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Help to analyze the results in the Quality Report



Additional information about the sections



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Summary



Project	231227_AleaPark_M
Processed	2023-12-27 18:02:06
Camera Model Name(s)	FC6310R_8.8_5472x3648 (RGB)(1), FC6310R_8.8_5472x3648 (RGB)(2)
Average Ground Sampling Distance (GSD)	3.21 cm / 1.26 in
Area Covered	0.821 km ² / 82.0936 ha / 0.32 sq. mi. / 202.9626 acres

Quality Check



Images	median of 48521 keypoints per image	
Dataset	510 out of 510 images calibrated (100%), all images enabled	
Camera Optimization	0.09% relative difference between initial and optimized internal camera parameters	
Matching	median of 32675.4 matches per calibrated image	
Georeferencing	yes, 16 GCPs (16 3D), mean RMS error = 0.012 m	

Preview

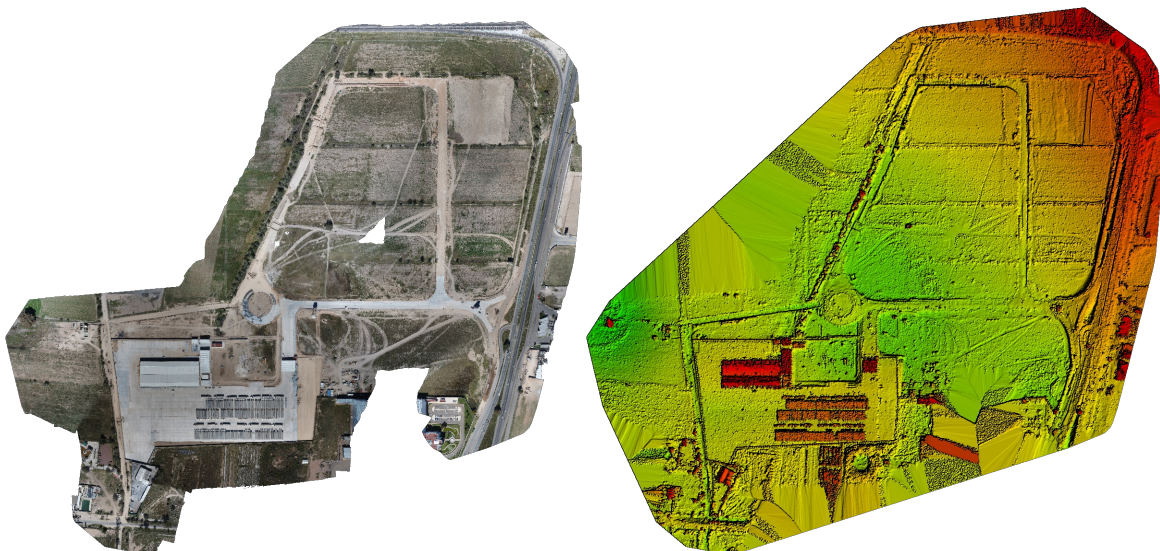


Figure 1: Orthomosaic and the corresponding sparse Digital Surface Model (DSM) before densification.

Calibration Details



Number of Calibrated Images	510 out of 510
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Initial Image Positions

