Contribution ID: **43** Type: **Oral Presentation**

Improvements in accuracy of a real-time orbital propagator by modelling perturbation forces acting on a LEO CubeSat

Wednesday, 10 July 2013 13:50 (20 minutes)

Abstract content
   (Max 300 words)

A precise orbit propagator was developed for implementing on a cubesat's on board computer for real-time orbit position and velocity determination and prediction. Knowledge of the accurate orbital position and velocity of a Low Earth Orbit(LEO) Cubesat orbit is required for various applications such as antenna and imager pointing. Satellite motion is governed by a number of forces other than Earth's gravity alone. The inclusion of pertubation forces such as Earth's aspheric gravity, third body attraction (e.g. Moon and Sun), atmospheric drag and solar radiation pressure, is subsequently required to improve the accuracy of an orbital propagator. Precise orbit propagation is achieved by numerically integrating a set of coupled second order differential equations derived from modelling the satellite's acceleration vector due to all forces acting it. In this study the Runge-Kutta-Fehlberg numerical integration method of the order 7(8) (RKF78), resulting from imbedding RK7 into RK8 was selected for precision integration. This integrator was selected for its stability, high accuracy and computational efficiency. For precision quantification a one-day section of Satellite Laser Ranging -derived precision orbit of the SUNSAT satellite was used as reference. Results, at three-hour intervals, on the improvement in accuracy are demonstrated by the sequential adding of perturbation forces to the initial two-body solution.

Apply to be
 considered for a student
   award (Yes / No)?

Yes

Level for award
 (Hons, MSc,
   PhD)?

MTECH

Main supervisor (name and email)
and his / her institution

Dr Ben Opperman
ben.opperman@sansa.org.za

Would you like to
 submit a short paper
 for the Conference
 Proceedings (Yes / No)?

No

Primary author: Mr TSHILANDE, Thinawanga (SANSA Space Science)

Co-authors: Dr OPPERMAN, Ben (SANSA Space Science); Prof. VAN ZYL, Robert (Cape Peninsula University of Technology)

Presenter: Mr TSHILANDE, Thinawanga (SANSA Space Science)

Session Classification: Space Science

Track Classification: Track D2 - Space Science