521 M7410 –Adjustment and Analysis of Spatial Information

Fall Semester 2024

Homework No. 6

handed out Thursday, October 30, 2025
due Thursday, November 06, 2025, 14:20 **Name:** _____

General Least-squares Adjustment

1. Given a linear transformation in the following form:

$$x = aX + bY + c$$
$$y = dX + eY + f$$

The observables are listed in the following table

1) Find LSQ estimates of all parameters (a, b, c, d, e, f) assuming that only (x, y) are treated as observables with an equal precision ($\sigma_x = \sigma_y = \pm 0.01$).
2) Find LSQ estimates of all parameters (a, b, c, d, e, f) assuming that (X, Y) and (x, y) are all treated as observables with different precisions ($\sigma_X = \sigma_Y = \pm 0.10$; $\sigma_x = \sigma_y = \pm 0.01$).

PT ID	X	Y	x	y
1	1.477	1.229	8.928	3.739
2	2.107	4.109	14.808	16.608
3	4.010	1.562	14.719	6.759
4	4.245	3.636	18.526	17.255
5	5.607	1.615	19.230	10.057

2. Discussions (extensive comparison of your answers in Part 1).

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