

Contents

1	Introduction.....	1
1.1	Basic idea and main task of photogrammetry	1
1.2	Why photogrammetry ?	3
1.3	Image sources: Analogue and digital cameras	4
1.4	Digital consumer cameras	6
1.5	Short history of photogrammetric evaluation methods	7
1.6	Geometric principles 1: Camera position, focal length	8
1.7	Geometric principles 2: Image orientation	11
1.8	Geometric principles 3: Relative camera positions (stereo)	13
1.9	Some definitions	15
1.10	Length and angle units	16
1.11	A typical workflow in photogrammetry	16
2	Included software and data	19
2.1	Hardware requirements, operating system	19
2.2	Image material	20
2.3	Overview of the software	20
2.4	Installation	22
2.5	Additional programmes, copyright, data	23
2.6	General remarks	23
2.7	Software versions, support	24
3	Scanning of photos	27
3.1	Scanner types	27
3.2	Geometric resolution	28
3.3	Radiometric resolution	29
3.4	Some practical advice	29
3.5	Import of the scanned images	31
4	Example 1: A single model	33
4.1	Project definition	33
4.2	Orientation of the images	35
4.2.1	Camera definition	35
4.2.2	Interior orientation	37
4.2.3	Brightness and contrast	39
4.2.4	Control points	40

4.2.5	Exterior orientation	43
4.2.6	Over-determination and error detection.....	47
4.3	Model definition	48
4.4	Stereoscopic viewing	51
4.5	Measurement of object co-ordinates	52
4.6	Creation of DTMs via image matching.....	55
4.6.1	Some theory.....	55
4.6.2	Practical tests	60
4.6.3	Additional manual measurements.....	63
4.6.4	Quality control.....	64
4.7	Ortho images.....	65
4.7.1	Some theory.....	66
4.7.2	Resampling methods.....	67
4.7.3	Practical tests	69
4.7.4	Creation and overlay of contours	70
4.7.5	Simple 3D data collection	72
5	Example 2: Aerial triangulation	75
5.1	Aerial triangulation measurement (ATM)	75
5.1.1	Common principles	75
5.1.2	Interior orientation.....	78
5.1.3	Manual measurement	78
5.1.4	Automatic measurement via image matching: Introduction	82
5.1.5	Co-ordinate input and measurement of ground control points.....	82
5.1.6	Strip definition.....	85
5.1.7	Measurement of strip connections	86
5.1.8	Automatic image co-ordinate measurement (AATM).....	87
5.2	Block adjustment with BLUH	91
5.2.1	Introduction	91
5.2.2	Running the block adjustment	92
5.2.3	Discussion of the results.....	94
5.2.4	Additional analysis of the results	99
5.2.5	Block adjustment with other programmes: Example BINGO	104
5.3	Mosaics of DTMs and ortho images	105
5.3.1	Model definition	105
5.3.2	Creation of a DTM mosaic.....	105
5.3.3	Creation of an ortho image mosaic	106
5.3.4	Shaded relief.....	108
5.3.5	Contour lines overlay	108
5.3.6	3D view	109
5.3.7	3D view in real-time: Example for plug-ins	109
6	Example 3: Some special cases.....	111
6.1	Scanning aerial photos with an A4 scanner	111
6.2	Interior orientation without camera parameters	113
6.3	Images from a digital camera.....	114

6.3.1	The situation	114
6.3.2	Interior and exterior orientation	116
6.3.3	Geometric problems	117
6.3.4	DTM creation	119
6.3.5	Differential DTM.....	120
6.4	An example of close-range photogrammetry	121
6.4.1	The situation	121
6.4.2	Interior and exterior orientation	123
6.4.3	Model definition	127
6.4.4	DTM creation	127
6.4.5	Image sequences	129
6.4.6	Visualisation of wave movement.....	130
6.5	Some remarks about lens distortion	132
6.6	Stereo images from satellites	134
6.7	Stereo images from flatbed scanners.....	137
6.8	A view into the future: Photogrammetry in 2020.....	139
7	Programme description	141
7.1	Some definitions	141
7.2	Basic functions.....	141
7.3	Aims and limits of the programme.....	142
7.4	Operating the programme	142
7.5	Buttons in the graphics windows	143
7.6	File handling	144
7.6.1	File > Select project.....	144
7.6.2	File > Define project.....	144
7.6.3	File > Edit project.....	145
7.6.4	File > Import raster.....	145
7.6.5	File > Import Rollei CDW	145
7.6.6	File > Combination.....	145
7.6.7	File > Reference list.....	146
7.6.8	File > Numerical file names	146
7.7	Pre programmes	147
7.7.1	Pre programmes > Camera definition > Analogue.....	147
7.7.2	Pre programmes > Camera definition > Digital	148
7.7.3	Pre programmes > Control point editor	149
7.7.4	Pre programmes > Strip definition.....	149
7.7.5	Pre programmes > Orientation > Measure > Interior orientation.....	150
7.7.6	Pre programmes > Orientation > Measure > Exterior orientation.....	152
7.7.7	Pre programmes > Orientation > Measure > Pseudo camera def.....	154
7.7.8	Pre programmes > Orientation > Measure > LICAL	154
7.7.9	Pre programmes > Parameters of the exterior orient. > Manual	155

7.7.10 Pre programmes > Parameters of the exterior orient. > Import	155
7.7.11 Pre programmes > Parameters of the exterior orient. > BINGO	155
7.7.12 Pre programmes > Select model	155
7.7.13 Pre programmes > Define model	156
7.8 Aerial triangulation measurement (ATM)	159
7.8.1 ATM > Manual measurement	159
7.8.2 ATM > Editor ATM points	163
7.8.3 ATM > Calculate strip images	163
7.8.4 ATM > Measure connections	163
7.8.5 ATM > Automatic measurement (AATM)	165
7.8.6 ATM > Import > IMATIE	166
7.8.7 ATM > Export > BLUH	166
7.8.8 ATM > Export > BINGO	167
7.8.9 ATM > Export > IMATIE	167
7.8.10 ATM > BLUH graphics	167
7.9 Processing	168
7.9.1 Processing > Stereo measurement	168
7.9.3 Processing > Stereo correlation (matching)	170
7.9.4 Processing > DTM interpolation	173
7.9.5 Processing > Compare nominal - real	173
7.9.6 Processing > Ortho image	174
7.9.7 Processing > Image sequence	175
7.10 Display	176
7.10.1 Display raster image	176
7.10.2 Display text	177
7.11 Aerial triangulation with BLUH	178
7.11.1 Getting started	178
7.11.2 Pre processing	178
7.11.3 Pre processing > Import PIX	178
7.11.4 Block adjustment > Strategy	179
7.11.5 Block adjustment > The central BLUH modules	179
7.11.6 Block adjustment > All (batch)	180
7.11.7 Block adjustment > Export orientations	180
7.11.8 Post processing > Analysis (BLAN)	180
7.11.9 Post processing > Display graphics	180
7.11.10 Some more theory	180
Appendix	185
1. Codes	185
2. GCP positions for tutorial 2	185
3. Technical data of digital camera chips	204
References	205
Glossary	209

List of figures and formulas.....213

1. Figures213

2. Formulas215

Index217

<http://www.springer.com/978-3-540-92724-2>

Digital Photogrammetry

A Practical Course

Linder, W.

2009, XV, 220 p. With 3-D glasses. With CD-ROM.,

Hardcover

ISBN: 978-3-540-92724-2