his universal law of gravitation described mathematically the motion of two bodies undergoing mutual gravitational attraction. However, it is impossible to solve analytically the equation of motion for three gravitationally interacting bodies. This book discusses some techniques used to obtain numerical solutions of the equations of motion for planets and satellites, which are of fundamental importance to solar-system dynamicists and to those involved in planning the orbits of artificial satellites. The first part introduces the classical two-body problem and solves it by rigorously developing the six integrals of the motion, starting from Newton's three laws of motion and his law of gravitation and then using vector algebra to develop the integrals. The various forms of the solution flow naturally from the integrals. In the second part, several modern perturbation techniques are developed and applied to cases of practical importance. For example, the perturbed two-body problem for an oblate planet or for a nonsymmetric rotating planet is considered, as is the effect of drag on a satellite. The two-body problem is regularized, and the nonlinear differential equation is thereby transformed to a linear one by further embedding several of the integrals. Finally, a brief sketch of numerical methods is given, as the perturbation equations must be solved by numerical rather than by analytical methods.

This long-awaited new edition of Montenbruck and Pfleger's successful book now includes chapters on perturbation calculations and on the calculation of physical ephemerides of the major planets and the sun. The book provides the reader with numerous programs and instructions for time and date calculation and for treating the two-body problem. Each chapter is carefully structured according to topic and closes with the listing of a relevant program, thereby facilitating its use as a practical handbook. The necessary astronomical and numerical fundamentals are also included in the text. The accompanying diskette has equally been completely revised.

This book chiefly addresses the analysis and design of geosynchronous synthetic aperture radar (GEO SAR) systems, focusing on the algorithms, analysis, methods used to compensate for ionospheric influences, and validation experiments for Global Navigation Satellite Systems (GNSS). Further, it investigates special problems in the GEO SAR context, such as curved trajectories, the Earth’s rotation, the ‘non-stop-and-go’ model, high-order Doppler parameters, temporal-variant ionospheric errors etc. These studies can also be extended to SAR with very high resolution and long integration time. Given the breadth and depth of its coverage, scientists and engineers in SAR and advanced graduate students in related areas will greatly benefit from this book.

In recent years, an unprecedented interest in novel and revolutionary space missions has risen out of the advanced NASA and ESA programs. Astrophysicists, astronomers, space systems engineers, mathematicians and scientists have been cooperating to implement novel and ground-breaking space missions. Recent progress in mathematical dynamics has enabled development of specialised spacecraft orbits and propulsion systems. Recently, the concept of flying spacecraft in formation has gained a lot of interest within the community. These progresses constitute the background to a significant renaissance of research dealing with astrodynamics and its applications. Modern Astrodynamics is designed as a stepping stone for the exposition of modern astrodynamics to students, researchers, engineers and scientists. This volume will present the main constituents of the astrodynamical science in an elaborate, comprehensive and rigorous manner. Although the volume will contain a few distinct chapters, it will render a coherent portrayal of astrodynamics. Encompasses the main constituents of the astrodynamical sciences in an elaborate, comprehensive and rigorous manner Presents recent astrodynamical advances and describes the challenges ahead The first volume of a series designed to give scientists and engineers worldwide an opportunity to publish their works in this multi-disciplinary field

This Handbook presents a complete and rigorous overview of the fundamentals, methods and applications of the multidisciplinary field of Global Navigation Satellite Systems (GNSS), providing an exhaustive, one-stop reference work and a state-of-the-art description of GNSS as a key technology for science and society at large. All global and regional satellite navigation systems, both those currently in operation and those under development (GPS, GLONASS, Galileo, BeiDou, QZSS, IRNSS/NAVIC, SBAS), are examined in detail. The functional principles of receivers and antennas, as well as the advanced algorithms and models for GNSS parameter estimation, are rigorously discussed. The book covers the broad and diverse range of land, marine, air and space applications, from everyday GNSS to high-precision scientific applications and provides detailed descriptions of the most widely used GNSS format standards, covering receiver formats as well as IGS product and meta-data formats. The full coverage of the field of GNSS is presented in seven parts, from its fundamentals, through the treatment of global and regional navigation satellite systems, of receivers and antennas, and of algorithms and models, up to the broad and diverse range of applications in the areas of positioning and navigation, surveying, geodesy and geodynamics, and remote sensing and timing. Each chapter is written by international experts and amply illustrated with figures and photographs, making the book an invaluable resource for scientists, engineers, students and institutions alike.

Spacecraft attitude maneuvers comply with Euler's moment equations, a set of three nonlinear, coupled differential equations. Nonlinearities complicate the mathematical treatment of the seemingly simple action of rotating, and these complications lead to a robust lineage of research. This book is meant for basic scientifically inclined readers, and commences with a chapter on the basics of spaceflight and leverages this remediation to reveal very advanced topics to new spaceflight enthusiasts. The topics learned from reading this text will prepare students and faculties to investigate interesting spaceflight problems in an era where cube satellites have made such investigations attainable by even small universities. It is the fondest hope of the editor and authors that readers enjoy this book.

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.

Satellite Orbits -Models, Methods, and Applications has been written as a compre hensive textbook that guides the reader through the theory and practice of satellite orbit prediction and determination. Starting from the basic principles of orbital mechanics, it covers elaborate force models as weH as precise methods of satellite tracking and their mathematical treatment. A multitude of numerical algorithms used in present-day satellite trajectory computation is described in detail, with proper focus on numerical integration and parameter estimation. The wide range of levels provided renders the book suitable for an advanced undergraduate or gradu ate course on spaceflight mechanics, up to a professional reference in navigation, geodesy and space science. Furthermore, we hope that it is considered useful by the increasing number of satellite engineers and operators trying to obtain a deeper understanding of flight dynamics. The idea for this book emerged when we realized that documentation on the methods, models and tools of orbit determination was either spread over numerous technical and scientific publications, or hidden in software descriptions that are not, in general, accessible to a wider community. Having worked for many years in the field of spaceflight dynamics and satellite operations, we tried to keep in c10se touch with questions and problems that arise during daily work, and to stress the practical aspects of orbit determination. Nevertheless, our interest in the underlying physics motivated us to present topics from first principles, and make the book much more than just a cookbook on spacecraft trajectory computation.