Quality Report

Generated with PIX4Dmapper version 4.8.4

Important: Click on the different icons for:

Help to analyze the results in the Quality Report

Additional information about the sections

Click here for additional tips to analyze the Quality Report

Summary

Project	CEXCI North block 5_1
Processed	2024-02-17 16:51:09
Camera Model Name(s)	ZenmuseP1_35.0_8192x5460 (RGB)
Average Ground Sampling Distance (GSD)	2.74 cm / 1.08 in

Quality Check

Images	median of 35602 keypoints per image	✓
Dataset	906 out of 906 images calibrated (100%), all images enabled	✓
Camera Optimization	8.47% relative difference between initial and optimized internal camera parameters	⚠
Matching	median of 4997.35 matches per calibrated image	✓
Georeferencing	yes, 2 GCPs (2 3D), mean RMS error = 0.168 m	✗

Calibration Details

Number of Calibrated Images	906 out of 906
Number of Geolocated Images	906 out of 906

Initial Image Positions

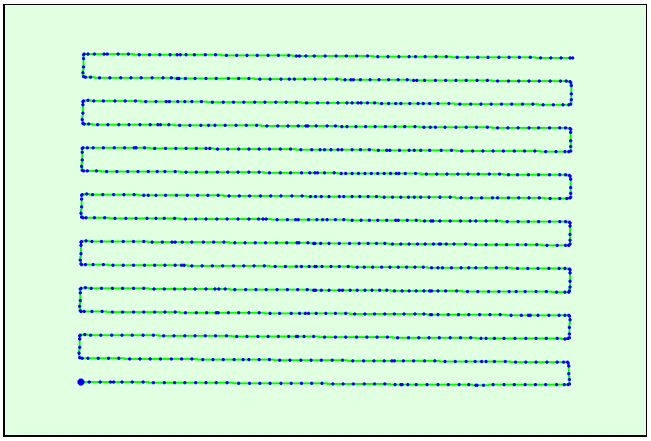
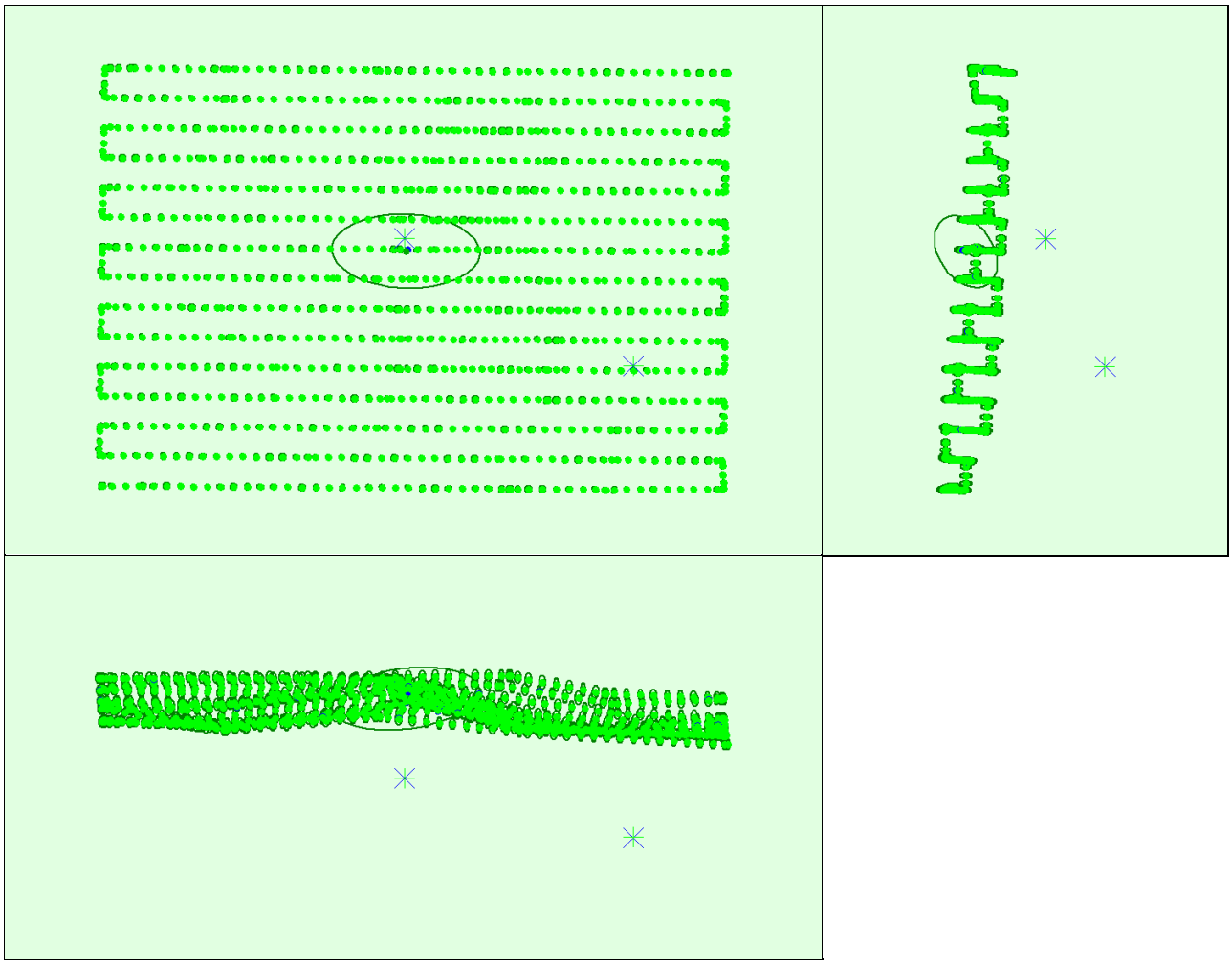


