

Bakalářská práce	
Příloha č.:	4
Fakulta stavební - České vysoké učení technické v Praze	
Název přílohy:	Technická zpráva (fotogrammetrie)
Počet stran:	8
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SCE CZ s.r.o.

**Technická zpráva
FOTOGRAMMETRIE**

02 March 2020



Survey Data

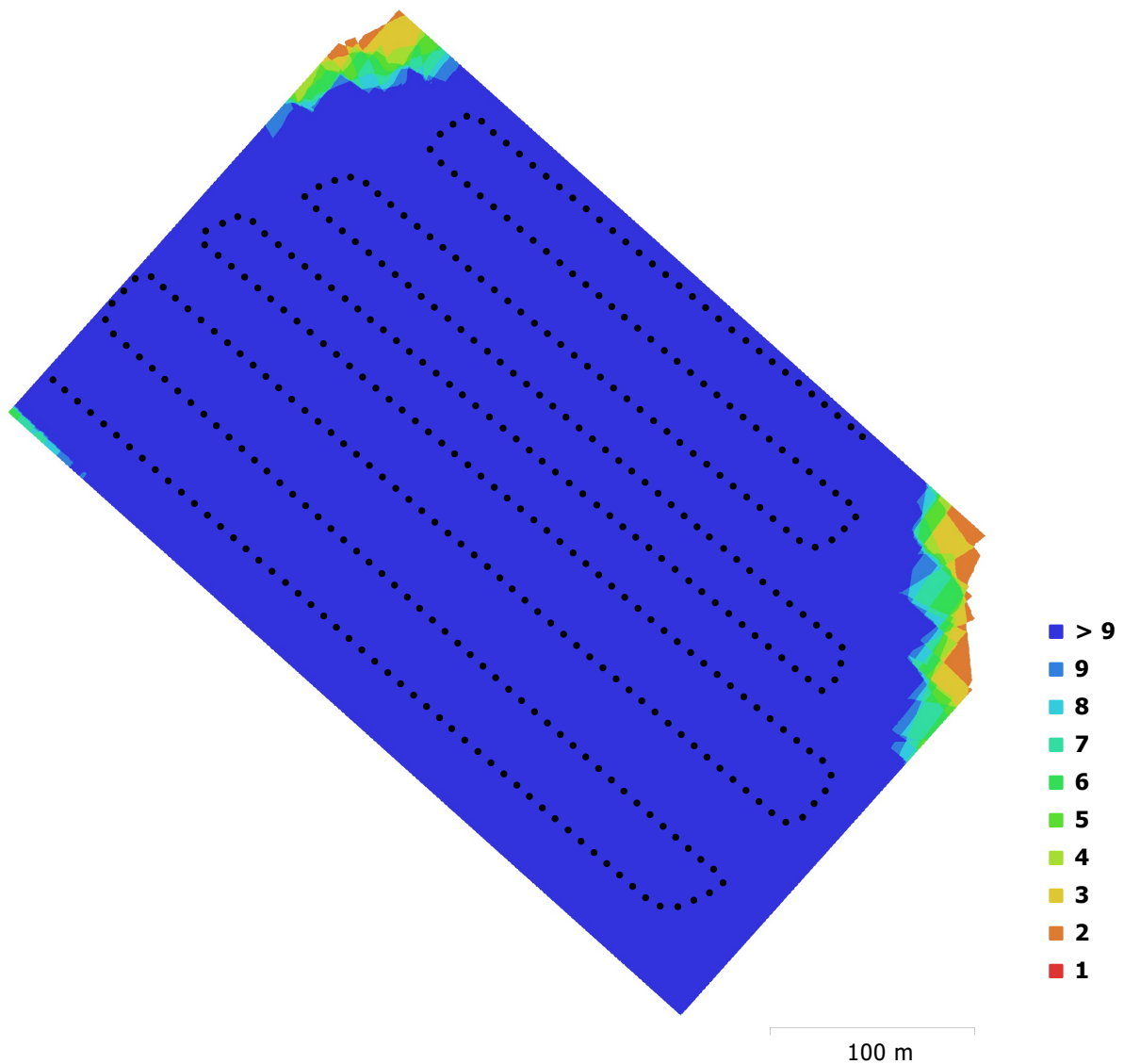


Fig. 1. Camera locations and image overlap.

