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对卫星目标的仅测角天基单站无源定位可观测性分析

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Observability Analysis of Bearings-only Passive Location for Satellite Target by Spaceborne Single Observer

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摘要

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摘要 可观测性分析是无源定位与跟踪系统的前提和基础。由于卫星运动系统方程是状态变量的隐函数形式, 以及观测方程的非线性, 使得对卫星目标仅测角无源定位的可观测性研究难度较大。鉴于此, 从伪线性化角度对非线性系统方程进行改造, 推导了关于状态变量的显性系统状态方程, 对仅测角条件下的单星对星无源定位系统进行了可观测性分析, 为进一步研究仅测角单星对星的无源定轨跟踪提供了理论基础。最后给出了仿真实例, 验证了理论分析的正确性。

关键词: 卫星定轨 无源定位 可观测性分析 单观测站 仅测角

Abstract: Observability analysis is the basis and prime task in a passive location and tracking system. The observability analysis of bearings-only passive location for a satellite target is a complicated problem, for the system motion equation of the satellite is an implicit function of system state and the observation equations are nonlinear. In this article, the nonlinear equations of the bearings-only spaceborne single observer passive location system are pseudolinearized, and the system motion equation is transformed to an explicit function of system state, and then the observability for a satellite target within this system is analyzed. This may lay the theoretic foundation for further research on satellite target orbit determination and tracking. Finally, a simulation instance is presented and its results are consistent with those concluded from theoretic analysis, indicating that the method is correct and valid.

Keywords: satellite orbit determination passive location observability analysis single observer bearings-only

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