Figure 2: Top view of the initial image position. The green line follows the position of the images in time starting from the large blue dot.

Computed Image/GCPs/Manual Tie Points Positions



Uncertainty ellipses 1000x magnified

Figure 3: Offset between initial (blue dots) and computed (green dots) image positions as well as the offset between the GCPs initial positions (blue crosses) and their computed positions (green crosses) in the top-view (XY plane), front-view (XZ plane), and side-view (YZ plane). Dark green ellipses indicate the absolute position uncertainty of the bundle block adjustment result.

Absolute camera position and orientation uncertainties

	X [m]	Y [m]	Z [m]	Omega [degree]	Phi [degree]	Kappa [degree]
Mean	0.008	0.007	0.014	0.007	0.007	0.009
Sigma	0.006	0.003	0.003	0.002	0.002	0.004

Bundle Block Adjustment Details

Number of 2D Keypoint Observations for Bundle Block Adjustment	6096335
Number of 3D Points for Bundle Block Adjustment	2385778
Mean Reprojection Error [pixels]	0.149

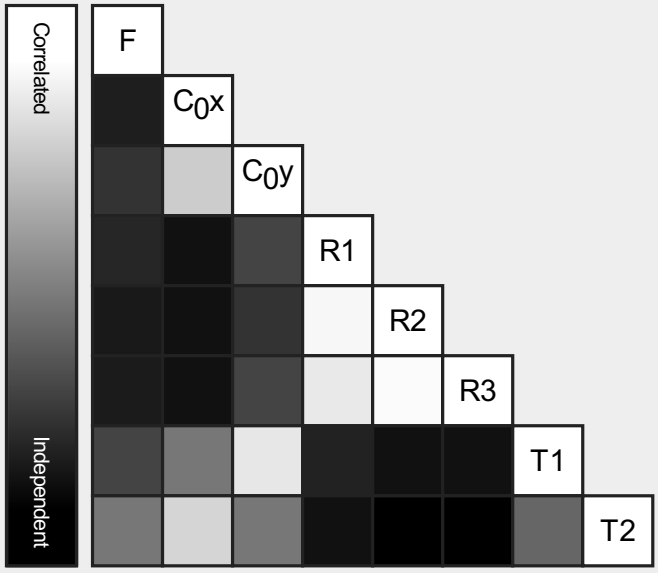
Internal Camera Parameters

ZenmuseP1_35.0_8192x5460 (RGB). Sensor Dimensions: 35.000 [mm] x 23.328 [mm]