Number of images:	404	Camera stations:	404
Flying altitude:	69.8 m	Tie points:	139,728
Ground resolution:	0.0264 m/pix	Projections:	1,771,663
Coverage area:	1.19e+05 m ²	Reprojection error:	0.783 pix

Camera Model	Resolution	Focal Length	Pixel Size	Precalibrated
FC300S (3.61 mm)	4000 x 3000	3.61 mm	1.56 x 1.56 μm	No

Table 1. Cameras.

Camera Calibration

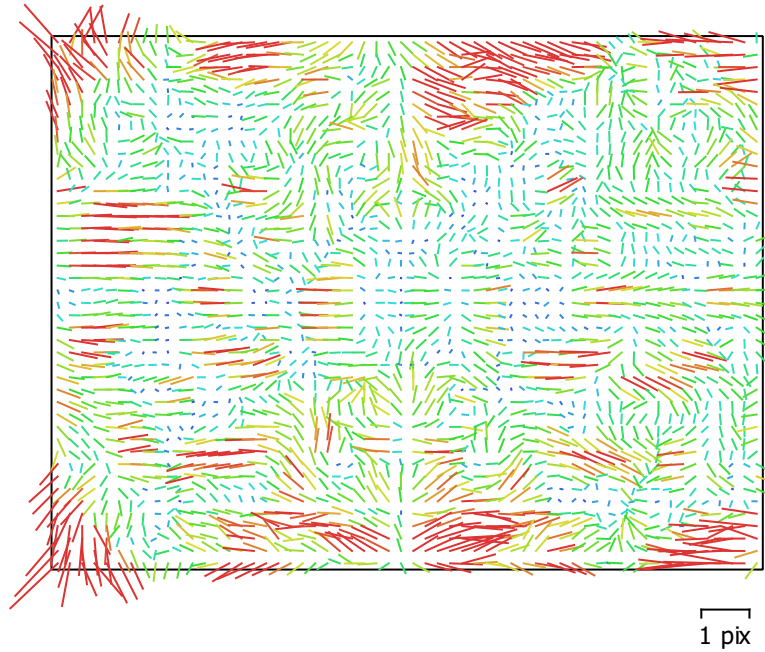


Fig. 2. Image residuals for FC300S (3.61 mm).

FC300S (3.61 mm)

404 images

Type
Frame

Resolution
4000 x 3000

Focal Length
3.61 mm

Pixel Size
1.56 x 1.56 μm

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	K4	P1	P2
F	2337.52	0.14	1.00	0.35	-0.73	-0.02	0.01	-0.14	-0.02	0.08	-0.10	-0.02	0.03
Cx	-9.19542	0.011		1.00	-0.25	0.01	-0.02	-0.03	-0.02	0.04	-0.05	0.55	0.01
Cy	-5.52326	0.013			1.00	0.01	-0.00	0.07	0.05	-0.09	0.11	0.01	0.36
B1	-4.31153	0.0084				1.00	0.02	0.01	-0.01	0.01	-0.01	-0.00	0.00
B2	0.227829	0.0083					1.00	-0.00	-0.00	0.00	-0.00	-0.00	0.01
K1	-0.00546642	3.2e-05						1.00	-0.96	0.91	-0.86	0.02	-0.01
K2	-0.0205581	0.00011							1.00	-0.99	0.96	-0.01	-0.01
K3	0.0474002	0.00015								1.00	-0.99	0.01	0.01
K4	-0.0198815	6.9e-05									1.00	-0.01	-0.01
P1	-0.000199845	1.2e-06										1.00	0.01
P2	-4.33638e-06	1e-06											1.00

Table 2. Calibration coefficients and correlation matrix.

