

论文与技术报告

双基地MIMO雷达搜索处理方法研究

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摘要:

双基地MIMO雷达结合了MIMO雷达和双基地雷达的优点, 相对于传统雷达拥有独特的优势, 但是其在信号处理尤其是搜索处理阶段存在复杂度较高以及匹配输出损失的问题. 本文建立了双基地MIMO雷达系统模型. 分析了步进频分线性调频信号(SFDLFM)存在的“距离-角度”耦合效应, 受此效应的影响, SFDLFM信号组合几乎完全丢失了对目标相对发射角度的空间分辨能力, 据此提出了双基地MIMO雷达简化的搜索处理结构, 能够有效降低双基地MIMO雷达搜索处理复杂度. 根据“距离-角度”耦合效应提出了一种搜索距离段划分方式, 将发射阵列间的空间频率偏差限制在一定范围内, 以这种划分方式进行搜索可以降低匹配滤波处理输出的损失, 最后的仿真分析了此种距离分段方式的有效性.

关键词: 双基地MIMO雷达; 线性调频信号; “距离-角度”耦合; 搜索; 距离段划分

Research on Bistatic MIMO radar search processing method

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Abstract:

Bistatic MIMO radar combines the advantages of the MIMO radar and bistatic radar, and has unique advantages compared to traditional radar, but there is also a problems of high processing complexity and output losses of matching filter in search stage of signal processing. This paper constructs the bistatic MIMO radar system model. And then the “Range - Direction” coupling effect of SFDLFM (stepped frequency-division linear frequency modulation) signal is analyzed, under the effect of which the SFDLFM signal almost loses the spatial resolution ability to the transmit angle of target. Based on the characteristic above, a simplified search structure of bistatic MIMO radar is proposed, which can effectively reduce the search processing complexity of bistatic MIMO radar. After that, a way of distance segment dividing based on the “Range - Direction” coupling effect is proposed. The principle of this division way is to limit the transmit array spatial frequency deviation in certain range, which can effectively reduce the matched filter output loss, and finally simulation results are presented to verify the effectiveness of the proposed method.

Keywords: Bistatic MIMO radar linear frequency modulation signal Range -Direction coupling Searching distance segment dividing

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