

Simultaneous Localization and Mapping for Mobile Robots

Introduction and Methods



Juan-Antonio Fernández-Madrigal & José Luis Blanco Claraco

Simultaneous Localization And Mapping For Mobile Robots Introduction And Methods

Judd E. Hollander



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Simultaneous Localization and Mapping for Mobile Robots: Introduction and Methods Fernández-Madriral, Juan-Antonio, 2012-09-30 As mobile robots become more common in general knowledge and practices as opposed to simply in research labs there is an increased need for the introduction and methods to Simultaneous Localization and Mapping SLAM and its techniques and concepts related to robotics Simultaneous Localization and Mapping for Mobile Robots Introduction and Methods investigates the complexities of the theory of probabilistic localization and mapping of mobile robots as well as providing the most current and concrete developments This reference source aims to be useful for practitioners graduate and postgraduate students and active researchers alike

SLAM Techniques Application for Mobile Robot in Rough Terrain Andrii Kudriashov, Tomasz Buratowski, Mariusz Giergiel, Piotr Małka, 2020-07-08 This book presents the development of SLAM based mobile robot control systems as an integrated approach that combines the localization mapping and motion control fields and reviews several techniques that represent the basics of the mathematical description of wheeled robots their navigation and path planning approaches localization and map creating techniques It examines SLAM paradigms and Bayesian recursive state and map estimation techniques which include Kalman and particle filtering and enable the development of a SLAM based integrated system for the inspection task performed The system s development is divided into two phases a single robot approach and multirobot inspection system The book describes an original approach to 2D SLAM in multi floor buildings that covers each 2D level map as well as continuous 3D pose tracking and views the multirobot inspection system as a group of homogeneous mobile robots The last part of the book is dedicated to multirobot map creation and the development of path planning solutions which allow the robots homogeneous behavior and configuration to be used to develop a multirobot system without theoretical limitations on the number of robots used

[Novel Algorithms and Techniques in Telecommunications, Automation and Industrial Electronics](#) Tarek Sobh, Khaled Elleithy, Ausif Mahmood, Mohammad A. Karim, 2008-08-15 Novel Algorithms and Techniques in Telecommunications Automation and Industrial Electronics includes a set of rigorously reviewed world class manuscripts addressing and detailing state of the art research projects in the areas of Industrial Electronics Technology and Automation Telecommunications and Networking Novel Algorithms and Techniques in Telecommunications Automation and Industrial Electronics includes selected papers form the conference proceedings of the International Conference on Industrial Electronics Technology and Automation IETA 2007 and International Conference on Telecommunications and Networking TeNe 07 which were part of the International Joint Conferences on Computer Information and Systems Sciences and Engineering CISSE 2007

Autonomous Mobile Robots Frank L. Lewis, Shuzhi Sam Ge, 2018-10-03 It has long been the goal of engineers to develop tools that enhance our ability to do work increase our quality of life or perform tasks that are either beyond our ability too hazardous or too tedious to be left to human efforts Autonomous mobile robots are the culmination of decades of research and development and their

potential is seemingly unlimited Roadmap to the Future Serving as the first comprehensive reference on this interdisciplinary technology Autonomous Mobile Robots Sensing Control Decision Making and Applications authoritatively addresses the theoretical technical and practical aspects of the field The book examines in detail the key components that form an autonomous mobile robot from sensors and sensor fusion to modeling and control map building and path planning and decision making and autonomy and to the final integration of these components for diversified applications Trusted Guidance A duo of accomplished experts leads a team of renowned international researchers and professionals who provide detailed technical reviews and the latest solutions to a variety of important problems They share hard won insight into the practical implementation and integration issues involved in developing autonomous and open robotic systems along with in depth examples current and future applications and extensive illustrations For anyone involved in researching designing or deploying autonomous robotic systems Autonomous Mobile Robots is the perfect resource

Advances in Mechatronics and Control Engineering II Krzysztof Galkowski, Yun Hae Kim, 2013-10-15 Selected peer reviewed papers from the 2013 2nd International Conference on Mechatronics and Control Engineering ICMCE 2013 August 28 29 2013 Guangzhou China
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Proceedings of the ... International Symposium on Micro-NanoMechatronics and Human Science, 2004 Intelligent Autonomous Vehicles 2004 (IAV 2004) J. Santos-Victor, M. I. Ribeiro, 2005 Sensor Fusion and Decentralized Control in Robotic Systems, 2001

