

基于STFAP的MIMO雷达运动目标参数估计的CRB研究

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Research on CRB for Moving Target Parameter Estimation in MIMO Radar Based on STFAP

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摘要

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摘要 多发多收(Multiple-Input Multiple-Output, MIMO)雷达在目标检测、参数估计等方面具有显著优势。目标参数估值的CRB被证明是系统设计和空时自适应处理(STAP)性能分析中的有力工具。该文针对采用频分正交信号的共置天线MIMO雷达,首先建立基于MIMO雷达的目标和杂波空-时-频信号模型;在此基础上,研究基于空-时-频自适应处理(STFAP)的MIMO雷达地面运动目标角度和多普勒参数最大似然估值的克拉美-罗界(CRB);最后通过CRB性能仿真分析验证了MIMO雷达STFAP有效消除目标检测盲速,提高目标参数估计精度的优势。

关键词: 多发多收雷达 空-时-频自适应处理 克拉美-罗界 最大似然估计

Abstract: MIMO (Multiple-Input Multiple-Output) radar has evident advantages in target detection, parameter estimation, and so on. The Cramer-Rao Bound (CRB) for parameter estimation is proved to be a useful tool for characterizing system design and STAP performance. Therefore, based on MIMO radar with collocated antennas utilizing orthogonal frequency division signal, the space time frequency signal model of target and clutter is given to be used in MIMO radar first. On the basis of the model, the CRB of the ML estimator of ground moving target angle and Doppler for MIMO radar are deduced based on STFAP. Finally, through simulation of CRB performance, it is demonstrated that MIMO radar is effective in eliminating velocity blind zones and improving target parameter estimation accuracy.

Keywords: MIMO radar Space-Time-Frequency Adaptive Processing (STFAP) Cramer-Rao Bound (CRB) Maximum Likelihood (ML) estimation

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