Visual Inertial Based Navigation With Mavs In Gps

PhD Dissertation
Advances in Embedded Computer Vision
2019 19th International Conference on Advanced Robotics (ICAR)
Robust Visual-inertial Navigation and Control of Fixed-wing and Multirotor Aircraft
Visual Inertial Navigation and Calibration
Proceedings of 2020 International Conference on Guidance, Navigation and Control, ICGNC 2020, Tianjin, China, October 23–25, 2020
Volume II
Volume 1
Advances in Robotics, Volume 2
2020 IEEE 63rd International Midwest Symposium on Circuits and Systems (MWSCAS)
Algorithmic Foundations of Robotics XII
25th International Conference, CRIWG+CollabTech 2019, Kyoto, Japan, September 4–6, 2019, Proceedings
Position, Navigation, and Timing Technologies in the 21st Century, Volumes 1 and 2
Robot 2015: Second Iberian Robotics Conference
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Field and Service Robotics
Intelligent Information Processing for Inertial-Based Navigation Systems
Visual-Inertial Navigation for Autonomous Vehicles
Results of the 9th International Conference
Aided Navigation: GPS with High Rate Sensors
Principles of GNSS, Inertial, and Multisensor Integrated Navigation Systems, Second Edition
New Paradigms
Integrated Satellite Navigation, Sensor Systems, and Civil Applications, Set
15th European Conference, Munich, Germany, September 8–14, 2018, Proceedings, Part IX
Integrated Satellite Navigation, Sensor Systems, and Civil Applications
Image-Based Floor Segmentation in Visual Inertial Navigation
Fundamentals of Inertial Navigation, Satellite-based Positioning and their Integration
All Source Positioning, Navigation and Timing
Monocular Visual-inertial-based Navigation for Mobile Robots with Perception Aware Exploration and Map Construction
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Analysis of Images, Social Networks and Texts
Results of the 6th International Conference
Proceedings of the Twelfth Workshop on the Algorithmic Foundations of Robotics
Autonomous Visual-inertial Navigation and Absolute Visual Scale Estimation
Robotics Research

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PhD Dissertation Monocular Visual-inertial-based Navigation for Mobile Robots with Perception Aware Exploration and Map ConstructionImage-Based Floor Segmentation in Visual Inertial Navigation[ANGLÈS] Floor segmentation is a challenging problem in image processing. It has a wide range of applications in the engineering field. In mobile robot navigation systems, detecting which pixels belong to the floor is crucial for guiding the robot within an environment, defining the geometry of the scene, or avoiding obstacles. This report presents a floor segmentation algorithm for indoor scenarios that works with single grey-scale images. The portion of the floor closest to the camera is segmented by judiciously joining a set of horizontal and vertical lines, previously detected. Unlike similar methods in the literature, it does not rely on computing the vanishing point and, thus, it adapts faster to changes in camera motion and is not restricted to typical corridor scenes. A second contribution of this thesis project is the moving features detection for points within the segmented floor area. Based on the camera ego-motion, the expected motion of the points on the ground plane is computed and used for rejecting feature points that belong to movable obstacles. A key point of the designed method is its ability to deal with general motion of the camera. The implemented techniques are to be integrated in a visual-aided inertial navigation system (INS) that combines visual and inertial information. This INS requires a certain number of feature point correspondences on the ground plane to correct data from an inertial measurement unit (IMU) and estimate the ego-motion of the camera. Hence, segmenting the floor region and detecting movable features become relevant tasks in order to ensure that the considered features do belong to the ground.Evaluation of a Commercially Available Visual-Inertial Odometry Solution for Indoor NavigationHeightened public interest in Unmanned Aerial Systems (UAS) has led recently to a rapid increase in both the number and diversity of small- to medium-sized vehicles in the public airspace. With many of these UAS boasting autonomous capabilities such as hands-free flying and obstacle avoidance, safe and accurate autonomous localization and navigation remains critically important. Various technologies have been developed to solve the problem of accurate localization in an unknown airspace, but highly accurate vision-based navigation solutions continue to see rapid development due to the added challenges posed by indoor navigation. Namely, the lack of a reliable GPS connection in indoor environments proves challenging for precise maneuvering, and many of the highest-fidelity alternatives to GPS-based localization are heavy, expensive, and difficult to implement. Growing consumer and commercial adoption of Virtual and Augmented Reality technologies has led to a sharp increase in the number of compact localization solutions available to the public, and the capabilities of these devices conveniently make them choice candidates in solving the challenges of accurate indoor navigation. In the present study, a UAS navigation solution using the Intel RealSense T265, a commercially available Visual-Inertial Odometry (VIO) device, is developed and presented for the purpose of characterizing indoor localization performance. The goal of the study is to determine whether the localization fidelity of a compact and inexpensive VIO solution is sufficiently high to support safe and reliable autonomy of small indoor aerial vehicles. Position and heading data from the T265 are analyzed in their raw form and also after correction using an Extended Kalman Filter (EKF). These data are gathered by way of a hand-carry test, and are compared to ground truth measurements obtained via a Vicon motion capture system. Additionally, a closed-loop flight test is performed outside of a motion capture room for concept validation purposes and to evaluate the convergence and command tracking capability of the EKF-based navigation system. Results from hand-carry testing examined both the raw data from the T265 and the combined data using the EKF. Localization estimates from the device gathered immediately after initialization are highly inaccurate, but the raw data improves significantly as the VIO device continues to operate and gather information about its environment. The device may indeed prove sufficiently accurate for precision maneuvering applications, but only once it has been running for some time. These findings also suggest that the device may perform well when combined with additional sensors (such as LiDAR) that can "correct" the initial pose estimates and reduce the time required to provide an accurate solution. Further localization improvements may also be achievable with varied software configurations. The performance of the Extended Kalman Filter during the closed-loop flight is also evaluated, and while the EKF does not significantly improve position estimates while the raw device data is still inaccurate, it shows smoothing of noisy T265 measurements and generally precise trajectory following capabilities. Future work to extend this characterization shall involve testing the performance of the device across varying flight envelopes, and especially for longer durations.Intelligent Information Processing for Inertial-Based Navigation Systems
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
Advances in Embedded Computer Vision John Wiley & Sons
Monocular Visual-inertial-based Navigation for Mobile Robots with Perception Aware Exploration and Map ConstructionImage-Based Floor Segmentation in Visual Inertial Navigation

