

Adj. Geospa. Obs. Homework 8
assigned Mon. 4 Dec., due Wed. 13 Dec.

1. See the accompanying data x, y, X, Y to use for discovering the 4-parameter transformation which relates them:

$$\begin{bmatrix} x \\ y \end{bmatrix} = \lambda \begin{bmatrix} \cos \theta & \sin \theta \\ -\sin \theta & \cos \theta \end{bmatrix} \begin{bmatrix} X \\ Y \end{bmatrix} + \begin{bmatrix} t_x \\ t_y \end{bmatrix}$$

equivalently written as,

$$\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} a & b \\ -b & a \end{bmatrix} \begin{bmatrix} X \\ Y \end{bmatrix} + \begin{bmatrix} c \\ d \end{bmatrix}$$

XY constant, xy observed with $\sigma = 0.1$ for the "good" points, but also many outliers ($\sim 1/2$). Use RANSAC with $P = 99.9\%$ to

- estimate the parameters
- designate the inliers and the outliers

2. See the accompanying data x, y to use for discovering the best line fit parameters. x : constant, y : observed, $\sigma = .05$, with "some" outliers. Construct the Indirect Obs. condition equations B, f and then run

$$[\text{par2}, v_2] = L_2(B, f) \quad \text{and}$$

$$[\text{par1}, v_1] = L_1(B, f)$$

- use the L_1 results to report the parameters and designate inliers & outliers
- comment on differences in residuals for L_1 & L_2 ($L_2 = LS$). plot data, fitted line, residuals for both cases

hw8_data

data for hw8, prob. 1

x	y	X	Y
22.303	8.220	9.863	5.134
18.318	0.682	8.734	2.694
17.491	16.094	5.097	5.990
6.823	9.127	2.718	2.202
8.184	9.575	3.369	3.009
5.022	7.698	2.170	0.484
5.289	14.105	2.765	5.643
19.477	13.833	3.433	9.360
17.301	11.109	8.622	8.030
5.787	13.415	1.567	6.973
7.031	12.709	1.409	4.614
15.103	10.480	7.571	6.624
24.723	15.414	7.363	7.497
14.274	14.996	3.557	5.315
16.505	12.579	3.411	4.828
9.565	4.115	6.668	0.293
11.061	16.933	2.171	8.943
14.152	13.767	5.614	8.315
4.566	14.594	1.242	7.378
12.198	16.100	3.197	8.985
14.224	4.264	9.532	2.307
4.859	9.420	1.374	1.800
13.502	12.880	5.694	6.142
12.842	1.955	9.757	0.167
10.640	6.114	5.034	2.993
14.211	11.071	6.677	6.685
9.540	18.774	0.342	9.526
13.621	12.091	4.561	8.162
4.544	8.357	1.559	0.779
2.538	2.687	4.760	1.346
8.315	13.896	1.697	5.765
4.651	0.115	8.963	1.773
13.892	17.906	3.734	9.945
7.241	7.241	3.797	1.174
15.527	13.532	8.583	8.408
6.995	3.426	6.461	0.140
8.968	4.999	5.835	8.717
18.564	12.017	6.684	9.024
7.502	12.449	1.778	4.492
16.068	9.177	8.492	6.182
14.231	15.985	4.424	9.790
13.961	7.124	8.315	3.973
13.940	-1.455	7.639	4.472
13.757	4.444	9.197	2.333
15.344	20.252	0.706	9.317
8.349	8.574	1.562	2.728
19.594	3.710	6.369	9.323
10.765	18.252	5.557	4.132
5.424	9.064	1.919	1.607
10.351	10.619	4.257	4.688

data for hw8, prob. 2

x	y
1.00	1.72
2.00	2.90
3.00	3.10
4.00	2.25
5.00	2.58
6.00	3.70
7.00	2.89
8.00	3.13
9.00	3.34
10.00	3.59
11.00	4.70
12.00	4.90
13.00	4.15
14.00	4.31
15.00	4.43