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Zhiguo Shi · Chaojie Gu · Shibo He · Kang Hu

LoRa Localization
System Design and Performance Analysis

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Zhiguo Shi
College of Information Science and Electronic Engineering
Zhejiang University
Hangzhou, China

Shibo He
College of Control Science and Engineering
Zhejiang University
Hangzhou, China

Chaojie Gu
College of Control Science and Engineering
Zhejiang University
Hangzhou, China

Kang Hu
IoT department
Alibaba Group
Hangzhou, China

ISSN 2191-5768 ISSN 2191-5776 (electronic)
SpringerBriefs in Computer Science
ISBN 978-3-031-48010-2 ISBN 978-3-031-48008-9 (eBook)
https://doi.org/10.1007/978-3-031-48008-9

Preface

The Internet of Things (IoT) has emerged as a transformative technology, enabling seamless connectivity and communication between various devices and objects. Within the realm of IoT, low-power solutions have gained significant attention due to their ability to support long battery life and enable widespread deployment of connected devices. One crucial aspect of low-power IoT is accurate node positioning, which holds immense potential for diverse industrial applications.

This monograph delves into the research and development of low-power IoT node positioning techniques, with a specific focus on the utilization of LoRa (Long Range) technology. LoRa offers long-range wireless connectivity, low power consumption, and cost-effective solutions, making it an ideal choice for IoT applications. Throughout this book, we explore different positioning models, hardware platforms, and algorithms to achieve accurate and efficient node localization in both indoor and outdoor environments.

Chapter 1 provides an introduction to low-power IoT, discussing its background, network architecture, and research on node positioning. Chapter 2 focuses on wireless positioning techniques and introduces a modular hardware platform for IoT applications. Chapter 3 explores wide area location using signal flight time and optimization techniques, achieving high accuracy with low power consumption. Chapter 4 presents a low-cost positioning system based on LoRa Mesh networking, demonstrating its effectiveness in wide-area coverage. Chapter 5 addresses indoor positioning challenges by utilizing signal arrival angles and antenna array structures, enabling accurate localization in complex environments. Chapter 6 investigates fusion localization and tracking using mobile robots, enhancing position estimation and trajectory tracking in diverse environments. Chapter 7 concludes the book, summarizing key findings and suggesting future research directions in LoRa's indoor and outdoor fusion positioning.

We hope this monograph serves as a valuable resource for researchers, engineers, and practitioners seeking to explore the potential of low-power IoT node positioning and contribute to the advancement of IoT technologies.

Hangzhou, China

Zhiguo Shi
Chaojie Gu
Shibo He
Kang Hu

Acknowledgements

We would like to thank all the people who have made contributions to this book. In particular, we want to acknowledge the enormous amount of help we received from Yihao Xu, Boya Liu, and Ying Liu at College of Information Science and Electronic Engineering, Zhejiang University; Haoran Shi at Polytechnic Institute, Zhejiang University; Yuhao Chen, Huimin Chen, and Jiming Chen at College of Control Science and Engineering, Zhejiang University; Tao Zhen at Alibaba Group.

In addition, we want to express our gratitude to our colleagues for their kind support and encouragement. Last but not least, this book is supported in part by the National Natural Science Foundation of China (NSFC) under grant U21A20456, U23A20326, 62302439, and U23A20296.

Contents