NOTICE OF THESIS DEFENCE PRESENTATION

Geodesy and Geomatics Engineering

Doctor of Philosophy

Sunil B. Bisnath

Wednesday, February 25, 2004
Head Hall Room E-11 @ 2:30 pm

Examining Board:

Supervisor:	Dr. Richard Langley (Geodesy and Geomatics Engineering)
	Dr. Marcelo Santos (Geodesy and Geomatics Engineering)
	Dr. Brad Nickerson (Computer Science)
	Dr. Bruce Colpitts (Electrical & Computer Engineering)
Chair:	Dr. Ed Biden (Associate Dean of Graduate Studies)
External Examiner:	Dr. Dorota Grejner-Brzezinska (Ohio State University)

Precise Orbit Determination of Low Earth Orbiters With A Single GPS Receiver-Based, Geometric Strategy

ABSTRACT

One application of the Global Positioning System (GPS) involves placing GPS receivers aboard earth orbiting space vehicles to provide *in situ* tracking information to aid in platform precise orbit determination (POD). In the mid-1990s, the most advanced high-precision form of GPS-based orbits was being produced by hybrid classical orbit determination and GPS-based techniques. Given the inherent complexity and computational cost of producing dynamics-based orbits, I began studying if a GPS-only orbit could be determined and if so, how accurate and precise could it be.

A much less complex, direct and therefore very efficient approach became apparent after iteration: to use an augmented form of undifferenced GPS positioning by processing simultaneous measurements from the LEO receiver and precise GPS satellite ephemeredes and clock offsets. Pseudorange observables are used to provide precise position change. To avoid constantly changing GPS satellite-to-receiver pairs, carrier smoothing of the pseudoranges is performed in the position domain. The resulting solution represents a kinematic, sequential, least-squares filter / smoother. The stand-alone positioning mode coupled with the fundamental dynamics-free nature of the processing engine resulted in solidifying the two foundations on which the final geometric strategy filter is based on.

The thesis question has been answered positively: LEO POD with a GPS-only solution utilising a single GPS receiver is possible. The processed results show that near-decimetre-level accuracy is attainable when compared against high-calibre hybrid dynamics / GPS orbits for the CHAMP satellite. A number of refinements and additions to this research have also been proposed.

All Faculty Members and Graduate Students are invited to attend the presentation.