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Introduction



I shall now recall to mind that the motion of the heavenly bodies is circular, since the motion appropriate to a sphere is rotation in a circle.

Mikołaj Kopernik (1473 - 1543)

This section is a short presentation of the orbital tools implemented in the PATRIUS Library. The orbital tools of the PATRIUS library cover the software requirements given in **[A1]** §13,17,18,20.

Applicable and Reference Documents

Applicable Documents

[A1] *CDCF - Fonctions de Base du Patrimoine de Dynamique du Vol*, V1.2, SIRIUS-CF-DV-0049-CN, 2011.

[A2] *Dossier de réutilisation Orekit et Commons Math*, V1.0, SIRIUS-DLR-DV-0080-CN, 2010.

Reference Documents

[R1] *Apache License*, Version 2.0, January 2004, [\[1\]](#).

Glossary

EGM96 Earth Gravitational Model 1996

EIGEN European Improved Gravity model of the Earth by New techniques

GRACE Gravity Recovery And Climate Experiment

GRGS Groupe de Recherche de Géodésie Spatiale

ICGEM International Centre for Global Earth Models

Overview

The following themes are discussed in this section:

Physical models

This chapter describes the force models available including but not limited to : central body attraction, third body attraction, atmospheric pressure, solar radiation pressure, new atmospheric models, terrestrial and ocean tides, other radiative pressure and interplanetary models. It also includes a description of the model describing the displacements of reference points due to the effect of the solid Earth tides.

Propagation

This chapter deals with the different propagators that are available to propagate the initial state of a spacecraft. Analytical propagators are implemented (Keplerian, Eckstein-Hechler, 2D, etc.) as well as numerical ones (that are better suited to perform more accurate propagations - it is the most important part of the Patrius library) and STELA semi-analytical propagator.

Multi Propagation

This chapter deals with the multi propagator that is available in PATRIUS to propagate several initial states. Numerical propagator is implemented.

Ephemeris

Integrated ephemeris, Ephemeris and Lagrange ephemeris.

Measures and data filtering

This chapter describes the basic concepts of localisation measures and orbit restitution, measure modelling and data filtering.

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