Strapdown Inertial Navigation Technology 2nd Edition By David Titterton

This book covers all aspects of inertial navigation systems (INS), including the sensor technology and the estimation of instrument errors, as well as their integration with the Global Positioning System (GPS) for geodetic applications. Complete mathematical derivations are given. Both stabilized and strapdown mechanizations are treated in detail. Derived algorithms to process sensor data and a comprehensive explanation of the error dynamics provide not only an analytical understanding but also a practical implementation of the concepts. A self-contained description of GPS, with emphasis on kinematic applications, is one of the highlights in this book. The text is of interest to geodesists, including surveyors, mappers, and photogrammetrists; to engineers in aviation, navigation, guidance, transportation, and robotics; and to scientists involved in aerogeophysics and remote sensing.
A bottom-up approach that enables readers to master and apply the latest techniques in state estimation This book offers the best mathematical approaches to estimating the state of a general system. The author presents state estimation theory clearly and rigorously, providing the right amount of advanced material, recent research results, and references to enable the reader to apply state estimation techniques confidently across a variety of fields in science and engineering. While there are other textbooks that treat state estimation, this one offers special features and a unique perspective and pedagogical approach that speed learning: * Straightforward, bottom-up approach begins with basic concepts and then builds step by step to more advanced topics for a clear understanding of state estimation * Simple examples and problems that require only paper and pen to solve lead to an intuitive understanding of how theory works in practice * MATLAB(r)-based source code that corresponds to examples in the book, available on the author's Web site, enables readers to recreate results and experiment with other simulation setups and parameters Armed with a solid foundation in the basics, readers are presented with a careful treatment of advanced topics, including unscented filtering, high order nonlinear filtering, particle filtering, constrained state estimation, reduced order filtering, robust Kalman filtering, and mixed Kalman/H? filtering. Problems at the end of each chapter include both written exercises and computer exercises. Written exercises focus on improving the reader's understanding of theory and key concepts, whereas computer exercises help readers apply theory to problems similar to ones they are likely to encounter in industry. With its expert blend of theory and practice, coupled with its presentation of recent research results, Optimal State Estimation is strongly recommended for undergraduate and graduate-level courses in optimal control and state estimation theory. It also serves as a reference for engineers and science professionals across a wide array of industries.
Fundamentals of Inertial Navigation, Satellite-based Positioning and their Integration is an introduction to the field of Integrated Navigation Systems. It serves as an excellent reference for working engineers as well as textbook for beginners and students new to the area. The book is easy to read and understand with minimum background knowledge. The authors explain the derivations in great detail. The intermediate steps are thoroughly explained so that a beginner can easily follow the material. The book shows a step-by-step implementation of navigation algorithms and provides all the necessary details. It provides detailed illustrations for an easy comprehension. The book also demonstrates real field experiments and in-vehicle road test results with professional discussions and analysis. This work is unique in discussing the different INS/GPS integration schemes in an easy to understand and straightforward way. Those schemes include loosely vs tightly coupled, open loop vs closed loop, and many more.
Compiled by leading authorities, Aerospace Navigation Systems is a compendium of chapters that present modern aircraft and spacecraft navigation methods based on up-to-date inertial, satellite, map matching and other guidance techniques. Ranging from the practical to the theoretical, this book covers navigational applications over a wide range of aerospace vehicles including aircraft, spacecraft and drones, both remotely controlled and operating as autonomous vehicles. It provides a comprehensive background of fundamental theory, the utilisation of newly-developed techniques, incorporates the most complex and advanced types of technical innovation currently available and presents a vision for future developments. Satellite Navigation Systems (SNS), long range navigation systems, short range navigation systems and navigational displays are introduced, and many other detailed topics include Radio Navigation Systems (RNS), Inertial Navigation Systems (INS), Homing Systems, Map Matching and other correlated-extremalsystems, and both optimal and sub-optimal filtering in integrated navigation systems.
Design Cutting-Edge Aided Navigation Systems for Advanced Commercial & Military Applications Aided Navigation is a design-oriented textbook and guide to building aided navigation systems for smart cars, precision farming vehicles, smart weapons, unmanned aircraft, mobile robots, and other advanced applications. The navigation guide contains two parts explaining the essential theory, concepts, and tools, as well as the methodology in aided navigation case studies with sufficient detail to serve as the basis for application-oriented analysis and design. Filled with detailed illustrations and examples, this expert design tool takes you step-by-step through coordinate systems, deterministic and stochastic modeling, optimal estimation, and navigation system design. Authoritative and comprehensive, Aided Navigation features: End-of-chapter exercises throughout Part I In-depth case studies of aided navigation systems Numerous Matlab-based examples Appendices define notation, review linear algebra, and discuss GPS receiver interfacing Source code and sensor data to support examples is available through the publisher-supported website Inside this Complete Guide to Designing Aided Navigation Systems • Aided Navigation Theory: Introduction to Aided Navigation • Coordinate Systems • Deterministic Modeling • Stochastic Modeling • Optimal Estimation • Navigation System Design • Navigation Case Studies: Global Positioning System (GPS) • GPS-Aided Encoder • Attitude and Heading Reference System • GPS-Aided Inertial Navigation System (INS) • Acoustic Ranging and Doppler-Aided INS
Out-of-print for years, this highly sought-after volume, remains the most popular reference on inertial navigation systems analysis. Finally, this classic book is back in print and readily available only from Artech House. Authored by a pioneer in the field, this authoritative resource focuses on terrestrial navigation, but is also useful for air and sea applications. Packed with valuable, time-saving equations and models, the book helps engineers design optimal navigation systems by comparing the performance of the various types of system mechanizations. Although applications and technology have changed over the years, this book remains the best source for fundamental inertial navigation system knowledge, from notational conventions, reference frames, and geometry of the earth, to unified error analysis, self-alignment techniques, and the development of a system error model. This well-illustrated, timeless reference belongs on the shelf of every practicing engineer working in this area.
With GPS and INS hardware becoming ever smaller and less expensive, innovative opportunities for commercial navigation systems are everywhereÑand continue to arise. Integrated GPS/INS systems have some real advantages, in terms of output rate, reliability, and accuracy. The Global Positioning System and Inertial Navigation is the first-ever reference to provide engineers and