2019 19th International Conference on Advanced Robotics (ICAR) Springer Science & Business Media
The book includes topics, such as: path planning, avoiding obstacles, following the path, go-to-goal control, localization, and visual-based motion control. The theoretical concepts are illustrated with a developed control architecture with soft computing and artificial intelligence methods. The proposed vision-based motion control strategy involves three stages. The first stage consists of the overhead camera calibration and the configuration of the working environment. The second stage consists of a path planning strategy using several traditional path planning algorithms and proposed planning algorithm. The third stage consists of the path tracking process using previously developed Gauss and Decision Tree control approaches and the proposed Type-1 and Type-2 controllers. Two kinematic structures are utilized to acquire the input values of controllers. These are Triangle Shape-Based Controller Design, which was previously developed and Distance-Based Triangle Structure that is used for the first time in conducted experiments. Four different control algorithms, Type-1 fuzzy logic, Type-2 Fuzzy Logic, Decision Tree Control, and Gaussian Control have been used in overall system design. The developed system includes several modules that simplify characterizing the motion control of the robot and ensure that it maintains a safe distance without colliding with any obstacles on the way to the target. The topics of the book are extremely relevant in many areas of research, as well as in education in courses in computer science, electrical and mechanical engineering and in mathematics at the graduate and undergraduate levels.
Robust Visual-inertial Navigation and Control of Fixed-wing and Multirotor Aircraft Springer Science & Business Media
In this book, a new approach to the Industry 4.0 revolution is given. New policies and challenges appear and education in robotics also needs to be adapted to this new era. Together with new factory conceptualization, novel applications introduce new paradigms and new solutions to old problems. The factory opens its walls and outdoor applications are solved with new robot morphologies and new sensors that were unthinkable before Industry 4.0 era. This book presents nine chapters that propose a new outlook for an unstoppable revolution in industrial robotics, from drones to software robots
Visual Inertial Navigation and Calibration Springer
With the increased performance and reduced cost of cameras, the robotics community has taken great interest in estimation and control algorithms that fuse camera data with other sensor data. In response to this interest, this dissertation investigates the algorithms needed for robust guidance, navigation, and control of fixed-wing and multirotor aircraft applied to target estimation and circumnavigation.
Proceedings of 2020 International Conference on Guidance, Navigation and Control, ICGNC 2020, Tianjin, China, October 23–25, 2020 John Wiley & Sons
This book features the latest theoretical results and techniques in the field of guidance, navigation, and control (GNC) of vehicles and aircraft. It covers a range of topics, including, but not limited to, intelligent computing communication and control; new methods of navigation, estimation, and tracking; control of multiple moving objects; manned and autonomous unmanned systems; guidance, navigation, and control of miniature aircraft; and sensor systems for guidance, navigation, and control. Presenting recent advances in the form of illustrations, tables, and text, it also provides detailed information of a number of the studies, to offer readers insights for their own research. In addition, the book addresses fundamental concepts and studies in the development of GNC, making it a valuable resource for both beginners and researchers wanting to further their understanding of guidance, navigation, and control.
Volume II Springer
The sixteen-volume set comprising the LNCS volumes 11205-11220 constitutes the refereed proceedings of the 15th European Conference on Computer Vision, ECCV 2018, held in Munich, Germany, in September 2018.The 776 revised papers presented were carefully reviewed and selected from 2439 submissions. The papers are organized in topical sections on learning for vision; computational photography; human analysis; human sensing; stereo and reconstruction; optimization; matching and recognition; video attention; and poster sessions.
Volume 1 BoD – Books on Demand
A modern look at state estimation, targeted at students and practitioners of robotics, with emphasis on three-dimensional applications.
Advances in Robotics, Volume 2 Springer Nature
This is the first book on the topic of all source positioning, navigation and timing (PNT) and how to solve the problem of PNT when the most widely-used measurement source available today, the GPS system, may be come unavailable, jammed or spoofed. Readers learn how to define the system architecture as well as the algorithms for GPS-denied and GPS-challenged PNT systems. In addition, the book provides comprehensive coverage of the individual technologies used, such as celestial navigation, vision-based navigation, terrain referenced navigation, gravity anomaly referenced navigation, signal of opportunity (SOO) based PNT, and collaborative PNT. Celestial Navigation is discussed, with stars and satellite used as reference, and star-tracker technology also included. Propagation based timing solutions are explored and the basic principles of oscillators and clocks presented. Initial alignment of strap-down navigation systems is explored, including initial alignment as a Kalman filter problem. Velocimeter/Dead reckoning based navigation and its impact on visual odometry is also explained. Covering both theoretical and practical issues, and packed with equations and models, this book is useful for both the engineering student as well as the advanced practitioner.
