MAE 593I- GPS
Homework 1 FAQs
Fall 2014

Question : Can you clarify this bullet in Part 1 Problem 2?
Compare the estimate position error from DOP and URE to errors with respect to the provided truths. Discuss;

Answer: DOP with sigma URE provides an estimate of the expected estimation performance. **See Eqs 20-27 in corrected Lecture4 (on eCampus)**. Because you have the truth position, you can determine the actual estimation performance. Compare the real estimation performance to the performance suggested by the DOP and URE.

Discuss any similarities and/or contrasts by qualitatively assessing time history plots of both performance metrics.

Question: How in depth would you like the report for the homework? Is this more of a presentable format and discussion of the data and graphs we got or is it a full blown procedural report on the code, estimation methods (calculations used), and lengthy discussions?

Somewhere in the middle: You don't need to rewrite all the equations from the notes (unless you want to for your future reference and/or it helps facilitate your discussion). I am most interested in your discussion and interpretation of the plots toward demonstrating your *understanding*.

Question: When we convert from ECEF to ENU what should be our local origin for the function xyz2enu? (origin is the 2nd ECEF position input to xyz2enu)

Answer: You are free to choose your own origin, just discuss your choice. Not that:

- The origin should be fixed to one location,and not be varied over the 2400 seconds of data.;
- I suggest just using nomXYZ;
- Be consistent with your origin . That is, use the **same origin** when transforming the truthXYZ to ENU and you estimatedXYZ to ENU.

If you are consistent with your origin, whenever you subtract the two ENU time series (truth and estimated), the origin you selected no longer matters as it is canceled in the subtration.

Question: How do I assign the weighting matrix **W**.

Answer:

- There for should be a new **W** for each epoch, i ,
- **W** needs to be a diagonal matrix of size nSat(i).
    - Where **W**(1,1)=sin(el) , where el is for the first sat used: satsXYZ(1,:,i)
    - **W**(2,2) = sin(el.) where el is determined for satsXYZ(2,:,i)
    - and so on..
- To do this, you should have a loop from j=1:nSat(i) for each epoch, i, that constructs each **W**(j,j) element separately, and then pass the entire **W** to your LLS GPS function.

Question: to convert from ECEF to ENU we just need xyz2enu not xyz2llh?

Answer: Correct, but the provided xyz2enu calls the function xyz2llh, so both should be downloaded from eCampus and included in your MATLAB path.

Question: For Part 1, number 1, the first bullet point means that we need to estimate the position and clock bias using LLS method, but what does the second bullet point mean "Estimate position and clock bias iteratively updating your nominal from the previous estimate"?

Answer:

- First, just use the same nominal guess for every epoch (provided nomXYZ and clockBiasNom)
- Second, use estimates from previous epoch as nominal for current epoch.

Question: For calculating Azimuth and Elevation, I don't have the book to get these equations from Appendix 4.A, do you have the relationship described in the book somewhere in the notes?

Answer: The last part of this website is a good reference: http://www.navipedia.net/index.php/Transformations_between_ECEF_and_ENU_coordinates