

Development of Precise Ephemeris Generation Module for Thaichote Satellite Operations

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Abstract : In this paper, the development of the ephemeris generation module used for the Thaichote satellite operations is presented. It is a vital part of the flight dynamics system, which comprises, the orbit determination, orbit propagation, event prediction and station-keeping maneuver modules. In the generation of the spacecraft ephemeris data, the estimated orbital state vector from the orbit determination module is used as an initial condition. The equations of motion are then integrated forward in time to predict the satellite states. The higher geopotential harmonics, as well as other disturbing forces, are taken into account to resemble the environment in low-earth orbit. Using a highly accurate numerical integrator based on the Burlish-Stoer algorithm the ephemeris data can be generated for long-term predictions, by using a relatively small computation burden and short calculation time. Some events occurring during the prediction course that are related to the mission operations, such as the satellite's rise/set viewed from the ground station, Earth and Moon eclipses, the drift in ground track as well as the drift in the local solar time of the orbital plane are all detected and reported. When combined with other modules to form a flight dynamics system, this application is aimed to be applied for the Thaichote satellite and successive Thailand's Earth-observation missions.

Keywords : flight dynamics system, orbit propagation, satellite ephemeris, Thailand's Earth Observation Satellite

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