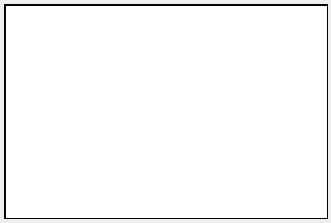
EXIF ID: ZenmuseP1_35.0_8192x5460

	Focal Length	Principal Point x	Principal Point y	R1	R2	R3	T1	T2
Initial Values	8194.340 [pixel] 35.010 [mm]	4096.001 [pixel] 17.500 [mm]	2729.996 [pixel] 11.664 [mm]	-0.048	0.021	-0.097	0.002	-0.001

Optimized Values	8888.771 [pixel] 37.977 [mm]	4077.050 [pixel] 17.419 [mm]	2781.206 [pixel] 11.883 [mm]	-0.064	0.059	-0.201	0.001	-0.000
Uncertainties (Sigma)	1.962 [pixel] 0.008 [mm]	0.546 [pixel] 0.002 [mm]	0.521 [pixel] 0.002 [mm]	0.000	0.004	0.008	0.000	0.000



The correlation between camera internal parameters determined by the bundle adjustment. White indicates a full correlation between the parameters, ie. any change in one can be fully compensated by the other. Black indicates that the parameter is completely independent, and is not affected by other parameters.



The number of Automatic Tie Points (ATPs) per pixel, averaged over all images of the camera model, is color coded between black and white. White indicates that, on average, more than 16 ATPs have been extracted at the pixel location. Black indicates that, on average, 0 ATPs have been extracted at the pixel location. Click on the image to the see the average direction and magnitude of the re-projection error for each pixel. Note that the vectors are scaled for better visualization. The scale bar indicates the magnitude of 1 pixel error.

2D Keypoints Table

	Number of 2D Keypoints per Image	Number of Matched 2D Keypoints per Image
Median	35602	4997
Min	23246	85
Max	46892	27296
Mean	35890	6729

3D Points from 2D Keypoint Matches

	Number of 3D Points Observed
In 2 Images	1659822
In 3 Images	435375
In 4 Images	161166
In 5 Images	64295
In 6 Images	25673
In 7 Images	13128
In 8 Images	8439
In 9 Images	6094
In 10 Images	4420
In 11 Images	2860
In 12 Images	1877
In 13 Images	1082
In 14 Images	690
In 15 Images	325
In 16 Images	189
In 17 Images	122
In 18 Images	95
In 19 Images	52

In 20 Images	33
In 21 Images	21
In 22 Images	12
In 23 Images	4
In 24 Images	3
In 25 Images	1

