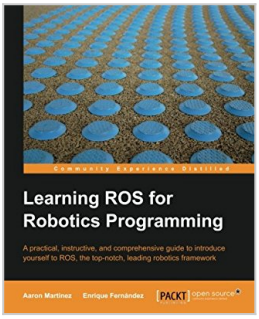

Learning ROS for Robotics Programming

By Aaron Martinez, Enrique Fernández

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Why make life difficult for yourself in robotics programming? ROS is a software framework that already supports many functionalities, and this book will tell you everything you need to know to realize its full potential.

Overview

- Model your robot on a virtual world and learn how to simulate it
- Carry out state-of-the-art Computer Vision tasks
- Easy to follow, practical tutorials to program your own robots

In Detail

Both the amateur and the professional roboticist who has ever tried their hand at robotics programming will have faced with the cumbersome task of starting from scratch, usually reinventing the wheel. ROS comes with a great number of already working functionalities, and this book takes you from the first steps to the most elaborate designs possible within this software framework.

"Learning ROS for Robotics Programming" is full of practical examples that will help you to understand the framework from the very beginning. Build your own robot applications in a simulated environment and share your knowledge with the large community supporting ROS.

"Learning ROS for Robotics Programming" starts with the basic concepts and usage of ROS in a very straightforward and practical manner. It is a painless introduction to the fascinating world of robotics, covering sensor integration, modeling, simulation, computer vision, and navigation algorithms, among other topics.

After the first two chapters, concepts like topics, messages, and nodes will become daily bread. Make your robot see with HD cameras, or navigate avoiding obstacles with range sensors. Furthermore, thanks to the contributions of the vast ROS community, your robot will be able to navigate autonomously, and even recognize and interact with you, in a matter of minutes.

"Learning ROS for Robotics Programming" will give you all the background you need to know in order to start in the fascinating world of robotics and program your own robot. Simply, you put the limit!

What you will learn from this book

- Install a complete ROS Fuerte system
- Create ROS packages and stacks, using and debugging them in real time
- Create, handle, and debug ROS nodes
- Design your 3D robot model and simulate it in a virtual environment within Gazebo
- Use cameras to give vision to your robots, and calibrate and perform Computer Vision tasks with them
- Use and integrate different sensors like Range Laser, Arduino, and Kinect with your robot
- Create and adapt the navigation stack to work with your robot
- Share your knowledge with the ROS community

Approach

The book will take an easy-to-follow and engaging tutorial approach, providing a practical and comprehensive way to learn ROS.

Who this book is written for

If you are a robotic enthusiast who wants to learn how to build and program your own robots in an easy-to-develop, maintainable and shareable way, "Learning ROS for Robotics Programming" is for you. In order to make the most of the book, you should have some C++ programming background, knowledge of GNU/Linux systems, and computer science in general. No previous background on ROS is required, since this book provides all the skills required. It is also advisable to have some background on version control systems, like svn or git, which are often used to share the code by the community.

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Learning ROS for Robotics Programming By Aaron Martinez, Enrique Fernández Bibliography

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Editorial Review

About the Author

Aaron Martinez

Aaron Martinez is a computer engineer, entrepreneur, and expert in digital fabrication. He did his Master's thesis in 2010 at the IUCTC (Instituto Universitario de Ciencias y Tecnologias Ciberneticas) in the University of Las Palmas de Gran Canaria. He prepared his Master's thesis in the field of telepresence using immersive devices and robotic platforms. After completing his academic career, he attended an internship program at The Institute for Robotics in the Johannes Kepler University in Linz, Austria. During his internship program, he worked as part of a development team of a mobile platform using ROS and the navigation stack. After that, he was involved in some projects related to robotics, one of them is the AVORA project in the University of Las Palmas de Gran Canaria. In this project, he worked on the creation of an AUV (Autonomous Underwater Vehicle) to participate in the Student Autonomous Underwater Challenge-Europe (SAUC-E) in Italy. In 2012, he was responsible for manufacturing this project; in 2013, he helped to adapt the navigation stack and other algorithms from ROS to the robotic platform.

Recently, Aaron created his own company called Biomecan. This company works with projects related to robotics, manufacturing of prototypes, and engineering tissue. The company manufactures devices for other companies and research and development institutes. For the past two years, he has been working on engineering tissue projects, creating a new device to help researchers of cell culture.

Aaron has experience in many fields such as programming, robotics, mechatronics, and digital fabrication, many devices such as Arduino, BeagleBone, Servers, and LIDAR, servomotors, and robotic platforms such as Wifibot, Nao Aldebaran, and Pioneer P3AT.

Enrique Fernández

Enrique Fernández is a computer engineer and roboticist. He did his Master's Thesis in 2009 at the University Institute of Intelligent Systems and Computational Engineering in the University of Las Palmas de Gran Canaria. There he has been working on his Ph.D for the last four years; he is expected to become a Doctor in Computer Science by September 2013. His Ph.D addresses the problem of Path Planning for Autonomous Underwater Gliders, but he has also worked on other robotic projects. He participated in the Student Autonomous Underwater Challenge-Europe (SAUC-E) in 2012, and collaborated for the 2013 edition. In 2012, he was awarded a prize for the development of an underwater pan-tilt vision system.

Now, Enrique is working for Pal-Robotics as a SLAM engineer. He completed his internship in 2012 at the Center of Underwater Robotics Research in the University of Girona, where he developed SLAM and INS modules for the Autonomous Underwater Vehicles of the research group using ROS. He joined Pal-Robotics in June 2013, where he is working with REEM robots using the ROS software intensively and developing new navigation algorithms for wheeled and biped humanoid robots, such as the REEM-H3 and REEM-C.

During his Ph.D, Enrique has published several conference papers and publications. Two of these were sent

to the International Conference of Robotics and Automation (ICRA) in 2011. He is the co-author of some chapters of this book, and his Master's Thesis was about the FastSLAM algorithm for indoor robots using a SICK laser scanner and the odometry of a Pioneer differential platform. He also has experience with electronics and embedded systems, such as PC104 and Arduino. His background covers SLAM, Computer Vision, Path Planning, Optimization, and Robotics and Artificial Intelligence in general.

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