Ground Control Points

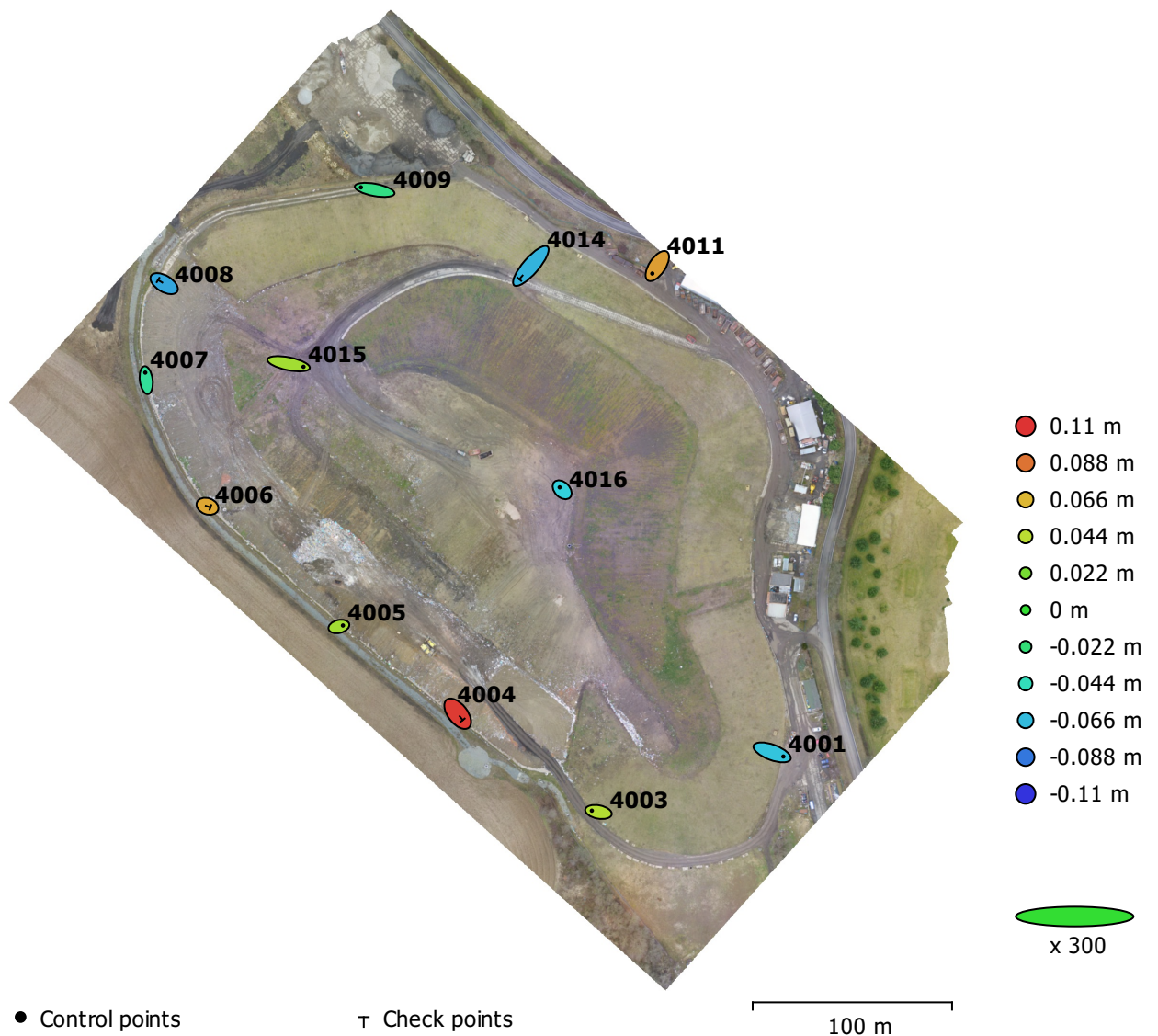


Fig. 3. GCP locations and error estimates.

Z error is represented by ellipse color. X,Y errors are represented by ellipse shape.
 Estimated GCP locations are marked with a dot or crossing.

