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OFD-LFM MIMO雷达中旋转目标微多普勒效应分析及三维微动特征提取

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Micro-Doppler Effect Analysis of Rotating Target and Three-dimensional Micro-motion Feature Extraction in OFD-LFM MIMO Radar

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摘要 该文将微多普勒效应引入到多输入多输出(MIMO)雷达技术研究,以旋转运动目标为例,分析了雷达辐射正交频分线性调频信号(OFD-LFM)时目标的微多普勒效应,给出了其参数化表达。在此基础上,进一步将微多普勒理论从目前的雷达视线方向上的微动分量提取扩展到微动部件3维运动和结构特征提取,利用MIMO雷达的多视角特性,提出了构建多元非线性方程组求解旋转部件的3维运动参数的算法,实现了目标3维微动特征的提取。仿真实验验证了算法的有效性和鲁棒性。

关键词: 多输入多输出雷达   微多普勒   旋转目标   目标识别

Abstract: The micro-Doppler (m-D) effect is introduced for the Multi-Input Multi-Output (MIMO) radar techniques in the paper. Taking rotating target for an example, the m-D effect is analyzed and the parameterized expression is deduced in MIMO radar which transmits OFD-LFM (Orthogonal Frequency Division Linear Frequency Modulation) signals. An algorithm for three-dimensional micro-motion feature extraction is proposed, which extends the m-D signature extraction from the micro-motion projection in Line-Of-Sight (LOS) to the three-dimensional micro-motion feature. By taking advantage of the multi-view of MIMO radar, the three-dimensional micro-motion features are obtained by solving nonlinear multivariable equation systems. Simulation results validate the effectiveness and robustness of the algorithm.

Keywords: MIMO radar   micro-Doppler (m-D)   Rotating target   Target recognition

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