Quality Report

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	231227_AleaPark_1
Processed	2023-12-27 18:15:55
Camera Model Name(s)	FC6310R_8.8_5472x3648 (RGB)
Average Ground Sampling Distance (GSD)	3.09 cm / 1.22 in
Area Covered	0.287 km^2 / 28.7400 ha / 0.11 sq. mi. / 71.0549 acres

Quality Check

Images	median of 34600 keypoints per image	✓
Dataset	217 out of 217 images calibrated (100%), all images enabled	✓
Camera Optimization	0.06% relative difference between initial and optimized internal camera parameters	✓
Matching	median of 20643.5 matches per calibrated image	✓
Georeferencing	yes, 7 GCPs (7 3D), mean RMS error = 0.022 m	✓

Preview

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

Calibration Details

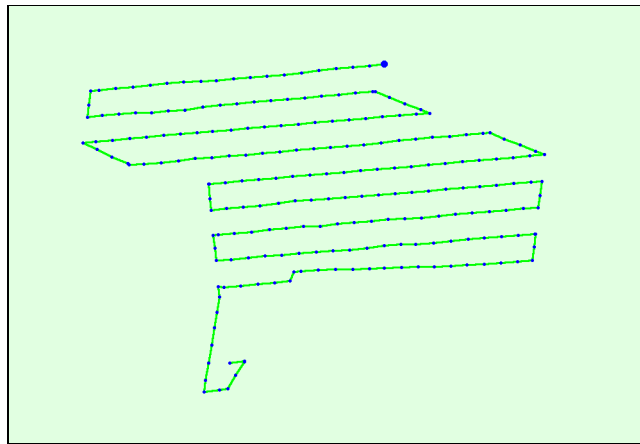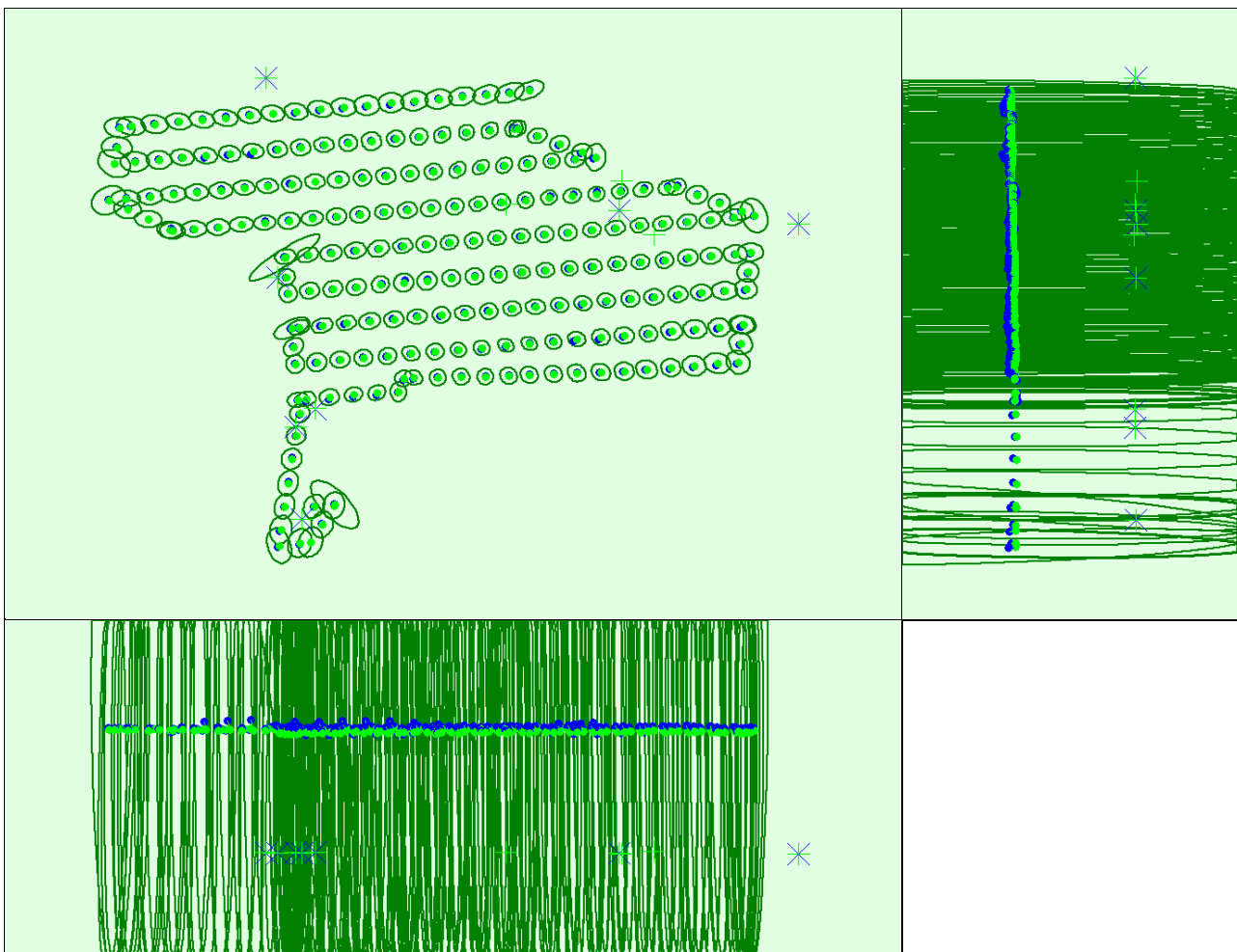| Number of Calibrated Images	217 out of 217
Number of Geolocated Images	217 out of 217

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	0.010	0.008	0.230	0.003	0.004	0.001

