

前视成像雷达图像序列配准算法研究

施云飞* 宋千 金添 周智敏*

国防科学技术大学电子科学与工程学院 长沙 410073

Research on Image Sequence Registration in Forward-looking Imaging Radar

Shi Yun-fei Song Qian Jin Tian Zhou Zhi-min*

School of Electronic Science and Engineering, National University of Defense Technology, Changsha 410073, China

摘要

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摘要 为解决前视阵列成像雷达中图像序列的配准问题, 该文将前视阵列雷达的成像原理与Hausdorff距离有机结合, 提出一种图像序列配准方法。该方法基于传感器信息、图像分辨率校正和回波域Hausdorff距离, 首先利用传感器信息估计出图像间的距离向偏移, 在此基础上修正天线孔径长度并校正序列图像分辨率。为解决地雷目标各向同性造成的角度估计困难, 使用Hausdorff距离对序列图像实施配准。结合前视阵列雷达的成像原理, 将Hausdorff距离从图像域映射到回波域, 实现分辨率校正与配准的统一, 提高配准速度和精度。通过实测数据验证, 该方法适用于前视阵列成像雷达, 能够提高图像序列配准精度, 改善系统检测率。

关键词: 前视成像雷达 图像配准 Hausdorff距离 虚拟孔径

Abstract: In order to solve the registration problem of sequence images in forward-looking imaging radar, this paper proposes an image registration algorithm, which is based on combination of imaging theory of forward-looking array radar and Hausdorff distance. First the sensor information is used to estimate range offset between images. Then the length of array aperture is modified and image resolution could be corrected. To solve the difficulty in angle estimating which is brought by the isotropy of landmine, the Hausdorff distance is introduced here. Combined with imaging theory, the Hausdorff distance is mapped from image field to echo field. Consequently the resolution correction and image registration are incorporated, which could improve the speed and precision of registration. It is proved by real data that the method is applicable to forward-looking array radar and the registration precision and detection rate are also improved.

Keywords: Forward-looking imaging radar Image registration Hausdorff distance Virtual apertures

Received 2010-11-29;

本文基金:

国家自然科学基金(60972121)和全国优秀博士学位论文作者专项资金(201046)资助课题

通讯作者: 施云飞 Email: yunfei1983@gmail.com

引用本文:

施云飞, 宋千, 金添, 周智敏. 前视成像雷达图像序列配准算法研究[J] 电子与信息学报, 2011, V33(6): 1427-1433

Shi Yun-Fei, Song Qian, Jin Tian, Zhou Zhi-Min. Research on Image Sequence Registration in Forward-looking Imaging Radar[J], 2011, V33(6): 1427-1433

链接本文:

<http://jeit.ie.ac.cn/CN/10.3724/SP.J.1146.2010.01309> 或 <http://jeit.ie.ac.cn/CN/Y2011/V33/I6/1427>

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