scientists with a detailed, top-to-bottom look at GPS and INS in a single volume. This in-depth text provides navigation system designers comprehensive and accurate coverage of such topics as coordinate frames and transformations, Kalman filtering techniques, navigation system performance analysis, GPS receiver ephemeris and pseudo-range processing, differential GPS, carrier phase processing, and attitude determination. Extensively cross-referenced to the literature on advanced navigation system design, this superb engineering reference is ideal for navigation systems designers, analysts, and project managers.

Many embedded engineers and programmers who need to implement basic process or motion control as part of a product design do not have formal training or experience in control system theory. Although some projects require advanced and very sophisticated control systems expertise, the majority of embedded control problems can be solved without resorting to heavy math and complicated control theory. However, existing texts on the subject are highly mathematical and theoretical and do not offer practical examples for embedded designers. This book is different;it presents mathematical background with sufficient rigor for an engineering text, but it concentrates on providing practical application examples that can be used to design working systems, without needing to fully understand the math and high-level theory operating behind the scenes. The author, an engineer with many years of experience in the application of control system theory to embedded designs, offers a concise presentation of the basics of control theory as it pertains to an embedded environment. Practical, down-to-earth guide teaches engineers to apply practical control theorems without needing to employ rigorous math Covers the latest concepts in control systems with embedded digital controllers

This book introduces readers to the fundamentals of estimation and dynamical system theory, and their applications in the field of multi-source information fused autonomous navigation for spacecraft. The content is divided into two parts: theory and application. The theory part (Part I) covers the mathematical background of navigation algorithm design, including parameter and state estimate methods, linear fusion, centralized and distributed fusion, observability analysis, Monte Carlo technology, and linear covariance analysis. In turn, the application part (Part II) focuses on autonomous navigation algorithm design for different phases of deep space missions, which involves multiple sensors, such as inertial measurement units, optical image sensors, and pulsar detectors. By concentrating on the relationships between estimation theory and autonomous navigation systems for spacecraft, the book bridges the gap between theory and practice. A wealth of helpful formulas and various types of estimators are also included to help readers grasp basic estimation concepts and offer them a ready-reference guide.

The subject of integrated navigation systems covered in this book is designed for those directly involved with the design, integration, and test and evaluation of navigation systems. It is assumed that the reader has a background in mathematics, including calculus. Integrated navigation systems are the combination of an onboard navigation solution (position, velocity, and attitude) and independent navigation data (aids to navigation) to update or correct navigation solutions. In this book, this combination is accomplished with Kalman filter algorithms.

