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算法研究

Keystone变换对空时自适应处理性能的影响分析

贾琼琼[1],吴仁彪[2],李 海[1]

1. 中国民航大学
2. 中国民航大学智能信号与图像处理天津市重点实验室

摘要：

机载/星载等高速平台进行高速空中动目标检测时，平台的高速运动会引起杂波走动，目标与平台的高速运动还会导致目标产生严重的距离走动，一般常用keystone变换(keystone formatting)来校正。但由于目标存在严重的速度模糊，keystone变换无法同时校正目标和杂波的距离走动。本文首先研究雷达处于高速平台时keystone变换校正空中动目标距离走动的同时对杂波特性的影响，进而分析其对空时自适应处理(Space-time adaptive processing，STAP)的影响。通过研究指出：当目标不存在多普勒模糊时，keystone变换可同时校正目标和杂波的距离走动，从而为取得良好的STAP性能提供了前提；当目标存在多普勒模糊时，keystone变换校正目标距离走动的同时会使杂波部分产生新的走动分量，最终降低STAP性能。分析结果为如何更好地实现高速平台高速空中动目标检测问题提供了理论参考。

关键词： 杂波走动

Analysis of the Effects of Keystone Formatting on Space-Time Adpative Processing

Abstract:

Detection of fast air moving targets from high speed platform is challenged by the range walk of both the clutter and moving targets. It is well known that keystone formatting can be used to compensate for the range walk of multiple moving targets simultaneously without using the knowledge of the motion parameters. However, in the presence of serious Doppler ambiguity of fast air moving targets, distribution of the clutter will be affected by the keystone formatting matched to the ambiguity number of targets, and as a result the space-time adaptive processing (STAP) performance will degrade. The effects of keystone formatting on the clutter distributions and on the performance of STAP are studied in this paper. We concluded that keystone formatting can compensate the range walk of both the target and clutter when the target is ambiguity-free. However, when the target is Doppler ambiguous, range walk compensation of the target by keystone formatting induces new range walk to the clutter, which will affect the distribution of the clutter and further degrade the STAP performance. The above conclusions are helpful in deriving better methods for the detection of fast air moving targets on high speed platform.

Keywords: clutter walk

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通讯作者: 贾琼琼

作者简介:

作者Email: qiongjiawei@163.com

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