Technische Universität Berlin

Chair of Geodesy and Adjustment Theory

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Adjustment Calculation I

Winter Term 2016/17

Homework 5: Adjustment Calculation – part III

- Linear and non-linear functional models -

Surname, Given Name:	Matriculation number:	Deadline: **27.02.2017** **A short report!**

Test Certificate

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Objective

This homework deals with the determination of 2D coordinates of points in a plane Cartesian coordinate system from observed directions and distances.

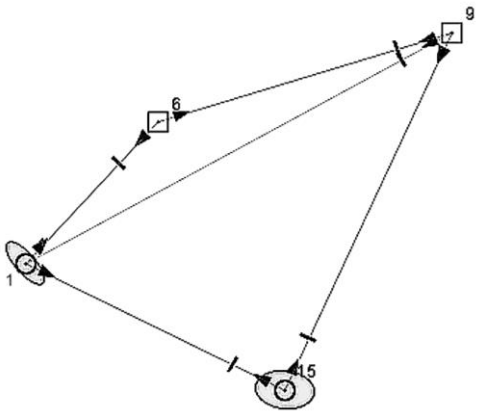

Figure 1: Combined horizontal network

Task 1:

The Gauss-Krueger coordinates of the control points, which can be regarded as fixed (error free) values as well as the initial values for the Gauss-Krueger coordinates of the new points are listed in Table 1. The measurements of the combined horizontal network depicted in Figure 1 are listed in Table 2. The distances measurements have been performed with an accuracy of 10 cm and are already reduced into the Gauss-Krueger projection. The observation of directions has been performed with an accuracy of 1 mgon and all measurements (distances and directions) are uncorrelated. Calculate the adjusted Gauss-Krueger coordinates of point *1* and *15* using least squares adjustment.

- What are the unknowns?
- What are the observations?
- Are all observations reduced into the Gauss-Krueger projection?
- What is the redundancy?
- Set up an appropriate functional model as well as the observation equations
- Set up the stochastic model
- Choose appropriate values for the break-off condition ϵ and δ and justify your decision
- Solve the normal equation system and determine the Gauss-Krueger coordinates of point *1* and *15* as well as their standard deviations
- Calculate the residuals and the adjusted observations as well as their standard deviations
- Comment and evaluate the results!

Table 1: Gauss-Krueger coordinates for control and new points

Point No.	Easting [m]	Northing [m]	Remarks
6	53 17 651.428	49 68 940.373	Fixed point
9	53 24 162.853	49 70 922.160	Fixed point
1	53 14 698.13	49 65 804.18	Initial values
15	53 20 448.85	49 62 997.53	Initial values

Table 2: Observed distances and directions

From	To	Horizontal directions [gon]	Horizontal distances [m]
1	6	148.0875	
	15	228.9044	
6	1	248.0883	4307.851
	9	81.1917	
9	15	207.9027	
	1	248.4428	10759.852
	6	261.1921	6806.332
15	1	358.9060	6399.069
	9	57.9014	8751.757