An updated guide to GNSS and INS, and solutions to real-world GPS/INS problems with Kalman filtering Written by recognized authorities in the field, this second edition of a landmark work provides engineers, computer scientists, and others with a working familiarity with the theory and contemporary applications of Global Navigation Satellite Systems (GNSS), Inertial Navigational Systems (INS), and Kalman filters. Throughout, the focus is on solving real-world problems, with an emphasis on the effective use of state-of-the-art integration techniques for those systems, especially the application of Kalman filtering. To that end, the authors explore the various subtleties, common failures, and inherent limitations of the theory as it applies to real-world situations, and provide numerous detailed application examples and practice problems, including GNSS-aided INS, modeling of gyros and accelerometers, and SBAS and GBAS. Drawing upon their many years of experience with GNSS, INS, and the Kalman filter, the authors present numerous design and implementation techniques not found in other professional references. This Second Edition has been updated to include: GNSS signal integrity with SBAS Mitigation of multipath, including results Ionospheric delay estimation with Kalman filters New MATLAB programs for satellite position determination using almanac and ephemeris data and ionospheric delay calculations from single and dual frequency data New algorithms for GEO with L1 /L5 frequencies and clock steering Implementation of mechanization equations in numerically stable algorithms To enhance comprehension of the subjects covered, the authors have included software in MATLAB, demonstrating the working of the GNSS, INS, and filter algorithms. In addition to showing the Kalman filter in action, the software also demonstrates various practical aspects of finite word length arithmetic and the need for alternative algorithms to preserve result accuracy.

This thesis develops next-generation multi-degree-of-freedom gyroscopes and inertial measurement units (IMU) using micro-electromechanical-systems (MEMS) technology. It covers both a comprehensive study of the physics of resonator gyroscopes and novel micro/nano-fabrication solutions to key performance limits in MEMS resonator gyroscopes. Firstly, theoretical and experimental studies of physical phenomena including mode localization, nonlinear behavior, and energy dissipation provide new insights into challenges like quadrature errors and flicker noise in resonator gyroscope systems. Secondly, advanced designs and micro/nano-fabrication methods developed in this work demonstrate valuable applications to a wide range of MEMS/NEMS devices. In particular, the HARPSS+ process platform established in this thesis features a novel slanted nano-gap transducer, which enabled the first wafer-level-packaged single-chip IMU prototype with co-fabricated high-frequency resonant triaxial gyroscopes and high-bandwidth triaxial micro-gravity accelerometers. This prototype demonstrates performance amongst the highest to date, with unmatched robustness and potential for flexible substrate integration and ultra-low-power operation. This thesis shows a path toward future low-power IMU-based applications including wearable inertial sensors, health informatics, and personal inertial navigation.

The objective of this book is to provide you the reader a complete systems engineering treatment of GNSS. I am an expert with practical experience in GPS/GNSS design and similar areas that are addressed within the book. I provide a thorough, in-depth treatment of each topic. In this book, updated information on GPS and GLONASS is presented. In

particular, descriptions of new satellites, such as GPS III and GLONASS K2 and their respective signal sets (e.g., GPS III L1C and GLONASS L3OC), are included. In this combined volume I provide in-depth technical descriptions of each emerging satellite navigation system: BeiDou, Galileo, QZSS, and NavIC. Dedicated chapters cover each system's constellation configuration, satellites, ground control system and user equipment. Detailed satellite signal characteristics are also provided. Recently, I've heard from many engineers that they learned how GPS receivers work from this title. In this title, the design is included, and treatment of receivers is updated and expanded in several important ways. New material has been added on important receiver components, such as antennas and front-end electronics. The increased complexity of multiconstellation, multifrequency receivers, which are rapidly becoming the norm today, is addressed in detail. Other added features of this title are the clear step-by-step design process and associated trades required to develop a GNSS receiver, depending on the specific receiver application. This subject will be of great value to those readers who need to understand these concepts, either for their own design tasks or to aid their satellite navigation system engineering knowledge. To round out the discussion of receivers, updated treatments of interference, ionospheric scintillation, and multipath are provided along with new material on blockage from foliage, terrain, and man-made structures. Now there has been major developments in GNSS augmentations, including differential GNSS (DGNSS) systems, Precise Point Positioning (PPP) techniques, and the use of external sensors/networks. The numerous deployed or planned satellite-based augmentation system (SBAS) networks are detailed, including WAAS, EGNOS, MSAS, GAGAN, and SDCM, as are groundbased differential systems used for various applications. The use of PPP techniques has greatly increased in recent years, and the treatment in this title has been expanded accordingly. Material addressing integration of GNSS with other sensors has been thoroughly revamped, as has the treatment of network assistance as needed to reflect the evolution from 2G/3G to 4G cellular systems that now rely on multiconstellation GNSS receiver engines. While this title has generally been written for the engineering/scientific community, one of the series is devoted to GNSS markets and applications. Marketing projections (and the challenge thereof) are enumerated and discussion of the major applications is provided. As in all the series, this book is structured such that a reader with a general science background can learn the basics of GNSS. The reader with a stronger engineering/scientific background will be able to delve deeper and benefit from the more in-depth technical material. It is this ramp-up of mathematical/technical complexity along with the treatment of key topics that enables this publication to serve as a student text as well as a reference source.

