



Cairo University

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

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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.

Table of Contents

Acknowledgements	i
Dedication	iii
Table of Contents	v
List of Tables	ix
List of Figures	xi
List of Abbreviations	xiii
List of Symbols	xv
Abstract	xvii
1 Introduction	1
1.1 Motivation	1
1.2 Objectives	1
1.3 Basic Definitions	1
1.4 Literature Review	3
1.4.1 Historical Aspects of the Orbit Problem	3
1.4.2 Orbit Propagators	4
1.4.3 Time Systems	6
1.4.4 Coordinate Systems	7
1.4.5 Force Models	8
1.4.5.1 Geopotential	8
1.4.5.2 Atmospheric Drag	10
1.4.5.3 Third-Body	12
1.4.5.4 Solar Radiation Pressure	12
1.4.5.5 Solid Earth Tides	13
1.4.5.6 Earth Radiation Pressure	13
1.4.6 Numerical Integration	14
1.5 Thesis Organization	15
2 Problem Formulation	17
2.1 Assumptions and Governing Equations	17
2.2 Time Systems and Formats	20
2.2.1 Time Systems	20
2.2.1.1 Universal Time Systems	20
2.2.1.2 Atomic Time Systems	21
2.2.1.3 Dynamical Time Systems	21
2.2.2 Time Formats	21
2.3 Coordinate Systems	22

2.3.1	Cartesian Systems	22
2.3.1.1	The Inertial System	22
2.3.1.2	The Earth-Fixed System	23
2.3.1.3	Transformation	24
2.3.2	Spherical Systems	28
2.3.3	Earth Orientation Parameters	29
2.4	Force Modeling	30
2.4.1	Geopotential	30
2.4.1.1	Geopotential Coefficients	31
2.4.1.2	Gravity Models	33
2.4.1.3	Acceleration	34
2.4.2	Atmospheric Drag	35
2.4.2.1	Density Evaluation	36
2.4.2.2	Space Weather Data	38
2.4.3	Third-Body	39
2.4.3.1	JPL Ephemerides	39
2.4.3.2	Chebyshev Approximation	40
2.4.4	Solar Radiation Pressure	41
2.4.4.1	Shadow Models	41
2.4.5	Solid Earth Tides	44
2.4.6	Earth Radiation Pressure	48
3	Numerical Integration	51
3.1	Explicit Runge-Kutta Methods	51
3.1.1	Embedded Runge-Kutta Methods	52
3.1.2	Stepsize Control	54
3.2	Implicit Runge-Kutta	56
3.2.1	First order system method	57
3.2.2	Second order system method	58
3.3	Dense Output	58
3.4	Testing of Numerical Integrators	59
3.5	Further Discussions	63
3.5.1	Tuning of the Implicit Runge-Kutta Methods	63
3.5.2	Discrepancy between the Number of Function Calls and the Execution Times	63
3.5.3	Modified Chebyshev-Picard Iteration Method (MCPI)	65
4	Propagator Evaluations and Discussions	67
4.1	Verification	67
4.2	Contributions of Individual Force Models	69
4.3	Sensitivity of Force Models	73
4.3.1	Sensitivity to Geopotential Models	73
4.3.2	Sensitivity to Atmospheric Models	75
4.3.3	Sensitivity to Third-bodies	77
4.3.4	Sensitivity to Shadow Models	78
4.3.5	Sensitivity to Earth Radiation Pressures	79

5	Summary, Conclusions, and Future Work	81
5.1	Summary	81
5.2	Conclusions	82
5.3	Future Work	83
	References	85
	Appendix A Code Overview	95
A.1	Inputs	95
A.2	Integration	97
A.3	Outputs	97
	Appendix B Earth Orientation Parameters	99
	Appendix C Normalized Cartesian Formulation for Gravitational Acceleration	101
C.1	Legendre Polynomials	101
C.2	Geopotential Coefficients	103
C.3	Normalized Classical Formulation	104
C.4	Derivation of the Cartesian Form	105
C.4.1	Recurrence Relations for $\bar{V}_{nm}$	106
C.4.2	Derivatives of $\bar{V}_{nm}$	107
C.4.3	Acceleration	110
C.5	Verification	111
	Appendix D Atmospheric Density Models	113
D.1	Jacchia-Roberts Model	113
D.1.1	Temperature Evaluation	113
D.1.2	Density Evaluation	115
D.1.2.1	Standard Density	115
D.1.2.2	Density Correction	116
D.2	Harris-Priester Model	116
D.3	Space Weather Data	119
	Appendix E Comparison of Propagator Outputs against TLE Data	123
E.1	Format of Two-Line Elements	123
E.2	Comparison	124