2D Keypoint Matches

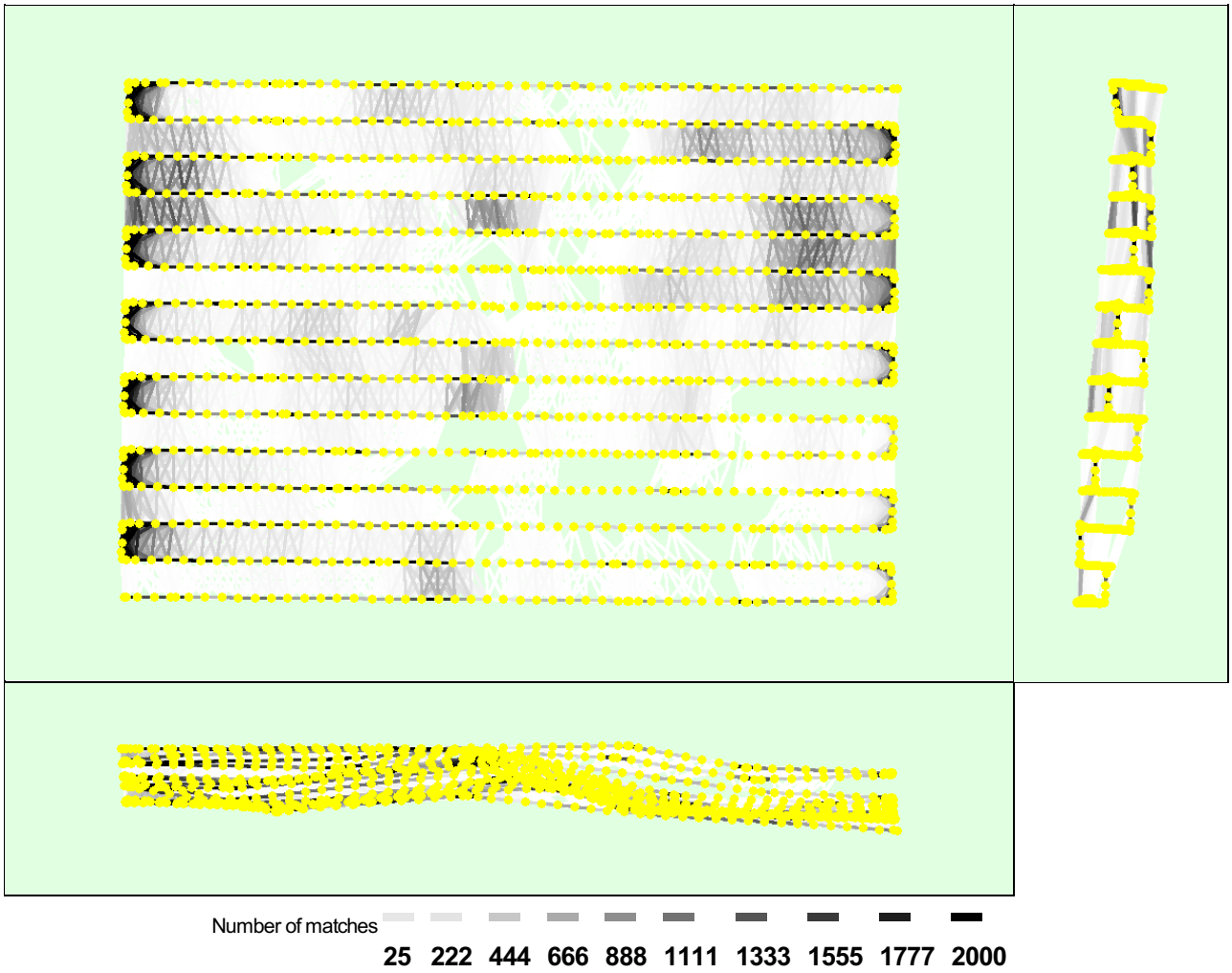


Figure 5: Computed image positions with links between matched images. The darkness of the links indicates the number of matched 2D keypoints between the images. Bright links indicate weak links and require manual tie points or more images.

Geolocation Details

Ground Control Points

GCP Name	Accuracy XY/Z [m]	Error X [m]	Error Y [m]	Error Z [m]	Projection Error [pixel]	Verified/Marked
GCP 21 (3D)	0.020/ 0.020	-0.033	-0.005	-0.020	2.096	9 / 9
GCP 22 NEW (3D)	0.020/ 0.020	0.009	-0.135	-0.861	5.500	17 / 17
Mean [m]		-0.011989	-0.070058	-0.440534		
Sigma [m]		0.020731	0.064877	0.420203		
RMS Error [m]		0.023948	0.095484	0.608803		

Localisation accuracy per GCP and mean errors in the three coordinate directions. The last column counts the number of calibrated images where the GCP has been automatically verified vs. manually marked.

