Orbit Determination via Topocentric Angular Observations

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Abstract

In this work, a set of topocentric angular observations of a satellite's motion are used to determine the salient parameters of the satellie's orbit. Two different methods of orbit determination are herein examined: the methods of Gauss and Laplace. After discussion of the merits and pitfalls of these methods, we demonstrate the accuracy of the two by computing a best-fit orbit for the Tiangon-1 satellite.

1 Introduction

The determination of patterns of motion for celestial bodies is a surprisingly difficult problem, and one that has been oft studied through the history of celestial mechanics. Although the aim of the method is simple, it has been incredibly fruitful in its products that the rest of science has benefitted from. The struggle of rationalizing Tycho's observational data on the known planets led to Kepler's three laws, which are a fundamental piece of our understanding of the solar system. The determination of the orbit of Ceres as it passed the sun in 1801-1802 led Gauss to develop the method of least squares regression, which has seen considerable use in the last century to fit models to observational data in all branches of science.

2 Theory of Orbit Determination

At this point, the pattern should be pretty obvious. This is where I'll leave things for now.

2.1 This is a subsection

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