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论文

超宽带SAR浅地表地雷聚焦与定位技术

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摘要
机载或车载超宽带合成孔径雷达可以大区域快速探测单个地雷和雷场，是探雷的发展趋势。由于传统成像算法基于均匀媒质的假设，在浅地表目标成像中不再适应。该文首先建立了浅地表目标回波模型，定量分析了折射和色散对成像的影响。基于回波模型，提出了分别在回波域和图像域补偿折射和色散影响的浅地表后向投影(Subsurface Back-Projection, SBP)成像算法。但是对未知区域进行地雷探测时，无法获得目标埋设深度和入射角先验信息。针对这个问题，提出了基于图像域SBP成像算法的粗、精补偿分级处理流程，实现了大区域多目标精确聚焦定位。最后利用Rail-GPSAR探雷试验系统实测数据验证了该文方法的有效性。

关键词 超宽带合成孔径雷达 浅地表成像 聚焦 定位

分类号 TN959.1

Focusing and Locating of Subsurface Landmines in Ultra-wideband SAR

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Abstract
Air- or vehicle-borne Ultra-WideBand Synthetic Aperture Radar (UWB SAR) can detect landmines or minefields over large area quickly, which is a trend of landmine detection. Traditional image formations, based on even medium assumption, are not suitable to the subsurface target imaging. In this paper, a subsurface target echo model is firstly developed to analyze the refraction and dispersion effects on imaging quantitatively. Based on the model, Subsurface Back-Projection (SBP) image formation is used to compensate the refraction and dispersion effects in echo domain and image domain, respectively. Unfortunately, prior knowledge of target buried depth and incident angle cannot be obtained in landmine detection over undiscovered areas. In order to solve the problem, a hierarchical processing procedure with coarse and fine compensation is proposed on SBP image formation in image domain, which realizes multi-target focusing and locating over wide areas. Finally, the proposed methods are verified using real data collected with the Rail-GPSAR landmine detection experimental system.

Key words Ultra-WideBand Synthetic Aperture Radar (UWB SAR) Subsurface imaging Focusing Locating

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