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基于预警卫星系统的临近空间飞行器跟踪

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Tracking Near Space Vehicle Using Early-warning Satellite

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摘要

系统地研究了如何对临近空间飞行器进行有效实时跟踪的问题，并提出了一种基于约束总体最小二乘与自适应交互式多模型（CTLS-AIMM）滤波相结合的实时跟踪滤波算法。首先考虑到临近空间飞行器的特点，选择使用红外预警卫星系统探测目标飞行器，并使用约束总体最小二乘算法（CTLS）对目标进行粗定位；然后在粗定位信息基础上，使用自适应交互式多模型滤波算法（AIMM）对目标飞行器进行实时跟踪。在AIMM中，根据临近空间飞行器机动特性，合理选择目标模型集，并使用迭代最小二乘算法对模型参数进行自适应调整。通过仿真，验证了该跟踪滤波算法的可行性。

关键词： 预警卫星 跟踪 临近空间飞行器 约束总体最小二乘 自适应交互式多模型

Abstract：

An algorithm based on a constrained total least squares combining adaptive interactive multiple model (CTLS-AIMM) is developed for the tracking of near space vehicles. First, taking near space vehicle characteristics into consideration, an early-warning satellite system is used to detect the target, and a constrained total least squares algorithm (CTLS) is used to calculate the pseudo position information roughly, based on which an adaptive interactive multiple model (AIMM) algorithm is developed for the real-time tracking. In the AIMM algorithm, appropriate model-sets are selected according to the characteristics of a near space vehicle, to describe the target motion, and iterative least square is used to calculate the adaptive parameters. A hypothetical scenario is taken as a testing case, and computer simulations show the effectiveness of the methods.

Keywords： early-warning satellite tracking near space vehicle constrained total least squares adaptive interactive multiple model

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