Homework 7 Adj. Geospd. Obs.

assigned 19 Nov. 2018, due ______________

Data is given for 20 points in 2 3D coordinate systems, related by a 3D rotation and 3 shifts (no scale parameter)

$$\begin{bmatrix} x \\ y \\ z \end{bmatrix} = M \begin{bmatrix} X \\ Y \\ Z \end{bmatrix} + \begin{bmatrix} t_x \\ t_y \\ t_z \end{bmatrix} \qquad \sigma_{x,y,z} = 0.1$$

(obs.) (const.)

1. First, verify that your 6-parameter model is working by replicating results for the "test" data set. Use conventional rotations $M = M_\kappa M_\phi M_\omega$. use approximations $\omega = 18°$, $\phi = 6°$, $\kappa = 54°$, $t_x = 9$, $t_y = 3$, $t_z = 3$

2. Try this verified code on the "real" data set (it will fail). Use approximations $\omega = 18°$, $\phi = 88°$, $\kappa = 54°$, $t_x = 9$, $t_y = 3$, $t_z = 3$
   What do you notice about the parameter corrections ?

3. Try the LS estimation with the rotation generated from unit quaternions, with appropriate constraint equation (It should succeed). Use approximations $q_i = -0.42$, $q_j = -0.57$, $q_k = -0.43$, $q_s = +0.56$.

4. For extra credit go back to the euler angle code, but change the order of the rotations from $\omega - \phi - \kappa$ to $\phi - \omega - \kappa$. This is another "work around"

5. For more extra credit implement the quaternion approach but handle the constraint by elimination and independent parameters, rather than by dependent parameters with constraint.