论文

一种新的采用分布式孔径的无源雷达成像方法

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A Novel Passive Radar Imaging Method Using Distributed Apertures

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摘要 该文提出一种新的利用机会照射源的无源分布式雷达目标成像方法。首先基于波方程建立接收回波信号模型。然后建立新的无源回波模型，该模型将所有接收单元(或接收机)处的回波信号用某一基准接收单元处的接收信号来描述，无需发射源信息。基于分布式孔径获得的数据有限，成像被描述为目标位置未知的二元假设检验。采用无源回波模型，依据最大信噪比准则构造空间可分辨的检测统计量，对观测区域每个位置进行检测，最终形成关于成像区域的检测统计量图像，获知目标位置信息。在给出该成像方法分辨率的理论分析的基础上，进一步通过仿真实验验证了理论分析结果和成像方法的有效性。

关键词： 无源雷达 分布式孔径 机会照射源 成像 波方程

Abstract： A novel passive radar imaging method is presented using distributed apertures that relies on illuminators of opportunity. The measurement is modeled using the wave equation. A new passive measurement model is proposed that expresses the measurement at a receiver in terms of the measurement at a different receiver and therefore requires no information about the illumination sources. Since only a limited number of measurements are available due to sparsely and randomly distributed apertures, the imaging issue is formulated as a binary hypothesis test with unknown target location. The spatial-resolved test-statistic is determined by maximizing the SNR of the test-statistic using the proposed passive measurement model. The resulting image is formed with the test-statistics evaluated at each hypothetical target location, which can provide the information about the target location. The resolution analysis of the imaging method is presented and numerical simulations are conducted to verify its performance and validate the theoretical findings.

Keywords： Passive radar   Distributed aperture   Illuminator of opportunity   Imaging   Wave equation

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