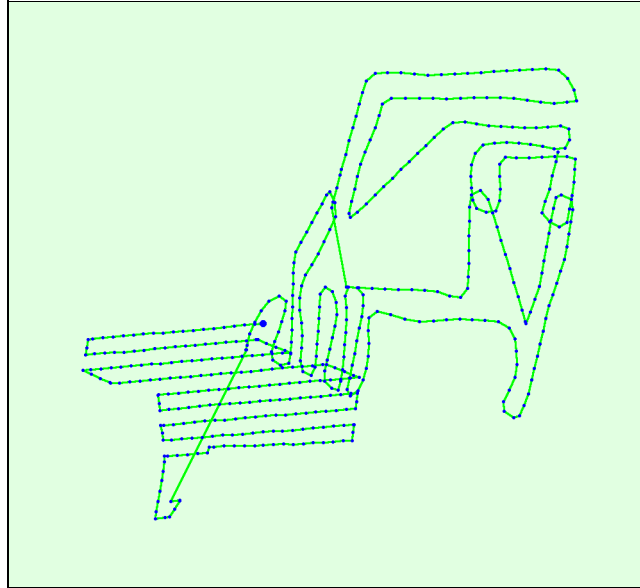
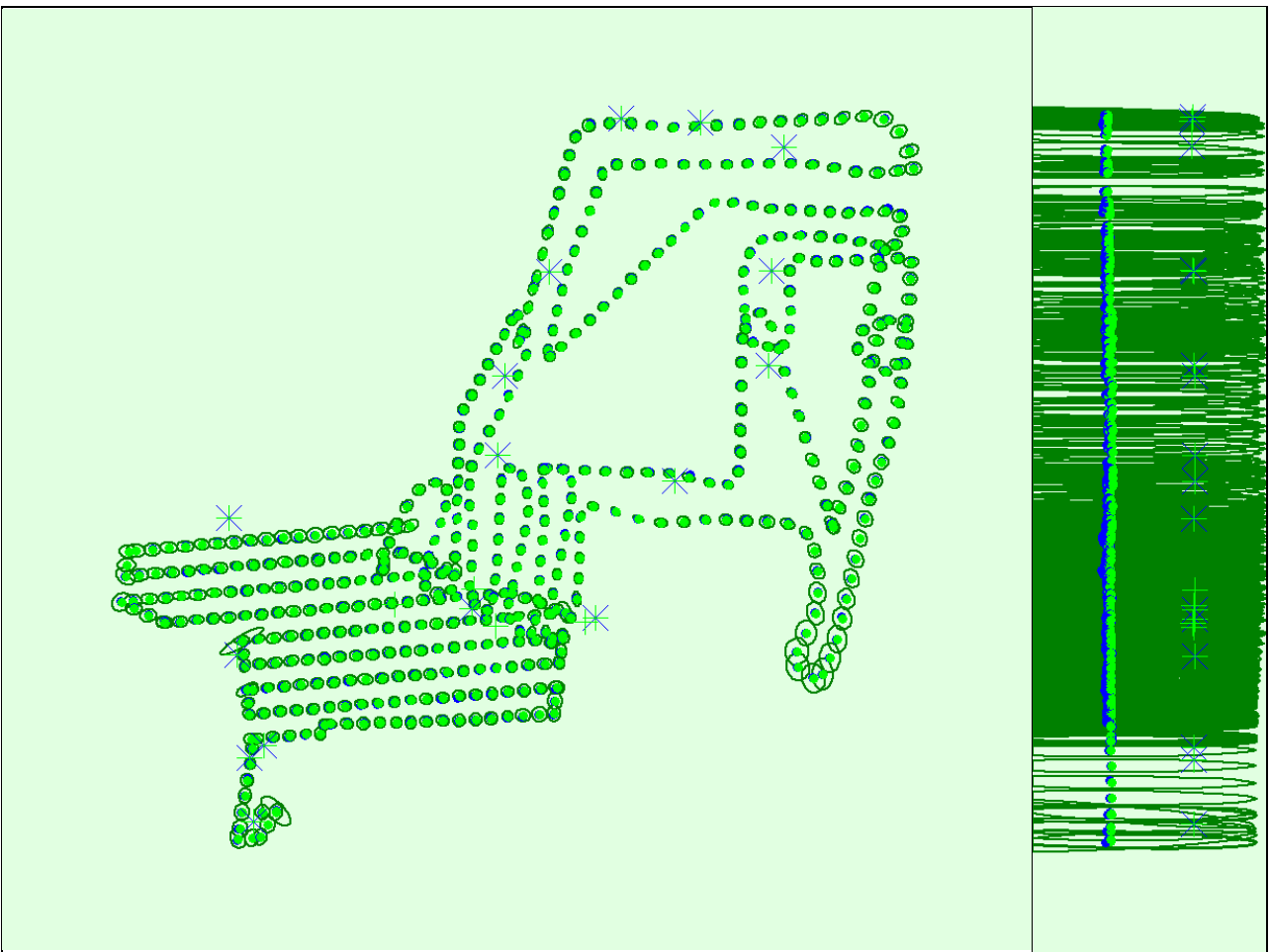
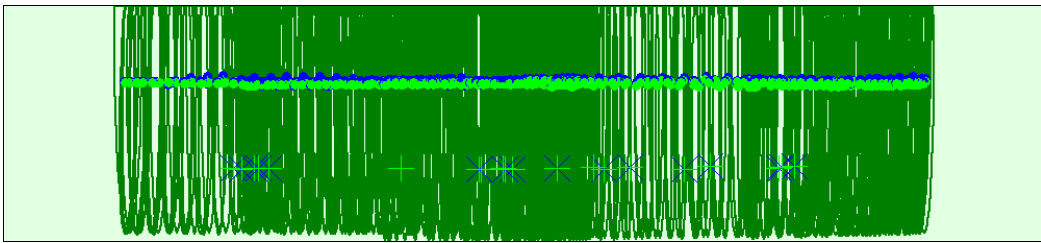


