

SPACE COMMUNICATIONS AND NAVIGATION SYMPOSIUM (B2)  
Space-Based Navigation Systems and Services (3)

Author: Ms. Amolika Soni  
Indian Institute of Technology, India, amolika10@gmail.com

RELATIVE NAVIGATION OF GEO SATELLITES IN FORMATION USING DOUBLE-DIFFERENCE  
CARRIER PHASE MEASUREMENTS WITH INTEGER AMBIGUITY RESOLUTION

**Abstract**

Satellite formation flying is the concept in which multiple satellites can work together in a group in order to accomplish a task. This begins with determining the position of one satellite with reference to another. This paper describes a method for relative navigation applied to Geosynchronous/ Geostationary satellites in formation.

True positions of two GEO satellites are modeled using orbital parameters and gravity perturbation model. The carrier phase measurements from GPS satellite is modeled using true positions. The modelling is done in MATLAB software. The major challenge comes with the visibility of GPS satellites to GEO satellite as the altitude of GEO satellite is higher than that of GPS. This reduces the accuracy in measurement of positions of GEO satellite and hence the relative position too. For simulations, a satellite visibility algorithm is applied in order to determine the visible GPS satellite at a particular instant.

A carrier phase differential global positioning system relative navigation estimator is developed for relative navigation of two GEO satellites in orbit. This technique is applied to the high altitude satellites such as geostationary and geosynchronous satellites. This is helpful in determining the satellite formations in the higher altitudes. The algorithm incorporates carrier phase ambiguity resolution technique- LAMBDA (Least squares Ambiguity De-correlation Adjustment method), to determine the relative position between two satellites. This is a unique method to correctly estimate the value of integer ambiguities in the double difference measurements.