



航空学报 2012, Vol. Issue (5) :893-901 DOI: CNKI:11-1929/V.20120320.1059.001

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## MIMO雷达DOD和DOA联合估计算法: RTR-ESPRIT

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### RTR-ESPRIT for Joint DOD and DOA Estimation for MIMO Radars

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摘要

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摘要 针对双基地多输入多输出(MIMO)雷达多目标波离角(DOD)和波达角(DOA)的联合估计问题,提出一种接收-发射-接收(RTR)-ESPRIT算法。该算法首先利用一维接收ESPRIT(R-ESPRIT)预估计目标DOA,随后分别利用一维发射ESPRIT(T-ESPRIT)和一维接收ESPRIT得到目标的高精度DOD和DOA估计,在每两次ESPRIT算法之间分别构造正交投影算子对接收信号进行接收波束形成和发射波束形成。与传统ESPRIT算法相比,该算法大大降低了数据协方差矩阵维数和计算复杂度,无需额外的配对算法,且理论证明了该方法还可以用于相干目标和单快拍情况下DOD和DOA的联合估计。仿真结果表明了该算法的正确性及良好的估计性能。

关键词: 双基地MIMO雷达 ESPRIT算法 正交投影算子 相干信号 单快拍 波离角 波达角

Abstract: A receive-transmit-receive (RTR)-ESPRIT algorithm is proposed for the joint estimation of the direction of departure (DOD) and direction of arrival (DOA) for a bistatic multiple-input multiple-output (MIMO) radar. The proposed algorithm first exploits a one-dimensional receive-ESPRIT (R-ESPRIT) to get initial DOA estimates, and then employs two one-dimensional transmit-ESPRIT (T-ESPRIT) and R-ESPRIT algorithms to obtain accurate DOD and DOA estimates, respectively. Between each of the two ESPRIT algorithms, a receive spatial beamforming process or a transmit spatial beamforming process is implemented by orthogonal projection operators. Compared with the ESPRIT algorithm, the proposed algorithm greatly reduces the dimension of the data covariance matrix as well as computational complexity, and requires no parameter pairing. The RTR-ESPRIT method is also proved to be applicable to the case of coherent signals and single snapshots. Simulation results are provided to verify the efficacy and good estimation performance of the proposed algorithm.

Keywords: bistatic MIMO radar ESPRIT algorithm orthogonal projection operator coherent signal single snapshot direction of departure direction of arrival

Received 2011-08-03;

Fund: 南京理工大学自主科研专项计划(2010ZYTS028)

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引用本文:

王克让, 何劲, 贺亚鹏, 朱晓华, 张燕洪. MIMO雷达DOD和DOA联合估计算法: RTR-ESPRIT [J]. 航空学报, 2012, (5): 893-901.

WANG Kerang, HE Jin, HE Yapeng, ZHU Xiaohua, ZHANG Yanhong. RTR-ESPRIT for Joint DOD and DOA Estimation for MIMO Radars[J]. Acta Aeronautica et Astronautica Sinica, 2012, (5): 893-901.

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