

ASSIGNMENT 5 – DATA FILES, ORBITS AND RANGES

Due Date: Friday, October 18 (Yes, I know this is the same day as the midterm).

This is an individual assignment worth 50 points. Please submit your answers and code to the D2L dropbox.

Our ultimate goal is to use GPS data (stored in a standard data format) and translate those data into positions. To do that we need to be able to 1) read GPS data files; 2) model GPS error terms, including orbits and clocks; and 3) use least squares estimation. In order to increase the likelihood that your code will work at the end of the semester, I am cutting up these tasks, and asking you to complete parts of them each of the next three weeks. Coding goals:

- Learn to read the navigation message (RINEX navigation format)
- Compute the Cartesian position of a GPS satellite at any GPS time.
- Read the *a priori* Cartesian position of the GPS receiver from the header of the observation file (RINEX observation format)

I recommend following these steps to structure your code

1. Define the name of the navigation message, brdc2640.12n. Define the name of the observation file, test.12o.
2. Read its contents of the navigation message using read_GPSbroadcast.m. This m file is included in the zip file.
3. You will be testing your code for time September 20, 2012, at 2 hours, 11 minutes, and 0 seconds. This is a GPS time, so do not attempt to add or subtract leap seconds. Translate this value into GPS week and GPS second of the week. I will call this time t_calculate.
4. Write a function that takes as input t_calculate, PRN number, and all the ephemeris data, and returns only the ephemeris you should use. This is defined to be the ephemeris message that is equal to or closest to t_calculate.
5. Now write a function that calculates the satellite coordinate for any given time and satellite. Use the file called broadcast_ephemeris_algorithm.pdf. *Do not bother coding up the satellite velocities.*
6. Calculate (and turn in) the three-dimensional coordinates for PRN 17, 15, and 12 at t_calculate in meters and to three decimal points. I recommend you use fprintf to print these out. Compare your answers to the values provided by Ben Bradlee's code as a reality check (broadcast2xva.p).
7. In order to eventually calculate the geometric range, you need a starting value for the receiver coordinate. Use read_rinex_header.m to read that value from the observation file. Nothing to turn in for this part. Notice that you will also be given the observation types as output. The following assignment will require that you be able to figure out which column stores P1, L2, and C1. read_rinex_obs.m will read each block of measurements if you want to look ahead.
8. Please let me know if I have missed providing any needed files.