

# Preface

The increasing interest in multi-robot systems is motivated by the wealth of possibilities offered by teams of robots cooperatively performing collective tasks. In these scenarios, distributed strategies attract a high attention, especially in applications which are inherently distributed in space, time, or functionality. These distributed schemes not only reduce the completion time of the task due to the parallel operation, but also present a natural robustness to failures due to the redundancy. In addition to the classical issues associated to the operation of individual robots, these scenarios introduce novel challenges specific to communications and coordination of the members of the robot team.

In this book, we analyze a particular problem of high interest in these scenarios: distributed map merging and localization. It allows the robots to acquire the knowledge of their surrounding needed for carrying out other coordinated tasks. We identify the main issues associated to this problem, and we present at each chapter different distributed strategies for solving them.

The explanation of this problem serves us as a tool for discussing topics which are classical in these scenarios and for introducing the reader to several multi-robot concepts. Thus, this book has several purposes. First, to give a complete solution to the distributed map merging and localization problem, which can be implemented in a multi-robot platform. Second, to provide the reader with the necessary tools for proposing new solutions to the multi-robot perception problem, or for addressing other interesting topics related to multi-robot scenarios. And third, to attract the attention to multi-robot systems and distributed strategies.

The authors have been working in different topics related to robotics perception and control. In this book they analyze distributed algorithms for perception in localization and map merging. The authors believe that this is an interesting topic, and that there are still many challenges that remain to be addressed in order to achieve the final aim of having a complete availability of these systems in the life of human beings.

This book can be of interest to the robotics and control communities, to post-graduate students and researchers, and, in general, to anyone interested in multi-robot systems. We do not make any assumption about the background needed to read the book. However, the basic understanding on mathematics of a graduate student is necessary. It is very difficult to give a fully self-contained material and, although we have introduced as many explanations and demonstrations as we could, we give references which can be studied if needed.

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October 2013

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Parallel and Distributed Map Merging and Localization  
Algorithms, Tools and Strategies for Robotic Networks

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2015, VIII, 116 p. 34 illus., Softcover

ISBN: 978-3-319-25884-3