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论文与技术报告

基于高阶时频分布的雷达目标微多普勒特征分析

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摘要：

目标微动特征提供了对目标细节的精细刻画，为雷达目标的探测和识别提供了新的途径。在分析机动点目标、振动点目标、复合运动点目标等几种典型微动目标的微多普勒变化规律的基础上，从高阶时频分析的角度出发，提出了一种基于改进L-Wigner分布的微动目标微多普勒特征的分析算法，详细分析了提高时频聚集性和消除交叉项的措施及其高效递推实现方法，并对算法的复杂度进行了分析，最后以机动点目标、振动点目标、复合运动点目标以及多个点目标构成的群目标为例对提出的算法进行了仿真分析。仿真结果表明，相对线性时频表示和Cohen类双线性时频分布，该算法对于复杂非线性调制目标回波信号提供了更好的时频聚集性，并能够较好地消除交叉干扰项的影响，且具有较小的算法运算量。

关键词： 微动 微多普勒 高阶时频分布;瞬时频率

Analysis of Micro-Doppler Signatures for Radar Targets Based on Higher Order Time-frequency Distribution

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Abstract:

Target characteristic with micro-motion depicts the target details detailedly, therefore it can provide a new way for radar target measurement and its recognition. On basis of analyzing the micro-Doppler laws of several typical targets with micro-motions, such as the maneuvered point target, the vibrational point target, the composite moving point target and so on, the paper proposed an algorithm to analyse the target micro-Doppler features using the modified L-Wigner distribution from the angle of higher order time-frequency analysis, analysed the measure to improve the time-frequency concentration and the measure to eliminate the cross-terms as well as its efficient recursive calculation method in detail, and then gave out the complexity analysis for the proposed algorithm. At last the algorithmic simulations were performed by taking the maneuvered point target, the vibrational point target, the composite moving point target and the group target containing multiple point targets as examples. Simulation results show, comparing with the linear time-frequency representation and the Cohen class bilinear time-frequency distribution, the proposed algorithm can gain better time-frequency concentration for a complex nonlinear modulation target echo signals, and better eliminate the influence of the cross interference items, and at the same time it has a smaller algorithmic calculation burden.

Keywords: Instantaneous frequency

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