2020 IEEE 63rd International Midwest Symposium on Circuits and Systems (MWSCAS) Springer Nature
The presence of mobile robots in diverse scenarios is considerably increasing to perform a variety of tasks. Among them, many developments have occurred in the fields of ground, underwater, and flying robotics. Independent of the environment where they move, navigation is a fundamental ability of mobile robots so that they can autonomously complete high-level tasks. This problem can be efficiently addressed through the following actions: First, it is necessary to perceive the environment in which the robot has to move, and extract some relevant information (mapping problem). Second, the robot must be able to estimate its position and orientation within this environment (localization problem). With this information, a trajectory toward the target points must be planned (path planning), and the vehicle must be reactively guided along this trajectory considering either possible changes or interactions with the environment or with the user (control). Given this information, this book introduces current frameworks in these fields (mapping, localization, path planning, and control) and, in general, approaches to any problem related to the navigation of mobile robots, such as odometry, exploration, obstacle avoidance, and simulation.
Algorithmic Foundations of Robotics XII Springer
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
25th International Conference, CRIWG+CollabTech 2019, Kyoto, Japan, September 4–6, 2019, Proceedings McGraw Hill Professional
ISRR, the "International Symposium on Robotics Research", is one of robotics pioneering Symposia, which has established over the past two decades some of the field's most fundamental and lasting contributions. This book presents the results of the seventeenth edition of "Robotics Research" ISRR15, offering a collection of a broad range of topics in robotics. The content of the contributions provides a wide coverage of the current state of robotics research.: the advances and challenges in its theoretical foundation and technology basis, and the developments in its traditional and new emerging areas of applications. The diversity, novelty, and span of the work unfolding in these areas reveal the field's increased maturity and expanded scope and define the state of the art of robotics and its future direction.
Position, Navigation, and Timing Technologies in the 21st Century, Volumes 1 and 2 Springer
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
Robot 2015: Second Iberian Robotics Conference Cambridge University Press
This book constitutes the refereed proceedings of the 25th International Conference, CRIWG+CollabTech 2019, held in Kyoto, Japan in September 2019. The 12 full papers presented in this book together with 8 work-in-progress papers were carefully reviewed and selected from 28 submissions, and the program also included an invited talk. This year presented a merger of the CRIWG and CollabTech conferences after having been jointly held since 2014. The papers published in this proceedings focus on innovative collaboration technologies and social computing.
Visual Inertial Navigation and Calibration Springer
This book constitutes the proceedings of the 6th International Conference on Analysis of Images, Social Networks and Texts, AIST 2017, held in Moscow, Russia, in July 2017. The 29 full papers and 8 short papers were carefully reviewed and selected from 127 submissions. The papers are organized in topical sections on natural language processing; general topics of data analysis; analysis of images and video; optimization problems on graphs and network structures; analysis of dynamic behavior through event data; social network analysis.
Proceedings of 2020 Chinese Intelligent Systems Conference Springer
This book introduces typical inertial devices and inertial-based integrated navigation systems, gyro noise suppression, gyro temperature drift error modeling compensation, inertial-based integrated navigation systems under discontinuous observation conditions, and inertial-based brain integrated navigation systems. Integrated navigation is the result of the development of modern navigation theory and technology. The inertial navigation system has the advantages of strong autonomy, high short-term accuracy, all-day time, all weather, and so on. And it has been applied in most integrated navigation systems. Among them, the information processing of inertial-based integrated navigation system is the core technology. Due to the effect of the device mechanism and working environment, there are errors in the output information of the inertial-based integrated navigation system, including gyroscope noise, temperature drift, and discontinuous observations, which will seriously reduce the accuracy and robustness of the system. And the book helps readers to solve these problems. The intelligent information processing technology involved is equipped with simulation verification, which can be used as a reference for undergraduate, graduate, and Ph.D. students, and also scientific researchers or engineers engaged in navigation-related specialties.
Field and Service Robotics Artech House
This thesis comprises three specific goals using our developed IMU board and the camera from the imaging source company: (1) to develop a robust and real-time orientation algorithm using only the measurements from IMU; (2) to develop a robust distance estimation in static free-living environments to estimate people's position and navigate people in static free-living environments and simultaneously the scale ambiguity problem, usually appearing in the monocular camera tracking, is solved by integrating the data from the visual and inertial sensors; (3) in case of moving

