

软件、算法与仿真

基于稳健波束形成的超宽带穿墙成像方法

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摘要:

针对现有超宽带穿墙雷达时域波束成像分辨率低、旁瓣高以及干扰抑制能力弱等问题, 提出利用稳健Capon波束形成对目标成像的方法。该方法基于目标回波模型首先补偿近场扩散损耗、墙体传播损耗和折射效应, 实现天线阵列接收数据的配准, 利用稳健Capon波束成像得到良好的成像分辨率和更好的干扰抑制能力。利用时域有限差分(finite-difference time domain, FDTD)数值仿真和实验数据实现了隐藏目标的二维成像, 验证了该方法的有效性。

关键词: 超宽带雷达 穿墙成像 稳健Capon波束形成 目标回波模型

Ultra-wideband through-the-wall imaging based on robust adaptive beamforming

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Abstract:

The existing time-domain beamforming imaging methods for ultra-wideband (UWB) through-the-wall radar suffer from low-resolution, high sidelobe levels and poor interference suppression capabilities. In order to solve the problems, the data-adaptive robust Capon beamformer (RCB) method is proposed for through-the-wall imaging applications. The received signals from all channels are alligned by compensating for geometric attenuation, wall propagation attenuation and refraction effects. Then the RCB imaging method is applied to achieve much better resolution and much better interference suppression capabilities. The effectiveness of the proposed method is demonstrated by achieving two dimensional images of hidden targets based on FDTD numerical simulations and the experimentally measured data.

Keywords: ultra-wideband (UWB) radar through-the-wall imaging robust Capon beamformer (RCB) target echo model

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