Senior Design Project Announcement – 2012-2013

Project title: Antenna Articulation Mechanism for Special-Purpose GPS Receiver

Brief description of project goals:

Overview:
GPS and other Global Navigation Satellite System (GNSS) Position, Navigation, and Timing (PNT) devices rely on the radio wave observables. The integrity of these observables can be degraded by multipath effects or completely destroyed by spoofing. Spoofing is the intentional broadcast of false signals. A promising technology for the detection and mitigation of multipath or spoofing effects is to exploit correlations between small motions of an antenna and changes in the observables of received signals. In order to do this, a GPS receiver needs an antenna articulation subsystem that can produce small, rapid motions and that can measure these motions and report them back to the receiver. Peak-to-peak deflections on the order of 5 cm with frequencies on the order of 8-10 Hz are required, which translates into a peak acceleration of up to 10g's. Sensing requirements are to measure these deflections to an accuracy on the order of 1 mm at a sampling frequency of up to 1000 Hz.

Specific Student Contribution:
This project involves the design, prototype fabrication, and testing of the requisite antenna articulation and sensing system. The articulation system development will involve acquisition or design & development of a bearing or flexure system and an actuator system. The motion sensing will involve acquisition or design & development of a sensor. Both the actuator and the sensor will need to be interfaced to a data acquisition and control computer or directly to a software radio GPS receiver.

M&AE Advisor Name: Mark Psiaki
- Email - mlp4@cornell.edu
- Phone - 607-255-9100
- Office - 206 Upson Hall

Project Web Site: gps.ece.cornell.edu

Number of Senior or MEng. Students Needed: Can accommodate up to 3 qualified students

Required Skills:
Participants must have taken or be co-registered in MAE/ECE 4150 with a minimum grade of A- if this course has been completed. At least one participant must have machining skills. At least one participant must have experience with computer data acquisition systems and real-time programming of embedded systems or must be co-
enrolled in a course that provides the requisite experience, e.g. ECE 3140 or MAE 3780.

**Estimated Project Time Frame:**

*Fall 2012 + Spring 2013 semesters*