Accurate determination of the mobile position constitutes the basis of many new applications. This book provides a detailed account of wireless systems for positioning, signal processing, radio localization techniques (Time Difference Of Arrival), performances evaluation, and localization applications. The first section is dedicated to Satellite systems for positioning like GPS, GNSS. The second section addresses the localization applications using the wireless sensor networks. Some techniques are introduced for localization systems, especially for indoor positioning, such as Ultra Wide Band (UWB), WIFI. The last section is dedicated to Coupled GPS and other sensors. Some results of simulations, implementation and tests are given to help readers grasp the presented techniques. This is an ideal book for students, PhD students, academics and engineers in the field of Communication, localization

MATLAB is an indispensable asset for scientists, researchers, and engineers. The richness of the MATLAB computational environment combined with an integrated development environment (IDE) and straightforward interface, toolkits, and simulation and modeling capabilities, creates a research and development tool that has no equal. From quick code prototyping to full blown deployable applications, MATLAB stands as a de facto development language and environment serving the technical needs of a wide range of users. As a collection of diverse applications, each book chapter presents a novel application and use of MATLAB for a specific result.

This proceedings book is a collection of high-quality peer-reviewed research papers presented at the International Conference of Experimental and Numerical Investigations and New Technologies (CNNTech2020) held at Zlatibor, Serbia, from 29th June to 2nd July 2020. The book discusses a wide variety of industrial, engineering and scientific applications of the engineering techniques. Researchers from academia and industry present their original work and exchange ideas, experiences, information, techniques, applications and innovations in the field of mechanical engineering, materials science, chemical and process engineering, experimental techniques, numerical methods and new technologies.

Covers the latest developments in PNT technologies, including integrated satellite navigation, sensor systems, and civil applications Featuring sixty-four chapters that are divided into six parts, this two-volume work provides comprehensive coverage of the state-of-the-art in satellite-based position, navigation, and timing (PNT) technologies and civilian applications. It also examines alternative navigation technologies based on other signals-of-opportunity and sensors and offers a comprehensive treatment on integrated PNT systems for consumer and commercial applications. Volume 1 of Position, Navigation, and Timing Technologies in the 21st Century: Integrated Satellite Navigation, Sensor Systems, and Civil Applications contains three parts and focuses on the satellite navigation systems, technologies, and engineering and scientific applications. It starts with a historical perspective of GPS development and other related PNT development. Current global and regional navigation satellite systems (GNSS and RNSS), their inter-operability, signal quality monitoring, satellite orbit and time synchronization, and ground- and satellite-based augmentation systems are examined. Recent progresses in satellite navigation receiver technologies and challenges for operations in multipath-rich urban environment, in handling spoofing and interference, and in ensuring PNT integrity are addressed. A section on satellite navigation for engineering and scientific applications finishes off the volume. Volume 2 of Position, Navigation, and Timing Technologies in the 21st Century: Integrated Satellite Navigation, Sensor Systems, and Civil Applications consists of three parts and addresses PNT using alternative signals and sensors and integrated PNT technologies for consumer and commercial applications. It looks at PNT using various radio signals-of-opportunity, atomic clock, optical, laser, magnetic field, celestial, MEMS and inertial sensors, as well as the concept of navigation from Low-Earth Orbiting (LEO) satellites. GNSS-INS integration, neuroscience of navigation, and animal navigation are also covered. The volume finishes off with a collection of work on contemporary PNT applications such as survey and mobile mapping, precision agriculture, wearable systems, automated driving, train control, commercial unmanned aircraft systems, aviation, and navigation in the unique Arctic environment. In addition, this text: Serves as a complete reference and handbook for professionals and students interested in the broad range of PNT subjects Includes chapters that focus on the latest developments in GNSS and other navigation sensors, techniques, and applications Illustrates interconnecting relationships between various types of technologies in order to assure more protected, tough, and accurate PNT Position, Navigation, and Timing Technologies in the 21st

