
A sensitivity analysis of the Gooding method for initial orbit determination

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Abstract

In this work we address the well-known problem of initial orbit determination from the perspective of optical ground-based stations. A classical approach is the Gooding method, which combines three line-of-sight observations. A Monte Carlo simulation sampling a homogeneous distribution of orbits, different precisions in line-of-sight angles, and different temporal sequences was conducted. Then, the Gooding method was applied to the synthetic measurements and compared with the actual orbits. Maps of errors across the parameter range are presented, highlighting the performance of the Gooding algorithm in the context of space surveillance and tracking. This data allows us to devise appropriate observational configurations for initial orbit determination.

Keywords: Initial Orbit Determination, Gooding Method, Monte Carlo Simulation, Sensitivity Analysis

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