

CE597 Adj. of Geospd. Obs. HW3
 assigned Friday, 30 Sep. 2016, due 1 week Fri, 7 Oct.

1. Determine the 7 transformation parameters by LS, indirect observations. XYZ observations, XYZ constants, $\lambda, \omega, \phi, k, t_x, t_y, t_z$ unknown parameters.

$$\begin{pmatrix} x \\ y \\ z \end{pmatrix} = \lambda M \begin{pmatrix} X - t_x \\ Y - t_y \\ Z - t_z \end{pmatrix}$$

ω : primary rotation, ϕ : secondary, k tertiary, data in accompanying file.

initial approx: λ 1.00, ω 15°, ϕ -5°, k 20°, t_x 3, t_y 10, t_z 2. $\sigma_{xyz} = 0.15$.

2. Determine ellipsoid parameters a, b from the observed cartesian coordinates, XYZ and corresponding, constant ϕ, λ, h , by LS, indirect observations.

$$\begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} (N+h) \cos \phi \cos \lambda \\ (N+h) \cos \phi \sin \lambda \\ ((1-e^2)N+h) \sin \phi \end{pmatrix}$$

where $N = a / [1 - e^2 \sin^2 \phi]^{1/2}$, $e^2 = 1 - (b/a)^2$. Use as initial approx.

a : 6378180, b : 6356600 (m). Data in accompanying file. $\sigma_{xyz} = 0.5$

use numerical approximation for partial derivatives. Extra credit: experiment with different values for Δ -parameter

3. Redo the 8 parameter problem from HW2, but now with rigorous Stochastic model, using LS, indirect observations. Use symbolic capability of matlab to obtain & evaluate the partial derivatives. Use as initial approximations your results from HW2.

x	y	z	X	hw3_1_dat \bar{Y}	z
7.70	4.95	-2.39	8.19	17.10	2.62
16.23	1.06	-2.92	17.19	16.84	2.79
7.24	10.23	-2.70	5.94	21.56	3.60
18.18	8.73	-2.66	16.28	24.03	5.12
8.60	10.62	-3.94	7.03	22.67	2.45
8.11	15.09	-3.24	5.15	26.29	4.29
12.64	-1.93	2.66	14.59	11.56	6.72
8.82	3.18	-0.50	9.71	15.28	3.87
21.97	4.40	-2.82	20.62	21.41	4.89
12.34	13.08	-3.88	9.23	25.90	3.98

x (m)	y (m)	z (m)	hw3_2_dat		h (m)
			phi (deg)	lam (deg)	
6251296.916	1130419.162	568674.442	5.1500000	10.2500000	50.0000000
521473.597	931158.818	6267168.995	80.4000000	60.7500000	200.0000000
-985074.177	5420515.491	-3203994.328	-30.3500000	100.3000000	500.0000000
-2367991.419	3283300.318	4912386.056	50.7000000	125.8000000	150.0000000
-3071853.744	814486.340	-5511539.130	-60.2000000	165.1500000	175.0000000
5396436.710	-3178743.935	-1203542.422	-10.9500000	-30.5000000	220.0000000
491249.520	-5730176.989	2749129.796	25.7000000	-85.1000000	310.0000000
-1120558.956	-1099249.989	6161466.244	75.8000000	-135.5500000	380.0000000