

521 M7280 – SATELLITE GEODESY

SPRING SEMESTER 2014

Lab No. 2

handed out Wednesday, March 05, 2014
due Wednesday, March 12, 2014 09:10 Name: _____

From Cartesian to Spherical Coordinates

1. Use the 3-D coordinates (x_o, y_o, z_o) you generated in Lab 1 as ECEF coordinates to compute their coordinates:
 - a. in a global spherical reference frame (latitude, longitude, height)
 - b. in a local Cartesian reference frame (e, n, u) (use the first point as your local origin)
 - c. in a local spherical reference frame (Az, El, Sr)

List your results in a table form with 13 columns (Pt_ID x_o, y_o, z_o , lat, lon, ht, e, n, u , Az, El, Sr).

2. Save your output from part 1a to a **data file** (ASCII). Then write a code to read this as an input file and compute backward their ECEF coordinates (x, y, z).
 - a. List your results in another table with 7 columns (Pt_ID, x_o, y_o, z_o, x, y, z).
 - b. Compute the difference between (x_o, y_o, z_o) and (x, y, z).
3. Discuss your results (for instance, what causes the difference (if any) in part 2b?)

Use for $GM = 398600.4418 (\text{km}^3/\text{s}^2)$, $\omega_e^* = 7292115.8553 \times 10^{-11} (\text{rad/s})$,
 $\omega_e = 7292115 \times 10^{-11} (\text{rad/s})$, and $R = 6371.000000 (\text{km})$.

Your (individual) final report should contain (use A4 papers):

- this page as the cover sheet
- source code(s) and outputs; do not forget to add your name and lots of comment cards to the source listing (%
- input and output files from program [input/output values used and calculated], if any
- plots, including captions on axes, title, your name, LB#/HM#, course title, date (if any)
- derivation and description of formulas used, accompanied by figures where applicable
- evidence of computational accuracy
- discussion of results