

Homework #6. General 2D Network Adjustment

- Write a general 2D network adjustment program to accept (1) distance observations, and (2) direction observations. Your program must read an arbitrary number of these observations in any order.
- The unknown parameters will be the point coordinates (except those components declared to be “control”) and the “station parameter” (the azimuth of the zero direction on the horizontal circle).
- For output, make sure to include:
 - Number of observations, number of parameters
 - Convergence confirmation (a listing showing convergence of some quantity(ies))
 - Parameter estimates, residuals, adjusted observations
 - Results of global test (one-tailed) at 0.05 level of significance
 - 2x2 covariance matrices for all points (scaled correctly from results of global test)
- Be able, for any point, to compute a confidence interval at any probability level, and be able to compute and sketch a confidence ellipse at any probability level.
- A complete example (at least one) with results is given for you to test your program.

- Assigned Monday, 8 November, 2004 (prepare and confirm program operation)
- Data files for another network will be emailed to you on Friday, 19 November (It may not be the same network for every student). On Tuesday 23, November turn in the adjustment of your network, and the requested statistical analysis.
- 3 ascii files will define the input data: obs.dat, pnt.dat, and control.dat. The fields are described below, and example is given, and you may find the example files in hw6ex1.zip in the ce506 folder on the “geomatics” drive.
- Obs.dat: observation code, at station, to station, observation field 1, observation field 2, observation field 3, sigma. Code: 1=distance, 2= direction. For distance, only observation field 1 is used, others are zero. For direction observation all three fields are used for degrees, minutes, and seconds. Distance units are meters, sigma for direction is in arc seconds.
- Pnt.dat: x, y, z. x and y are the point coordinates (approximations for unknown points, fixed values for control points). The z value is an approximation for the station parameter in degrees. (it is not an elevation !)
- Control.dat: point number, coordinate component to fix. For the coordinate component, 1=x, and 2=y. if 1 & 2 are specified for a point then it is a “full” control point. If only 1 or 2 are specified for a point then it is a “partial” control point.

Helpful hints:

- You can easily read and parse a numeric, fixed format ascii/text file by, for example

```
data=textread('obs.dat');
```

```
code=data(:,1);
```

```
at=data(:,2);
```

```
to=data(:,3);
```

```
obs1=data(:,4);
```

```
obs2=data(:,5);
```

etc.

- Suggest (as in homework 4) that you fill B and f matrices with all columns, then remove control columns before forming N & t. careful when you add (reduced) delta to the current parameters.

- Suggest handling two types of condition equations by a function for each:

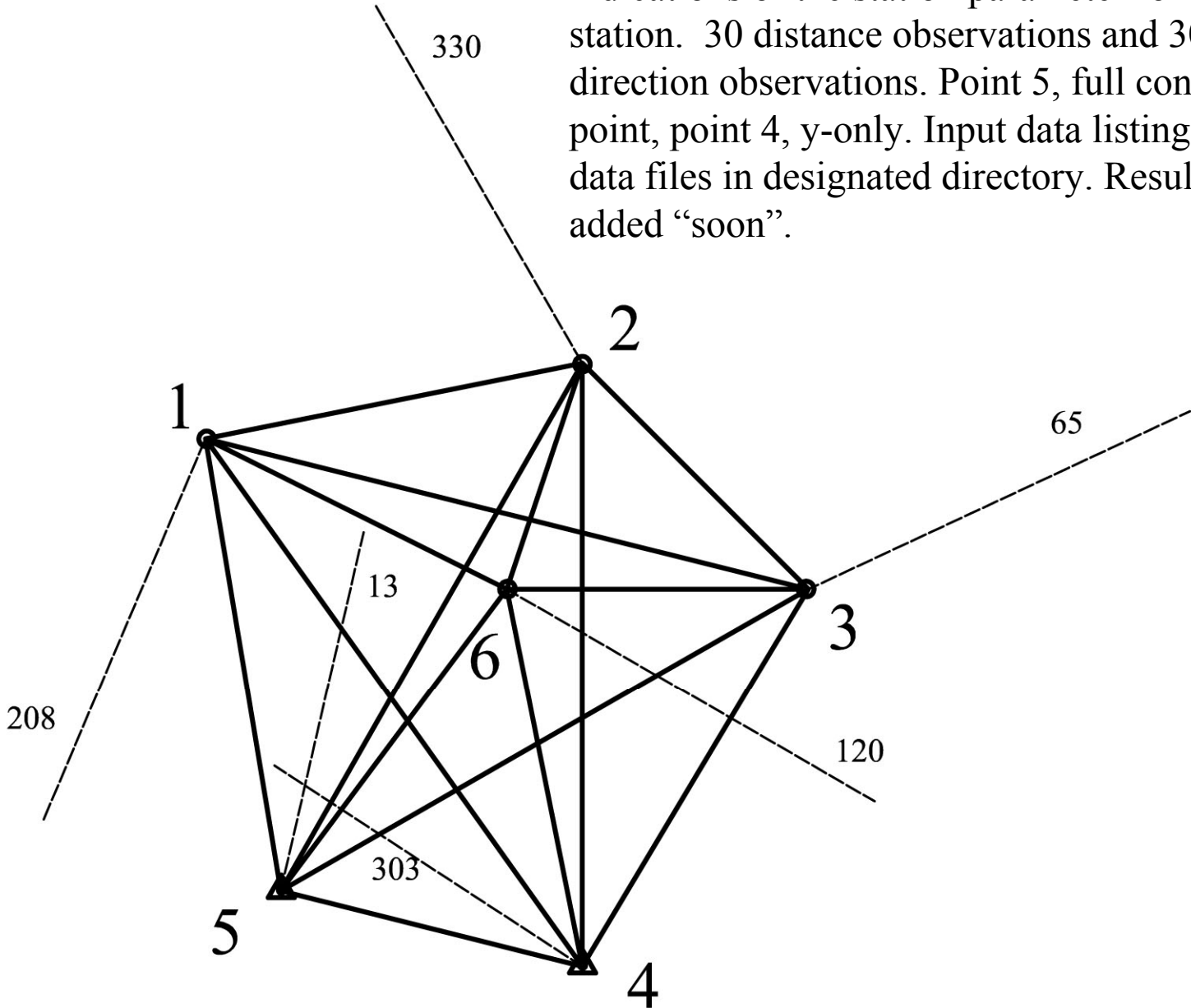
- Result=dist2d(x, y, at, to, obs)