Count	X error (m)	Y error (m)	Z error (m)	XY error (m)	Total (m)
8	0.0296941	0.014722	0.0489104	0.0331432	0.0590821

Table 3. Control points RMSE.

Count	X error (m)	Y error (m)	Z error (m)	XY error (m)	Total (m)
4	0.023846	0.025466	0.0816808	0.0348877	0.0888195

Table 4. Check points RMSE.

Label	X error (m)	Y error (m)	Z error (m)	Total (m)	Image (pix)
4001	0.0376041	-0.0138778	-0.0632809	0.0749076	0.489 (7)
4003	-0.0222251	0.00425178	0.0401584	0.0460948	0.498 (14)
4005	0.0135009	0.00331599	0.0354295	0.0380594	0.428 (13)
4007	-0.00318009	0.0252619	-0.0337322	0.0422627	0.327 (15)
4009	-0.04614	0.00854342	-0.027444	0.0543605	0.374 (12)
4011	-0.0167312	-0.0251722	0.0743727	0.08028	0.393 (11)
4015	0.0497723	-0.0100757	0.0343951	0.0613337	0.426 (7)
4016	-0.0082084	0.00811842	-0.0604979	0.0615896	0.459 (9)
Total	0.0296941	0.014722	0.0489104	0.0590821	0.422

Table 5. Control points.

Label	X error (m)	Y error (m)	Z error (m)	Total (m)	Image (pix)
4004	0.0168238	-0.0212659	0.107149	0.110527	0.670 (12)
4006	0.00988454	-0.00358029	0.0715763	0.0723442	0.361 (11)
4008	-0.0203121	0.012274	-0.0728913	0.0766575	0.427 (9)
4014	-0.0384865	-0.0444787	-0.0690644	0.0907163	0.656 (13)
Total	0.023846	0.025466	0.0816808	0.0888195	0.559

Table 6. Check points.