Figure 2: Top view of the initial image position. The green line follows the position of the images in time starting from the large blue dot.

Computed Image/GCPs/Manual Tie Points Positions





Uncertainty ellipses 500x magnified

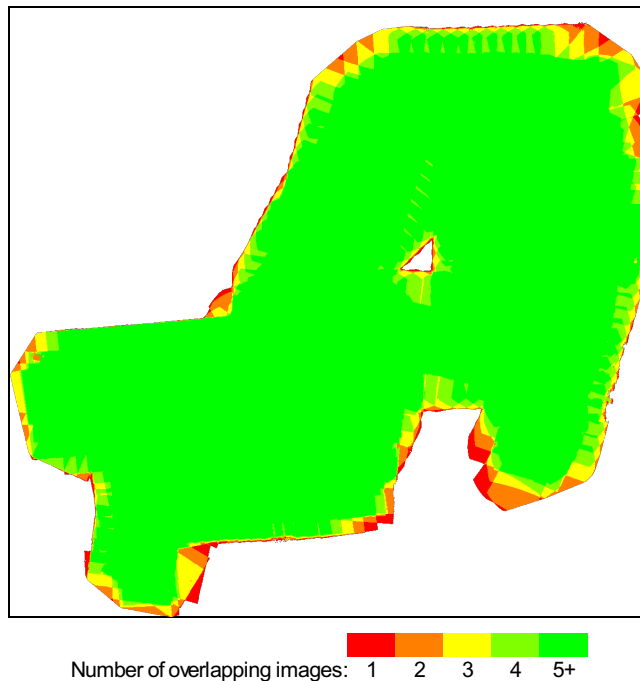
Figure 3: Offset between initial (blue dots) and computed (green dots) image positions as well as the offset between the GCPs initial positions (blue crosses) and their computed positions (green crosses) in the top-view (XY plane), front-view (XZ plane), and side-view (YZ plane). Dark green ellipses 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	0.017	0.015	0.409	0.006	0.007	0.002
Sigma	0.004	0.004	0.010	0.002	0.002	0.001

? Overlap



Number of overlapping images: 1 2 3 4 5+

Figure 4: Number of overlapping images computed for each pixel of the orthomosaic. Red and yellow areas indicate low overlap for which poor results may be generated. Green areas indicate an overlap of over 5 images for every pixel. Good quality results will be generated as long as the number of keypoint matches is also sufficient for these areas (see Figure 5 for keypoint matches).

Bundle Block Adjustment Details



Number of 2D Keypoint Observations for Bundle Block Adjustment	16774719
Number of 3D Points for Bundle Block Adjustment	3983165
Mean Reprojection Error [pixels]	0.193

