

451-337 Satellite Positioning and Geodesy Practical Assignment 3 – GPS Navigation Solution

Aim

The aim of this assignment is to implement a simple GPS navigation solution in a spreadsheet, based on equally weighted C/A-code pseudo-range observations.

Background information

To implement the GPS navigation solution requires a knowledge of satellite coordinates, satellite clock error and the pseudo-ranges measured by the receiver. From this information, 3D receiver coordinates and the receiver clock offset can be calculated. The following table shows where this information can be obtained for the purposes of this assignment.

<i>Date :</i> 31 August 2008	<i>Julian day :</i> 244
<i>GPS week :</i> 1495	<i>Time :</i> 15:15:00 GPS time
<i>Day of week :</i> 0	<i>Station :</i> Parkville (PARK)

Data	File type and name	Source
Satellite coordinates and clock correction (IGS rapid)	IGS SP3 ¹ file igr14950.sp3.Z	IGS Central Bureau http://igsceb.jpl.nasa.gov/
Measured pseudo-ranges	GPSNet RINEX ¹ file	GPSnet server http://www.gpsnet.com.au/

A briefing session to assist students getting started on this assignment will be held in the tutorial class on 3 September, 2008.

Task

Students may work on this assignment either individually or in pairs. Your primary task is to create a spreadsheet to calculate receiver coordinates and receiver clock offset at station PARK, for the time and date specified above. In particular, your submission must include :

- Final receiver coordinates (metres)
- Receiver clock offset (metres and seconds)
- Comparison between estimated and known coordinates (from the RINEX file header)
- A discussion on the significance and likely causes of any coordinate differences
- Calculated PDOP and GDOP and a discussion on their interpretation
- The azimuth and elevation of each satellite for the observation epoch (table and skyplot)

Submission details

Due : 19 September 2007
Weight : 8%

¹ The SP3 format is an IGS standard for the dissemination of precise satellite orbit and clock data. Similarly, the RINEX (Receiver Independent Exchange) format is used for the dissemination of GPS observation data. You will need to read information from the IGS web-site in order to understand the relevant file structures and hence extract the necessary information from the SP3 and RINEX files used for this assignment.

451-337 - Assignment 3	Mark out of	Mark given
Set-up of problem		
Observation equations	1	
Linearisation	4	
Variance matrix	2	
Least squares algorithm	1	
Solution		
Receiver coordinates	10	
Receiver clock offset	2	
Calculated PDOP and GDOP	4	
Coordinate comparison	2	
Discussion of solution	6	
Discussion of PDOP and GDOP values	2	
Satellite locations		
Azimuth of each satellite	3	
Zenith angle of each satellite	3	
Skyplot	3	
Discussion	2	
Quality of report	5	

Total	50	
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Student number	
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