Verification of the Draper semianalytic satellite theory in the OREKIT open source flight dynamics library

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Abstract
With an increasing dependence on space systems in all areas of society, the need for accurate and robust Space Situational Awareness (SSA) is paramount. Despite this, software tools have been slow to progress; many systems remain in legacy languages, based on deprecated design principles. The Draper Semianalytic Satellite Theory (DSST) is one such system, though especially suited to the problem of SSA due to its high computational efficiency.

Originally implemented in Fortran 77 in the proprietary R&D Goddard Trajectory Determination System (GTDS), DSST has remained inaccessible to most researchers. Recent work has been undertaken to reimplement DSST in the open source ORbit Extrapolation KIT (OREKIT), a modern and operationally tested astrodynamics library.

Tests to verify OREKIT DSST’s accuracy and stability will be presented, including direct comparisons with the GTDS implementation.

It is hoped that this, and other additions to OREKIT, will provide a modern, verified, and freely available framework for SSA and space flight dynamics, encouraging standardisation and international collaboration on the development of new and existing algorithms.