

近距离大转角目标超宽带ISAR成像

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UWB ISAR Imaging of Near Field Rotating Target with Large Angle

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摘要

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摘要 该文采用冲激体制超宽带时域方法, 研究近距离大转角目标的高分辨率逆合成孔径成像, 针对目标大转角带来的严重的散射点分辨单元走动、固有的转动角度离散化带来的数据误差以及接收回波过程中的噪声污染等问题, 提出了具有强鲁棒性的频域加窗滤波球后向投影算法 (Windowing Filtered Spherical Back Projection, WFSBP), 从几何上阐明了滤波对转动角度离散化带来的数据误差的补偿作用, 分析了大转角目标成像点扩散函数, 进而讨论了发射单频信号时的高分辨成像, 通过仿真和实测数据进行验证, 结果表明, 该算法优于传统的后向投影算法, 对大转角目标能得到高质量高分辨率的图像。

关键词: 逆合成孔径雷达 (ISAR) 超宽带 时域 滤波后向投影 大转角目标 点扩散函数

Abstract: In this paper, Inverse Synthesis Aperture Radar (ISAR) turntable imaging of near field rotating target with large angle is implemented using UWB (Ultra Wide Band) system. With large and discrete rotation angle, and noise pollution considered, the robust Windowing Filtered Spherical Back Projection (WFSBP) algorithm is presented. The compensation of filtering for error resulted from discrete rotation angle is explained geometrically. The Point Spread Function (PSF) is analyzed, which also proves high resolution image can be obtained even transmitting monochromatic signal. Simulation and experiment are conducted, showing the better performance of WFSBP than traditional algorithm. High quality and high resolution image is obtained for the large rotation angle target.

Keywords: Inverse Synthesis Aperture Radar (ISAR) Ultra Wide Band (UWB) Time domain Filtered Back Projection (FBP) Rotating target with large angle Point Spread Function (PSF)

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