Digital Elevation Model

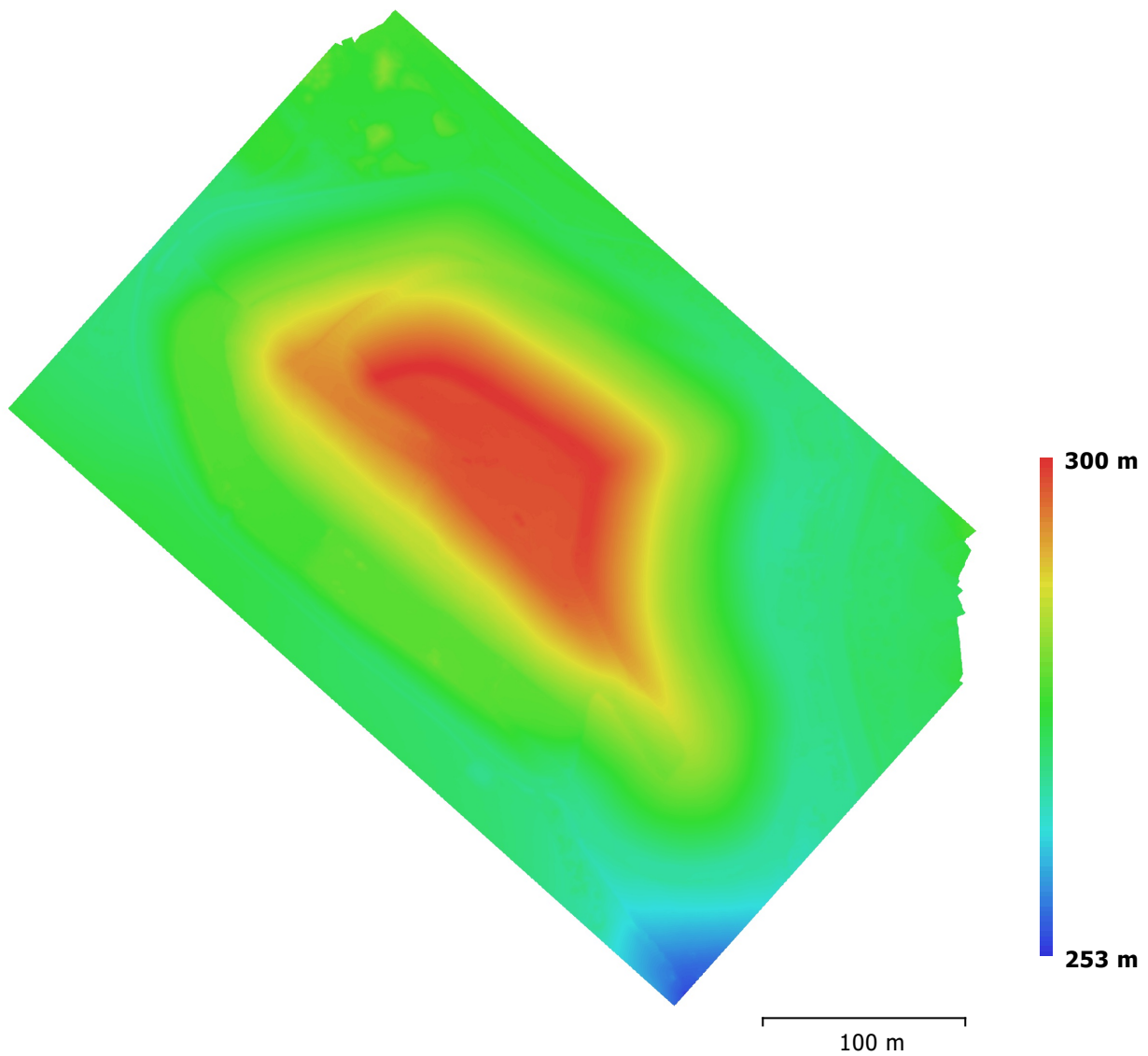


Fig. 4. Reconstructed digital elevation model.

Resolution: 0.105 m/pix
Point density: 89.9 points/m²

Processing Parameters

General

Cameras	404
Aligned cameras	404
Markers	12
Coordinate system	Local Coordinates (m)
Rotation angles	Yaw, Pitch, Roll

Point Cloud

Points	139,728 of 192,045
RMS reprojection error	0.274403 (0.783486 pix)
Max reprojection error	1.3394 (29.3366 pix)
Mean key point size	2.82054 pix
Effective overlap	13.8404

Alignment parameters

Accuracy	High
Generic preselection	Yes
Reference preselection	Yes
Key point limit	60,000
Tie point limit	6,000
Adaptive camera model fitting	Yes
Matching time	1 hours 3 minutes
Alignment time	5 minutes 2 seconds

Optimization parameters

Parameters	f, b1, b2, cx, cy, k1-k4, p1, p2
Fit rolling shutter	No
Optimization time	13 seconds

Dense Point Cloud

Points	13,949,830
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Reconstruction parameters

Quality	Medium
Depth filtering	Moderate
Depth maps generation time	43 minutes 29 seconds
Dense cloud generation time	15 minutes 18 seconds

Model

Faces	249,999
Vertices	125,960
Texture	4,096 x 4,096, uint8

Reconstruction parameters

Surface type	Arbitrary
Source data	Dense
Interpolation	Enabled
Quality	Medium
Depth filtering	Moderate
Face count	250,000
Processing time	10 minutes 23 seconds

Texturing parameters

Mapping mode	Adaptive orthophoto
Blending mode	Mosaic
Texture size	4,096 x 4,096
Enable color correction	No
Enable hole filling	Yes
UV mapping time	3 seconds
Blending time	3 minutes 35 seconds

DEM

Size	4,859 x 4,736
Coordinate system	Local Coordinates (m)

Reconstruction parameters

Source data	Mesh
Interpolation	Enabled
Processing time	11 seconds
Orthomosaic	
Size	18,160 x 18,656
Coordinate system	Local Coordinates (m)
Channels	3, uint8
Reconstruction parameters	
Blending mode	Mosaic
Surface	DEM
Enable color correction	No
Enable hole filling	Yes
Processing time	7 minutes 9 seconds
Software	
Version	1.3.2 build 4164
Platform	Windows 64