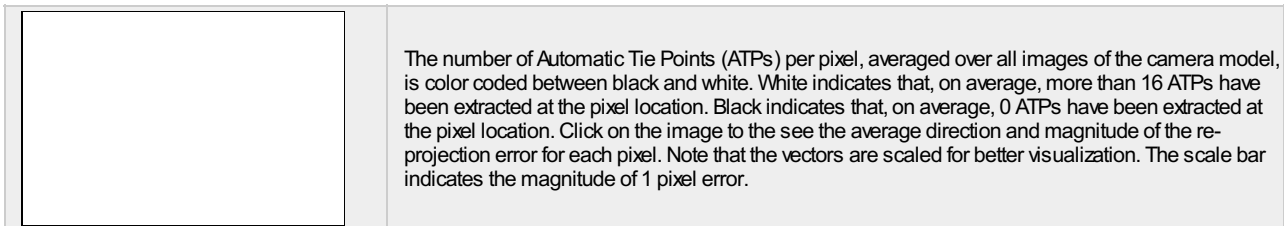
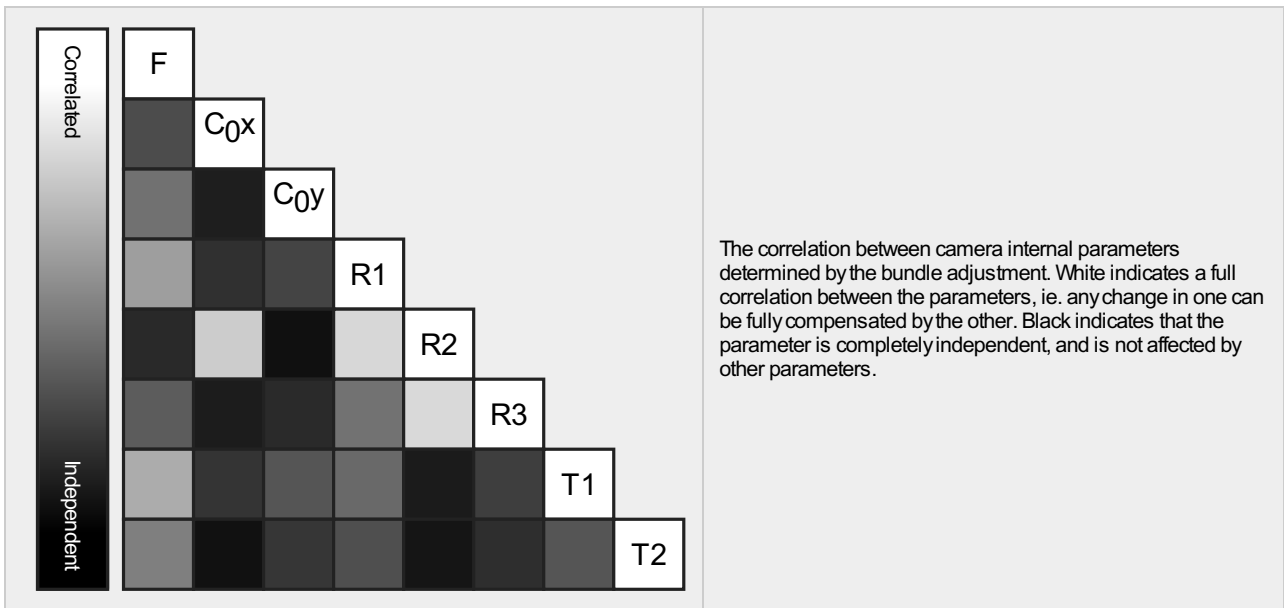
? Internal Camera Parameters

FC6310R_8.8_5472x3648 (RGB)(1). Sensor Dimensions: 12.833 [mm] x 8.556 [mm]



EXIF ID: FC6310R_8.8_5472x3648

	Focal Length	Principal Point x	Principal Point y	R1	R2	R3	T1	T2
Initial Values	3658.300 [pixel] 8.580 [mm]	2722.500 [pixel] 6.385 [mm]	1835.100 [pixel] 4.304 [mm]	0.000	0.000	0.000	0.000	0.000
Optimized Values	3663.531 [pixel] 8.592 [mm]	2723.430 [pixel] 6.387 [mm]	1816.096 [pixel] 4.259 [mm]	-0.013	0.003	0.005	-0.001	-0.001
Uncertainties (Sigma)	12.963 [pixel] 0.030 [mm]	0.284 [pixel] 0.001 [mm]	0.277 [pixel] 0.001 [mm]	0.000	0.000	0.000	0.000	0.000



