AN IMPLEMENTATION AND VERIFICATION OF A HIGH-PRECISION ORBIT PROPAGATOR

By

Ahmed Mohamed Ismail Atallah

A Thesis Submitted to the
Faculty of Engineering at Cairo University
in Partial Fulfillment of the
Requirements for the Degree of
MASTER OF SCIENCE
in
Aerospace Engineering

FACULTY OF ENGINEERING, CAIRO UNIVERSITY
GIZA, EGYPT
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Under the Supervision of

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Title of Thesis:

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Key Words:
Orbit Propagation; Numerical Integration

Summary:

This work aims to implement a high-precision orbit propagator. The basic propagator modules are the force models, numerical integrator, time systems, and coordinate systems. The force models include: the geopotential, drag, third-body, solar radiation pressure, solid Earth tides, and Earth radiation pressure. The DOPPRI8 method was used to integrate the resulting set of equations. The implemented propagator demonstrated millimeter level of positional difference with industry standard propagators for conservative forces and matches to the meter-level when nonconservative forces are considered.

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Dedication

To my mother, wife, and son.

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