

ABSTRACT

Numerical Analysis of Orbit Prediction Errors of LAPAN's Satellites

by

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Indonesia's space agency organization named LAPAN had also launched several satellites to orbit the Earth. They are there for several reasons, from Earth monitoring to the measurement of the Earth's magnetic field. These missions that they have would be useless if there is no means of keeping track of the satellites. So there is an apparent need for determining the whereabouts of the satellites that orbit the Earth. Orbit determination system that is conventionally used is the Two-Line Elements (TLE) which only gives non-so frequent updates of the satellites' whereabouts. Propagation methods are then used to compensate for this lack of updates, and to name some of the propagation methods there are the idealized two-body propagation, two-body + J_2 that considers the Earth oblateness, and the more complex SGP4 propagation method.

The focus of this research is to see how the different propagation methods would behave when applied to the satellites' that are owned by LAPAN, for which they are orbiting in the Low-Earth Orbit and have an almost perfectly circular orbit. Furthermore, the propagation results would then be compared to the observed values in the TLE historical data of each satellite. The evaluated values would then be analyzed using some statistical method of analyzing, linear regression and R^2 correlation, to see how the errors in the orbital elements and the state vectors behave over the propagation period. Based on how the propagation method generally implies, the errors should be in the acceptable region especially for the SGP4. What that means is that the error would be relatively small in respect to the historical data, and its behavior would increase at a small value over time.

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