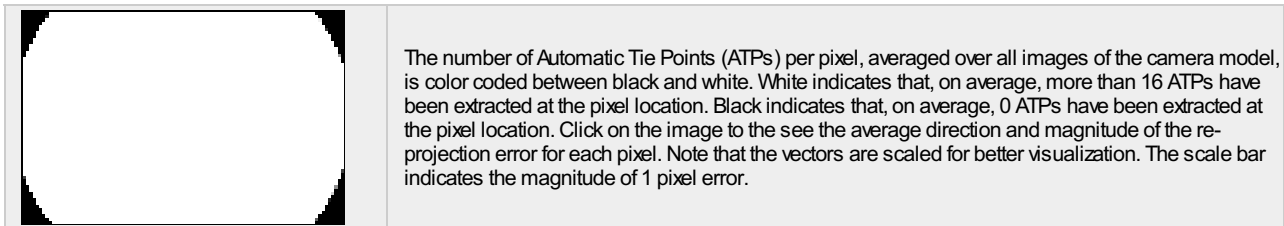
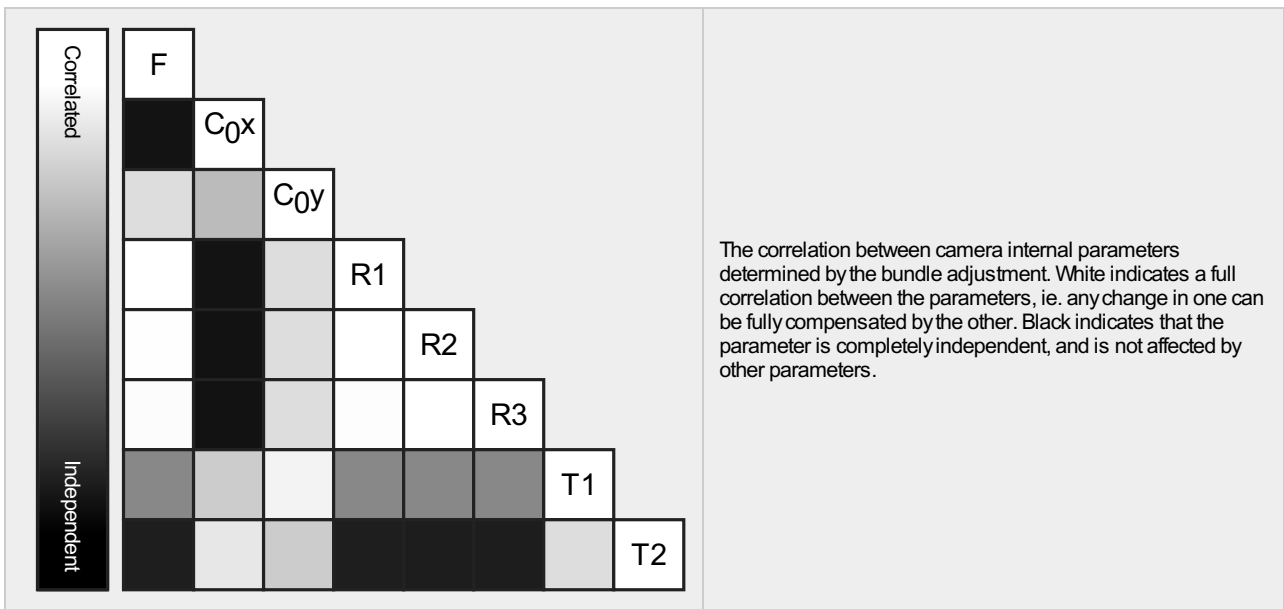
Internal Camera Parameters

FC6310R_8.8_5472x3648 (RGB)(2). Sensor Dimensions: 12.833 [mm] x 8.556 [mm]



EXIF ID: FC6310R_8.8_5472x3648

	Focal Length	Principal Point x	Principal Point y	R1	R2	R3	T1	T2
Initial Values	3658.300 [pixel] 8.580 [mm]	2722.500 [pixel] 6.385 [mm]	1835.100 [pixel] 4.304 [mm]	-0.269	0.112	-0.033	0.000	-0.001
Optimized Values	3656.815 [pixel] 8.576 [mm]	2717.379 [pixel] 6.373 [mm]	1813.589 [pixel] 4.253 [mm]	-0.277	0.121	-0.034	-0.000	-0.000
Uncertainties (Sigma)	13.436 [pixel] 0.032 [mm]	0.189 [pixel] 0.000 [mm]	0.191 [pixel] 0.000 [mm]	0.002	0.002	0.001	0.000	0.000



2D Keypoints Table

	Number of 2D Keypoints per Image	Number of Matched 2D Keypoints per Image
Median	48521	32675
Mn	20483	9255
Max	79891	63895
Mean	49329	32892

2D Keypoints Table for Camera FC6310R_8.8_5472x3648 (RGB)(1)

