

Preface

While geolocation is a relatively new topic in the multidisciplinary area of electrical, mechanical, and industrial engineering, it has grown very rapidly in the last decade due to the tremendous impact it is having on our everyday lives. Some of the most conspicuous applications, to name a few, range from location identification in mobile social networking and in automatic recognition systems, to furnishing real-time directions on the road, as well as in critical missions for precision personnel tracking in emergency situations such as firefighting.

Geolocation systems are based on a number of different technologies. For example, the Global Positioning System has existed for several decades, but only in the last couple of years has it been commercially accessible to the everyday consumer in the form of portable navigators. The pervasiveness of wireless access points for communications has, as a byproduct, provided yet another means for consumers to determine their positions using Wi-Fi technology. Fourth generation cellular systems, which are currently being rolled out, are being designed specifically—as opposed to previous generations—with location services in mind and, in turn, can deliver accuracy an order of magnitude higher. Also, the approval of the unlicensed FCC band has enabled rapid growth in the use of Ultra-Wideband technology for high-precision ranging. Finally, the maturity of inertial-based location systems coupled with their cost-effective solutions are beginning to play a central role in cheap smartphones as well as in more complex emergency responder rescue systems. All these technologies, while treated separately in the past, are coming together in the form of hybrid systems that offer robust solutions for a wide range of user communities.

This scope of this book is to provide a comprehensive overview of geolocation technologies and techniques, from radio-frequency based to inertial based—to our knowledge, the first book to do so—affording the reader a valuable resource that facilitates not only basic understanding of the subject, but also depth to serve as a reference for scholarly activities such as teaching, self-learning, or research. The book contains sufficient detail for use as a university textbook, but is broad enough to be of interest to laymen wishing to gain insight into the topic. In that capacity, it could serve as a starting point for a graduate student who wishes to conduct

in-depth research on the topic. Likewise, it could be used in the industry during the first stages of product development. The audience will range from general readers who are interested to know about geolocation fundamentals to the more advanced readers such as researchers and industry engineers who will benefit from the technical depth and advanced techniques provided. The collaboration of international co-authors brings together expertise in different specific subjects to ultimately provide material that adds value to the many interested in the field of geolocation.

Geolocation Techniques

Principles and Applications

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