Century: Integrated Satellite Navigation, Sensor Systems, and Civil Applications will appeal to all industry professionals, researchers, and academics involved with the science, engineering, and applications of position, navigation, and timing technologies. pnt21book.com

This book constitutes the thoroughly refereed post-conference proceedings of the Second International Conference on Industrial IoT Technologies and Applications, IoT 2017, held in Wuhu, China, in March 2017. The volume contains 25 papers carefully reviewed and selected from 41 submissions focusing on topics such as big data, cloud computing, Internet of things, areas of control, mobile computing, and security.

China Satellite Navigation Conference (CSNC 2020) Proceedings presents selected research papers from CSNC 2020 held during 22nd-25th November in Chengdu, China. These papers discuss the technologies and applications of the Global Navigation Satellite System (GNSS), and the latest progress made in the China BeiDou System (BDS) especially. They are divided into 13 topics to match the corresponding sessions in CSNC2020, which broadly covered key topics in GNSS. Readers can learn about the BDS and keep abreast of the latest advances in GNSS techniques and applications.

This book focuses on gyro-free inertial navigation technology, which is used to measure not only linear motion parameters but also angular rates. Since no gyroscopes are used, the key technologies, such as initial alignment, attitude resolution, and error calibration, are very different than those used in traditional methods. Discussing each key technology in gyro-free inertial navigation system (GFINS) manufacture in a separate chapter, the book features easy-to-understand, detailed illustrations, to allow all those involved in inertial navigation to gain a better grasp of GFINS manufacture, including accelerometer setting principles; initial alignment; quaternion-based, attitude resolution algorithms; and accelerometer de-noise methods.

Navigation fundamentally provides information on position, velocity and direction which are needed for travel in ocean, land, air and in space. The myriad forms of navigation developed so far are collectively called modern navigation. This recent text discusses new promising developments that will assist the students when they enter their future professional career. It is the outcome of authors' wide experience in teaching, research and development in the field of navigation and inertial sensors. The content of the book is designed to impart adequate knowledge to the students in the area of navigation and related sensors. The text discusses inertial navigation, inertial sensors, MEMS based inertial sensors, satellite navigation, integrated inertial navigation, signal processing of inertial sensors and their applications. The chapters introduce all the topics in an easy to understand manner so that an appreciative understanding of the text matter can be made without resorting to equations and mathematics. Considerable references have been provided to enable both the students and the professors to dwell and learn more on the topics of their interest. This textbook is primarily intended to meet the academic needs of undergraduate and postgraduate students of aerospace engineering and avionics.

Control systems play an important role in engineering. Fuzzy logic is the natural choice for designing control applications and is the most popular and appropriate for the control of home and industrial appliances. Academic and industrial experts are constantly researching and proposing innovative and effective fuzzy control systems. This book is an edited volume and has 21 innovative chapters arranged into five sections covering applications of fuzzy control systems in energy and power systems, navigation systems, imaging, and industrial engineering. Overall, this book provides a rich set of modern fuzzy control systems and their applications and will be a useful resource for the graduate students, researchers, and practicing engineers in the field of electrical engineering.

Modern inertial sensors and systems cover more than five decades of continuous research and development involving various branches of science and engineering. Various technologies have emerged in an evolutionary manner surpassing the earlier ones in performance and reliability. The subject is still growing with proliferation in newer cost effec-tive applications, while its wider usage in aerospace systems continues. This book exposes the readers to the subject of inertial navigation, the inertial sensors and inertial systems in a unified manner while emphasizing the growth areas in emerging technologies such as micro-electromechanical inertial sensors, satellite navigation, satellite navigation integrated inertial navigation, hemispherical resonator gyro, vibrating beam accelerometer, interferometric fibre optic gyro, inertial sensor signal processing, redundant inertial systems and the quite recent emergence of cold atom interferometer based inertial sensors. The contents are imaginatively designed that will of interest to a wide spectrum of readers. The book has been written with utmost lucidity and clarity and explanations provided with a large number of illustrative figures. Besides being an ideal introduction to the principles of inertial sensors and systems for undergraduate and postgraduate students of aerospace engineering, the topics dealt with will also be of benefit to practising engineers and can assist the researchers to locate excellent references for research work. The authors have had three decades of design and application research experience in premier research institutions and have made use of their experience in giving a user-friendly shape to the book.