	Number of 2D Keypoints per Image	Number of Matched 2D Keypoints per Image
Median	34600	21545
Mn	20483	9255
Max	79891	63895
Mean	39313	25949

2D Keypoints Table for Camera FC6310R_8.8_5472x3648 (RGB)(2)

	Number of 2D Keypoints per Image	Number of Matched 2D Keypoints per Image
Median	59903	38689
Mn	25226	13211
Max	79083	60402
Mean	56746	38033

Median / 75% / Maximal Number of Matches Between Camera Models

	FC6310R_8.8_...(RGB)(1)	FC6310R_8.8_...(RGB)(2)
FC6310R_8.8_5472x3648 (RGB)(1)	853 / 2941 / 42184	6 / 12 / 57
FC6310R_8.8_5472x3648 (RGB)(2)		1854 / 6039 / 33819

3D Points from 2D Keypoint Matches

Number of 3D Points Observed

In 2 Images	1722885
In 3 Images	697389
In 4 Images	418657
In 5 Images	279371
In 6 Images	194346
In 7 Images	147626
In 8 Images	115577
In 9 Images	90223
In 10 Images	71383
In 11 Images	55492
In 12 Images	42962
In 13 Images	33744
In 14 Images	26364
In 15 Images	20415
In 16 Images	15715
In 17 Images	12019
In 18 Images	8991
In 19 Images	7135
In 20 Images	5459
In 21 Images	4290
In 22 Images	3368
In 23 Images	2661
In 24 Images	1990
In 25 Images	1499
In 26 Images	1075
In 27 Images	677
In 28 Images	475
In 29 Images	382
In 30 Images	308
In 31 Images	215
In 32 Images	156
In 33 Images	105
In 34 Images	68
In 35 Images	61
In 36 Images	37
In 37 Images	18
In 38 Images	11
In 39 Images	8
In 40 Images	4
In 41 Images	3
In 42 Images	1