Absolute Geolocation Variance

Min Error [m]	Max Error [m]	Geolocation Error X [%]	Geolocation Error Y [%]	Geolocation Error Z [%]
-	-0.04	0.11	0.00	24.97
-0.04	-0.03	0.00	0.11	3.65
-0.03	-0.02	0.00	0.00	3.87
-0.02	-0.02	0.00	0.66	5.75
-0.02	-0.01	1.55	1.55	6.41
-0.01	0.00	47.96	43.65	5.97
0.00	0.01	48.18	51.93	3.43
0.01	0.02	2.21	2.10	4.75
0.02	0.02	0.00	0.00	5.30
0.02	0.03	0.00	0.00	5.19
0.03	0.04	0.00	0.00	4.09
0.04	-	0.00	0.00	26.63
Mean [m]		0.000073	0.000169	0.002127
Sigma [m]		0.003883	0.003773	0.090379
RMS Error [m]		0.003884	0.003776	0.090404

Min Error and Max Error represent geolocation error intervals between -1.5 and 1.5 times the maximum accuracy of all the images. Columns X, Y, Z show the percentage of images with geolocation errors within the predefined error intervals. The geolocation error is the difference between the initial and computed image positions. Note that the image geolocation errors do not correspond to the accuracy of the observed 3D points.

Relative Geolocation Variance

Relative Geolocation Error	Images X [%]	Images Y [%]	Images Z [%]
[-1.00, 1.00]	96.91	97.35	29.61
[-2.00, 2.00]	99.89	99.34	51.71
[-3.00, 3.00]	99.89	99.89	68.62
Mean of Geolocation Accuracy [m]	0.008879	0.008879	0.022771
Sigma of Geolocation Accuracy [m]	0.000202	0.000202	0.000813

Images X, Y, Z represent the percentage of images with a relative geolocation error in X, Y, Z.

Geolocation Orientational Variance	RMS [degree]
Omega	1.085
Phi	1.528
Kappa	1.095

Geolocation RMS error of the orientation angles given by the difference between the initial and computed image orientation angles.

Initial Processing Details

System Information

Hardware	CPU: 13th Gen Intel(R) Core(TM) i9-13900 RAM: 64GB GPU: NVIDIA GeForce GTX 1080 Ti (Driver: 31.0.15.3623), Intel(R) UHD Graphics 770 (Driver: 31.0.101.4577)
Operating System	Windows 10 Pro, 64-bit

Coordinate Systems

Image Coordinate System	WGS 84
Output Coordinate System	WGS 84 / UTM zone 51N

Processing Options

Detected Template	No Template Available
Keypoints Image Scale	Full, Image Scale: 0.5
Advanced: Matching Image Pairs	Aerial Grid or Corridor
Advanced: Matching Strategy	Use Geometrically Verified Matching: no
Advanced: Keypoint Extraction	Targeted Number of Keypoints: Automatic
Advanced: Calibration	Calibration Method: Standard Internal Parameters Optimization: All External Parameters Optimization: All Rematch: Auto, no

Point Cloud Densification details

Processing Options

Image Scale	multiscale, 1/2 (Half image size, Default)
Point Density	Optimal
Minimum Number of Matches	3
3D Textured Mesh Generation	yes
3D Textured Mesh Settings:	Resolution: Medium Resolution (default) Color Balancing: no
LOD	Generated: no
Advanced: 3D Textured Mesh Settings	Sample Density Divider: 1
Advanced: Image Groups	group1
Advanced: Use Processing Area	yes
Advanced: Use Annotations	yes

Results

Number of Generated Tiles	11
Number of 3D Densified Points	253771381
Average Density (per m^3)	79.19