Inertial navigation is widely used for the guidance of aircraft, missiles ships and land vehicles, as well as in a number of novel applications such as surveying underground pipelines in drilling operations. This book sets out to provide a clear and concise description of the physical principles of inertial navigation, the associated growth of errors and their compensation. There is also detailed treatment of recent developments in inertial sensor technology and a description of techniques for implementing and evaluating such systems. This new edition includes a number of refinements covering sensor technology, geodesy and error modelling, the major additions to the original text are new chapters on MEMS technology and inertial system applications. [Source : 4e de couv.].

Presents an authoritative overview of the recent developments and technical advances in the applications of automated control to space technology. Topics covered include: geostationary satellites, scientific satellites, flexible systems, low earth orbit satellites, orbit and trajectory control, component technology, platforms, rendez-vous and docking (RVD) and manipulators. Contains 39 research and review papers.

This volume of Advances in Soft Computing and Lecture Notes in Computer th Science vols. 5551, 5552 and 5553, constitute the Proceedings of the 6 Inter- tional Symposium of Neural Networks (ISNN 2009) held in Wuhan, China during May 26–29, 2009. ISNN is a prestigious annual symposium on neural networks with past events held in Dalian (2004), Chongqing (2005), Chengdu (2006), N- jing (2007) and Beijing (2008). Over the past few years, ISNN has matured into a well-established series of international conference on neural networks and their applications to other fields. Following this tradition, ISNN 2009 provided an a- demic forum for the participants to disseminate their new research findings and discuss emerging areas of research. Also, it created a stimulating environment for the participants

to interact and exchange information on future research challenges and opportunities of neural networks and their applications. ISNN 2009 received 1,235 submissions from about 2,459 authors in 29 co- tries and regions (Australia, Brazil, Canada, China, Democratic People's Republic of Korea, Finland, Germany, Hong Kong, Hungary, India, Islamic Republic of Iran, Japan, Jordan, Macao, Malaysia, Mexico, Norway, Qatar, Republic of Korea, Singapore, Spain, Taiwan, Thailand, Tunisia, United Kingdom, United States, Venezuela, Vietnam, and Yemen) across six continents (Asia, Europe, North America, South America, Africa, and Oceania). Based on rigorous reviews by the Program Committee members and reviewers, 95 high-quality papers were selected to be published in this volume.

Inertial navigation is widely used for the guidance of aircraft, missiles ships and land vehicles, as well as in a number of novel applications such as surveying underground pipelines in drilling operations. This book discusses the physical principles of inertial navigation, the associated growth of errors and their compensation. It draws current technological developments, provides an indication of potential future trends and covers a broad range of applications. New chapters on MEMS (microelectromechanical systems) technology and inertial system applications are included.

Annotation Beginning with the basic principles of navigation, "Integrated Navigation and Guidance Systems takes a step beyond introductions with a concise look at the flight applications of inertial navigation systems integrated with Global Positioning System (GPS) satellite systems. Written at the senior engineering college level, the textbook takes a tutorial approach, weaving interrelated disciplines together with interactive computer exercises and AINSBOOK software for error analysis and Kalman filter simulation. Get a "technical jump start" with a look at traditional navigation radio aids, inertial guidance systems, and Kalman filters. Launch into GPS applications to navigation, precision approach and landing, attitude control, and air traffic control. More than 100 figures, photos, and tables add to the textbook's value.

This book showcases new theoretical findings and techniques in the field of intelligent systems and control. It presents in-depth studies on a number of major topics, including: Multi-Agent Systems, Complex Networks, Intelligent Robots, Complex System Theory and Swarm Behavior, Event-Triggered Control and Data-Driven Control, Robust and Adaptive Control, Big Data and Brain Science, Process Control, Intelligent Sensor and Detection Technology, Deep learning and Learning Control, Guidance, Navigation and Control of Aerial Vehicles, and so on. Given its scope, the book will benefit all researchers, engineers, and graduate students who want to learn about cutting-edge advances in intelligent systems, intelligent control, and artificial intelligence.