Mobile Robot Localization and Map Building Jose A. Castellanos, Juan D. Tardós, 2012-12-06 During the last decade many researchers have dedicated their efforts to constructing revolutionary machines and to providing them with forms of artificial intelligence to perform some of the most hazardous risky or monotonous tasks historically assigned to human beings Among those machines mobile robots are undoubtedly at the cutting edge of current research directions A rough classification of mobile robots can be considered on the one hand mobile robots oriented to human made indoor environments on the other hand mobile robots oriented to unstructured outdoor environments which could include flying oriented robots space oriented robots and underwater robots The most common motion mechanism for surface mobile robots is the wheel based mechanism adapted both to flat surfaces found in human made environments and to rough terrain found in outdoor environments However some researchers have reported successful developments with leg based mobile robots capable of climbing up stairs although they require further investigation The research work presented here focuses on wheel

based mobile robots that navigate in human made indoor environments The main problems described throughout this book are Representation and integration of uncertain geometric information by means of the Symmetries and Perturbations Model SPmodel This model combines the use of probability theory to represent the imprecision in the location of a geometric element and the theory of symmetries to represent the partiality due to characteristics of each type of geometric element A solution to the first location problem that is the computation of an estimation for the mobile robot location when the vehicle is completely lost in the environment The problem is formulated as a search in an interpretation tree using efficient matching algorithms and geometric constraints to reduce the size of the solution space The book proposes a new probabilistic framework adapted to the problem of simultaneous localization and map building for mobile robots the Symmetries and Perturbations Map SPmap This framework has been experimentally validated by a complete experiment which profited from ground truth to accurately validate the precision and the appropriateness of the approach The book emphasizes the generality of the solutions proposed to the different problems and their independence with respect to the exteroceptive sensors mounted on the mobile robot Theoretical results are complemented by real experiments where the use of multisensor based approaches is highlighted

MRSLAM - Multi-Robot Simultaneous Localization and Mapping João Alexandre Simões Martins, 2013-09-01 Nowadays a collection of two or more autonomous mobile agents working together are denoted as teams or simply societies of mobile robots In Multi Robot Systems MRS robots are allowed to coordinate with each other in order to achieve a specific goal In these systems robots are far less capable as an entity but the real power lies in the cooperation of the team The simplicity of MRS has produced a wide set of applications such as in military tasks searching for survivors in disaster hit areas parallel and simultaneous transportations of vehicles and delivery of payloads The success of single robot Simultaneous Localization and Mapping SLAM in the past two decades has led to research on Multi Robot Simultaneous Localization and Mapping MRSLAM A team of robots is able to map an unknown environment faster and more and reliably However MRSLAM raises several challenging problems including map fusion unknown robot poses and scalability issues Rao Blackwellized Particle Filters RBPFs have been demonstrated as an effective solution to the problem of single robot Simultaneous Localization and Mapping SLAM and a few extensions to teams of robots exist However these approaches are usually characterized by strict assumptions on both communication bandwidth and prior knowledge on relative poses between teammates In this dissertation we describe in detail a distributed MRSLAM approach using RBPF in the case of possibly constrained communication and unknown relative initial poses using Robot Operating System ROS We consider the environment as a two dimensional space with several obstacles which are explored by a team of cooperative mobile robots equipped with laser sensors In order to efficiently tackle the problem the cooperation between agents and the memory space available for observations storage must be taken into account Experimental results using a team of up to two robots in a large indoor area show the robustness and performance of the approach

Autonomous Robot Navigation Based on

Simultaneous Localization and Mapping (SLAM), and Particle Filtering Amirhossein Monjazebe,2007

Knowledge-based Intelligent Information and Engineering Systems ,2004 Intelligent Systems and Automation

Lotfi Beji, Samir Otmane, Azgal Abichou, 2009-03-09 The aim of CISA 09 is to present the latest research and application results emerging from new research and technological developments of complex systems and intelligent machines acting on known or unknown virtual or real environments in an autonomous way or in cooperation with humans This field requires skills in automation and control perception of the environment human computer interfaces mechanics and design simulation etc It also aims at encouraging scientific cooperation between North and South and promoting scientific exchanges through a durable event Proceedings 2002 IEEE/RSJ International Conference on Intelligent Robots and Systems ,2002 **IJCAI** ,2003 *MFI ...* ,2001

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