 2D Keypoint Matches



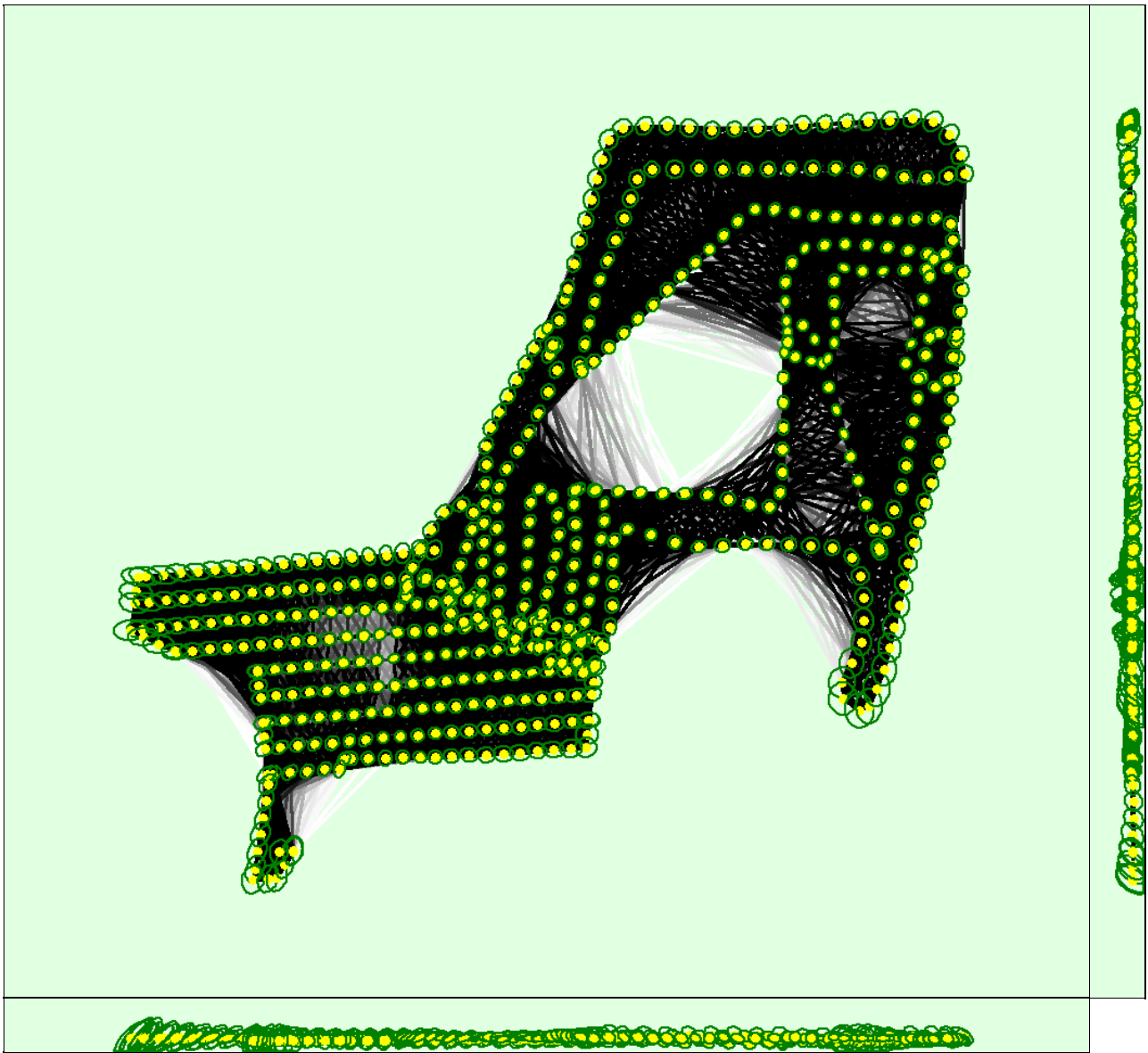


Figure 5: Computed image positions with links between matched images. The darkness of the links indicates the number of matched 2D keypoints between the images. Bright links indicate weak links and require manual tie points or more images. Dark green ellipses indicate the relative camera position uncertainty of the bundle block adjustment result.

Relative camera position and orientation uncertainties



	X[m]	Y[m]	Z[m]	Omega [degree]	Phi [degree]	Kappa [degree]
Mean	0.020	0.020	0.017	0.009	0.008	0.003
Sigma	0.005	0.005	0.007	0.002	0.002	0.001

Manual Tie Points



MTP Name	Projection Error [pixel]	Verified/Marked
LP01	0.681	37 / 37
LP02	0.505	39 / 39
LP03	0.744	14 / 20
LP04	0.627	35 / 35

Projection errors for manual tie points. The last column counts the number of images where the manual tie point has been automatically verified vs. manually marked.

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
GC2 (3D)	0.020/ 0.020	-0.022	0.018	0.013	0.473	18 / 18
GC4 (3D)	0.020/ 0.020	0.009	0.001	0.004	0.350	11 / 11
GC6 (3D)	0.020/ 0.020	0.002	0.012	-0.001	0.369	14 / 14
GC7 (3D)	0.020/ 0.020	0.007	-0.008	0.002	0.410	19 / 19
GC8 (3D)	0.020/ 0.020	0.000	-0.007	0.007	0.678	11 / 11
GC9 (3D)	0.020/ 0.020	0.002	0.004	-0.006	0.299	9 / 9
GC10 (3D)	0.020/ 0.020	-0.007	-0.010	0.002	0.285	9 / 9
GC11 (3D)	0.020/ 0.020	-0.006	0.006	0.002	0.347	15 / 15
GC12 (3D)	0.020/ 0.020	0.006	-0.004	-0.011	0.261	13 / 13
GC13 (3D)	0.020/ 0.020	-0.001	-0.005	0.005	0.350	21 / 21
GC14 (3D)	0.020/ 0.020	0.004	-0.004	-0.000	0.402	43 / 43
GC17 (3D)	0.020/ 0.020	-0.010	0.009	-0.015	0.643	10 / 10
GC19 (3D)	0.020/ 0.020	0.021	0.002	0.016	0.496	19 / 19
GC21 (3D)	0.020/ 0.020	-0.021	-0.012	-0.014	0.500	15 / 15
GC22 (3D)	0.020/ 0.020	-0.005	0.002	-0.012	0.353	10 / 10
GC23 (3D)	0.020/ 0.020	0.016	0.017	0.066	0.602	5 / 5
Mean [m]		-0.000329	0.001211	0.003567		
Sigma [m]		0.011195	0.008979	0.018485		
RMS Error [m]		0.011200	0.009061	0.018826		

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 v.s. manually marked.