- Result can be a vector with 4 partial derivatives, and a value for F, etc.

- Result=direction(x, y, z, at, to, obs)

- Result can be a vector with 5 partial derivatives and a value for F.

Example network #1. dotted lines & label give indications of the station parameter for each station. 30 distance observations and 30 direction observations. Point 5, full control point, point 4, y-only. Input data listing follows, data files in designated directory. Results will be added "soon".



1	1	2	509.85	0	0	0.05
1	1	3	824.63	0	0	0.05
1	1	4	860.17	0	0	0.05
1	1	5	608.26	0	0	0.05
1	1	6	447.17	0	0	0.05
1	2	1	509.84	0	0	0.05
1	2	3	424.21	0	0	0.05
1	2	4	799.98	0	0	0.05
1	2	5	806.23	0	0	0.05
1	2	6	316.22	0	0	0.05
1	3	1	824.67	0	0	0.05
1	3	2	424.25	0	0	0.05
1	3	4	583.02	0	0	0.05
1	3	5	806.23	0	0	0.05
1	3	6	400	0	0	0.05
1	4	1	860.25	0	0	0.05
1	4	2	800.02	0	0	0.05
1	4	3	583.16	0	0	0.05
1	4	5	412.28	0	0	0.05
1	4	6	509.91	0	0	0.05
1	5	1	608.28	0	0	0.05
1	5	2	806.2	0	0	0.05
1	5	3	806.33	0	0	0.05
1	5	4	412.3	0	0	0.05
1	5	6	499.93	0	0	0.05
1	6	1	447.3	0	0	0.05
1	6	2	316.24	0	0	0.05
1	6	3	399.94	0	0	0.05
1	6	4	509.93	0	0	0.05
1	6	5	500.06	0	0	0.05

Obs.dat

2	1	2	230	41	31.526	15
2	1	3	256	2	10.401	15
2	1	4	296	27	40.216	15
2	1	5	322	32	34.789	15
2	1	6	268	34	22.138	15
2	2	1	288	41	16.404	15
2	2	3	165	0	1.5515	15
2	2	4	209	59	47.884	15
2	2	5	239	44	51.78	15
2	2	6	228	25	30.343	15
2	3	1	219	2	25.33	15
2	3	2	250	0	3.2838	15
2	3	4	145	57	53.449	15
2	3	5	175	15	36.631	15
2	3	6	204	59	55.88	15
2	4	1	21	27	42.363	15
2	4	2	56	59	40.941	15
2	4	3	87	57	24.567	15
2	4	5	341	1	59.922	15
2	4	6	45	41	28.457	15
2	5	1	337	32	7.5211	15
2	5	2	16	44	21.568	15
2	5	3	47	15	34.519	15
2	5	4	91	1	59.794	15
2	5	6	23	52	11.462	15
2	6	1	176	33	54.172	15
2	6	2	258	26	2.0738	15
2	6	3	330	0	5.9492	15
2	6	4	48	41	20.282	15
2	6	5	96	51	46.669	15

Continued

400	6500	208
900	6600	330
1200	6300	65
900	5800	303
500	5900	13
800	6300	120

Pnt.dat

5 1
5 2
4 2

Control.dat