Space Electronic Reconnaissance: Localization Theories and Methods

By Fucheng Guo, Yun Fan, Yiyu Zhou, Caigen Xhou, Qiang Li

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Presents the theories and applications of determining the position of an object in space through the use of satellites

As the importance of space reconnaissance technology intensifies, more and more countries are investing money in building their own space reconnaissance satellites. Due to the secrecy and sensitivity of the operations, it is hard to find published papers and journals on the topic outside of military and governmental agencies. This book aims to fill the gap by presenting the various applications and basic principles of a very modern technology. The space electronic reconnaissance system in mono/multi-satellite platforms is a critical feature which can be used for detection, localization, tracking or identification of the various kinds of signal sources from radar, communication or navigation systems.

Localization technology in space electronic reconnaissance uses single or multiple satellite receivers which receive signals from radar, communication and navigation emitters in the ground, ocean and space to specify the location of emitter. The methods, principles and technologies of different space electronic reconnaissance localization systems are introduced in this book, as are their performances, and the various methods are explained and analysed. Digital simulations illustrate the results.

- Presents the theories and applications of determining the position of an object in space through the use of satellites
- Introduces methods, principles and technologies of localization and tracking in the space electronic reconnaissance system, the localization algorithm and error in satellite system and near space platform system, and the tracking algorithm and error in single satellite-to-satellite tracking system
- Provides the fundamentals, the mathematics, the limitations, the measurements, and systems, of localization with emphasis on defence industry applications

Highly relevant for Engineers working in avionics, radar, communication, navigation and electronic warfare.

Chapters include:- the introduction of space electronic reconnaissance localization technology, knowledge about the satellite orbit and basic terminology of passive localization, single satellite geolocation technology based

on direction finding, three-satellite geolocation technology based on time difference of arrival (TDOA), two-satellite geolocation technology based on TDOA and frequency difference of arrival (FDOA), the single satellite localization technology based on kinematics theory, localization principles of near-space platform electronic reconnaissance systems, the orbit determination of single satellite-to-satellite tracking using bearings only(BO) information, the orbit determination of single satellite-to-satellite tracking using bearings and frequency information, the orbit determination of single satellite-to-satellite tracking using frequency only(FO) information. Each chapter ends with a problem and solution section, some using Matlab code.

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Editorial Review

From the Back Cover

Determining the positions of various radar, communication, or navigation sources by intercepting radio signals transmitted from these sources is very useful in electronic intelligence collection and early warning. Due to the regular orbit of a satellite and the prior knowledge of emitters on the Earth's surface, the localization problem in space electronic reconnaissance is intrinsically different from geolocation problems using platforms on land, ocean or air. This book presents some basic theories and methods of how to geolocate the emitter on earth or in aerospace by using one or multiple satellites.

• Presents the theories and methods of determining a source's position in space through the use of satellites.

• Introduces the methods, principles and technologies of
• localization and tracking sources with space electronic reconnaissance systems

• localization algorithms and error in satellite system and near-space platform systems

• tracking algorithms and error in single satellite-to-satellite tracking systems.

• Provides the fundamentals, mathematics, analysis, measurements, and systems of localization with emphasis on defense industry applications.

This book is written for engineers and researchers working in avionics, radar, communication, navigation and electronic warfare. The book can also be used by postgraduates studying aerospace engineering, electronic engineering, communication engineering, and electronic countermeasures.

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Users Review

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Bess Malloy:

This Space Electronic Reconnaissance: Localization Theories and Methods book is just not ordinary book, you have it then the world is in your hands. The benefit you have by reading this book is actually information

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