Absolute Geolocation Variance



Mn Error [m]	Max Error [m]	Geolocation Error X [%]	Geolocation Error Y [%]	Geolocation Error Z [%]
-	-6.84	0.00	0.00	0.00
-6.84	-5.47	0.00	0.00	0.39
-5.47	-4.10	0.00	0.00	2.75
-4.10	-2.74	0.20	0.00	1.96
-2.74	-1.37	2.75	7.25	11.96
-1.37	0.00	49.41	37.45	35.69
0.00	1.37	46.08	51.96	29.22
1.37	2.74	1.57	2.75	12.16
2.74	4.10	0.00	0.59	4.31
4.10	5.47	0.00	0.00	0.98
5.47	6.84	0.00	0.00	0.39
6.84	-	0.00	0.00	0.20
Mean [m]		-0.513069	0.695912	2.854698
Sigma [m]		0.704755	0.826533	1.774050
RMS Error [m]		0.871733	1.080486	3.361035

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.

Geolocation Bias	X	Y	Z
Translation [m]	-0.489150	0.715947	2.870204

Bias between image initial and computed geolocation given in output coordinate system.

Relative Geolocation Variance



Relative Geolocation Error	Images X[%]	Images Y[%]	Images Z[%]
[-1.00, 1.00]	95.88	90.78	91.96
[-2.00, 2.00]	100.00	99.61	99.61
[-3.00, 3.00]	100.00	100.00	100.00
Mean of Geolocation Accuracy [m]	1.439124	1.439124	3.076983
Sigma of Geolocation Accuracy [m]	0.059784	0.059784	0.277079

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

Geolocation Orientational Variance	RMS [degree]
Omega	0.247
Phi	0.424
Kappa	3.026

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: Intel(R) Core(TM) i7-10700K CPU @ 3.80GHz RAM: 64GB GPU: NMDIA GeForce RTX 3080 (Driver: 31.0.15.3742)
Operating System	Windows 10 Pro, 64-bit

Coordinate Systems



Image Coordinate System	WGS 84
Ground Control Point (GCP) Coordinate System	WGS 84 / UTMzone 13N (2D)
Output Coordinate System	WGS 84 / UTMzone 13N (2D)

Processing Options



Detected Template	No Template Available
Keypoints Image Scale	Custom, Image Scale: 1
Advanced: Matching Image Pairs	Aerial Grid or Corridor
Advanced: Matching Strategy	Use Geometrically Verified Matching: yes
Advanced: Keypoint Extraction	Targeted Number of Keypoints: Automatic
Advanced: Calibration	Calibration Method: Standard Internal Parameters Optimization: All External Parameters Optimization: All Rematch: Auto, yes

Point Cloud Densification details



Processing Options



Image Scale	multiscale, 1/2 (Half image size, Default)
Point Density	Optimal
Minimum Number of Matches	4
3D Textured Mesh Generation	yes

3D Textured Mesh Settings:	Resolution: Medium Resolution (default) Color Balancing: yes
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
Time for Point Cloud Densification	27m:55s
Time for Point Cloud Classification	04m:11s
Time for 3D Textured Mesh Generation	19m:28s

Results



Number of Generated Tiles	4
Number of 3D Densified Points	50390470
Average Density (per m ³)	96.52

DSM, Orthomosaic and Index Details



Processing Options



DSM and Orthomosaic Resolution	5 [cm/pixel]
DSM Filters	Noise Filtering: yes Surface Smoothing: yes, Type: Medium
Raster DSM	Generated: yes Method: Inverse Distance Weighting Merge Tiles: yes
Orthomosaic	Generated: yes Merge Tiles: yes GeoTIFF Without Transparency: no Google Maps Tiles and KML: no
Raster DTM	Generated: yes Merge Tiles: yes
DTM Resolution	20 [cm/pixel]
Contour Lines Generation	Generated: yes Contour Base [m]: 0 Elevation Interval [m]: 0.5 Resolution [cm]: 75 Minimum Line Size [vertices]: 30
Time for DSM Generation	03m:02s
Time for Orthomosaic Generation	15m:57s
Time for DTM Generation	12m:45s
Time for Contour Lines Generation	05s
Time for Reflectance Map Generation	00s
Time for Index Map Generation	00s