objects viewed by the camera existing in free-living environments, to firstly design a robust scene segmentation algorithm and then respectively estimate the motion of the vIMU system and moving objects.

Intelligent Information Processing for Inertial-Based Navigation Systems MDPI

The book focuses on new theoretical results and techniques in the field of intelligent systems and control. It provides in-depth studies on a number of major topics such as 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 Flight 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.

Visual-Inertial Navigation for Autonomous Vehicles Springer

This book contains a selection of papers accepted for presentation and discussion at ROBOT 2015: Second Iberian Robotics Conference, held in Lisbon, Portugal, November 19th-21th, 2015. ROBOT 2015 is part of a series of conferences that are a joint organization of SPR – “Sociedade Portuguesa de Robótica/ Portuguese Society for Robotics”, SEIDROB – Sociedad Española para la Investigación y Desarrollo de la Robótica/ Spanish Society for Research and Development in Robotics and CEA-GTRob – Grupo Temático de Robótica/ Robotics Thematic Group. The conference organization had also the collaboration of several universities and research institutes, including: University of Minho, University of Porto, University of Lisbon, Polytechnic Institute of Porto, University of Aveiro, University of Zaragoza, University of Malaga, LIACC, INESC-TEC and LARSyS. Robot 2015 was focussed on the Robotics scientific and technological activities in the Iberian Peninsula, although open to research and delegates from other countries. The conference featured 19 special sessions, plus a main/general robotics track. The special sessions were about: Agricultural Robotics and Field Automation; Autonomous Driving and Driver Assistance Systems; Communication Aware Robotics; Environmental Robotics; Social Robotics: Intelligent and Adaptable AAL Systems; Future Industrial Robotics Systems; Legged Locomotion Robots; Rehabilitation and Assistive Robotics; Robotic Applications in Art and Architecture; Surgical Robotics; Urban Robotics; Visual Perception for Autonomous Robots; Machine Learning in Robotics; Simulation and Competitions in Robotics; Educational Robotics; Visual Maps in Robotics; Control and Planning in Aerial Robotics, the XVI edition of the Workshop on Physical Agents and a Special Session on Technological Transfer and Innovation.

Results of the 9th International Conference Springer Nature

This books presents the results of the 6th edition of "Field and Service Robotics" FSR03, held in Chamonix, France, July 2007. The conference provided a forum for researchers, professionals and robot manufacturers to exchange up-to-date technical knowledge and experience. This book offers a collection of a broad range of topics including: Underwater Robots and Systems, Autonomous Navigation for Unmanned Aerial Vehicles, Simultaneous Localization and Mapping, and Climbing Robotics.

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