This book presents selected papers of the Itzhack Y. Bar-Itzhack Memorial Sympo- sium on Estimation, Navigation, and Spacecraft Control. Itzhack Y. Bar-Itzhack, professor Emeritus of Aerospace Engineering at the Technion – Israel Institute of Technology, was a prominent and world-renowned member of the applied estimation, navigation, and spacecraft attitude determination communities. He touched the lives of many. He had a love for life, an incredible sense of humor, and wisdom that he shared freely with everyone he met. To honor Professor Bar-Itzhack's memory, as well as his numerous seminal professional achievements, an international symposium was held in Haifa, Israel, on October 14–17, 2012, under the auspices of the Faculty of Aerospace Engineering at the Technion and the Israeli Association for Automatic Control. The book contains 27 selected, revised, and edited contributed chapters written by eminent international experts. The book is organized in three parts: (1) Estimation, (2) Navigation and (3) Spacecraft Guidance, Navigation and Control. The volume was prepared as a reference for research scientists and practicing engineers from academy and industry in the fields of estimation, navigation, and spacecraft GN&C.

Microelectromechanical system (MEMS) inertial sensors have become ubiquitous in modern society. Built into mobile telephones, gaming consoles, virtual reality headsets, we use such sensors on a daily basis. They also have applications in medical therapy devices, motion-capture filming, traffic monitoring systems, and drones. While providing accurate measurements over short time scales, this diminishes over longer periods. To date, this problem has been resolved by combining them with additional sensors and models. This adds both expense and size to the devices. This tutorial focuses on the signal processing aspects of position and orientation estimation using inertial sensors. It discusses different modelling choices and a selected number of important algorithms that engineers can use to select the best options for their designs. The algorithms include optimization-based smoothing and filtering as well as computationally cheaper extended Kalman filter and complementary filter implementations. Engineers, researchers, and students deploying MEMS inertial sensors will find that this tutorial is an essential monograph on how to optimize their designs.

This new edition of the bestselling Measurement, Instrumentation, and Sensors Handbook brings together all aspects of the design and implementation of measurement, instrumentation, and sensors. Reflecting the current state of the art, it describes the use of instruments and techniques for performing practical measurements in engineering, physics, chemistry, and the life sciences; explains sensors and the associated hardware and software; and discusses processing systems, automatic data acquisition, reduction and analysis, operation characteristics, accuracy, errors, calibrations, and the incorporation of standards for control purposes. Organized according to measurement problem, the Second Edition: Consists of 2 volumes Features contributions from 240+ field experts Contains 53 new chapters, plus updates to all 194 existing chapters Addresses different ways of making measurements for given variables Emphasizes modern intelligent instruments and techniques, human factors, modern display methods, instrument networks, and virtual instruments Explains modern wireless techniques, sensors, measurements, and applications A concise and useful reference for engineers, scientists, academic faculty, students, designers, managers, and industry professionals involved in instrumentation and measurement research and development, Measurement, Instrumentation, and Sensors Handbook, Second Edition provides readers with a greater understanding of advanced applications.

This newly revised and greatly expanded edition of the popular Artech House book Principles of GNSS, Inertial, and Multisensor Integrated Navigation Systems offers you a current and comprehensive understanding of satellite navigation, inertial navigation, terrestrial radio navigation, dead reckoning, and environmental feature matching . It provides both an introduction to navigation systems and an in-depth treatment of INS/GNSS and multisensor integration. The second edition offers a wealth of added and updated material, including a brand new chapter on the principles of radio positioning and a chapter devoted to important applications in the field. Other updates include expanded treatments of map matching, image-based navigation, attitude determination, acoustic positioning, pedestrian navigation, advanced GNSS techniques, and several terrestrial and short-range radio positioning technologies .. The book shows you how satellite, inertial, and other navigation technologies work, and focuses

on processing chains and error sources. In addition, you get a clear introduction to coordinate frames, multi-frame kinematics, Earth models, gravity, Kalman filtering, and nonlinear filtering. Providing solutions to common integration problems, the book describes and compares different integration architectures, and explains how to model different error sources. You get a broad and penetrating overview of current technology and are brought up to speed with the latest developments in the field, including context-dependent and cooperative positioning.