Sigma	0.002	0.002	0.003	0.001		0.001	0.000	

Overlap
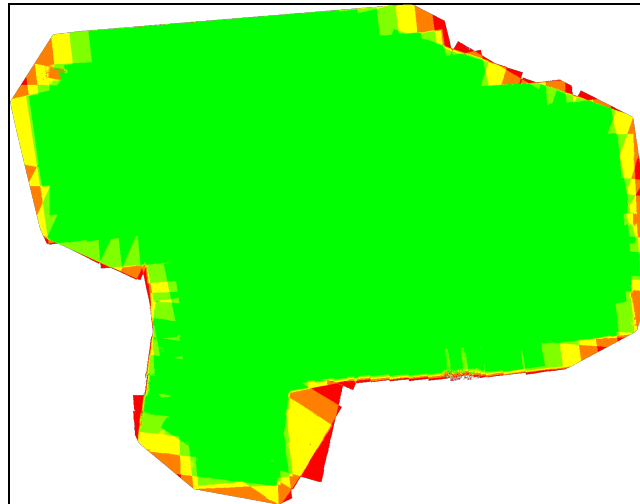
Number of overlapping images: 1 2 3 4 5+

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).
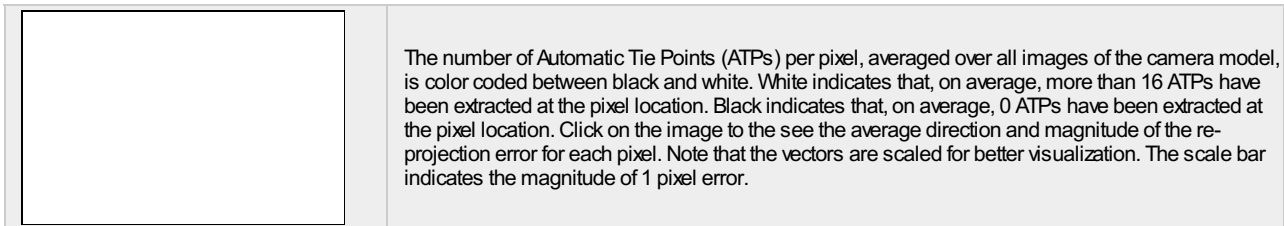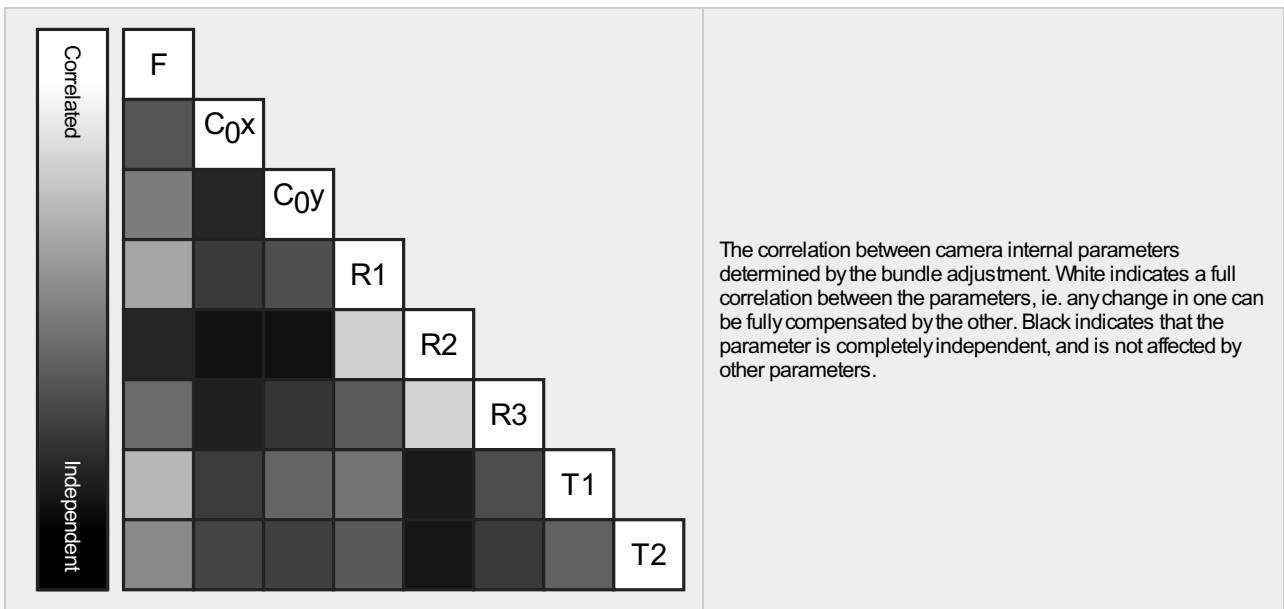
Bundle Block Adjustment Details

Number of 2D Keypoint Observations for Bundle Block Adjustment	5494071
Number of 3D Points for Bundle Block Adjustment	1310762
Mean Reprojection Error [pixels]	0.209

Internal Camera Parameters

FC6310R_8.8_5472x3648 (RGB). 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	3660.784 [pixel] 8.586 [mm]	2723.024 [pixel] 6.386 [mm]	1815.715 [pixel] 4.258 [mm]	-0.012	0.002	0.006	-0.001	-0.001
Uncertainties (Sigma)	7.424 [pixel] 0.017 [mm]	0.141 [pixel] 0.000 [mm]	0.136 [pixel] 0.000 [mm]	0.000	0.000	0.000	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   ℹ

	Number of 2D Keypoints per Image	Number of Matched 2D Keypoints per Image
Median	34600	20643
Min	20483	8772
Max	79891	63004
Mean	39313	25318

❓ 3D Points from 2D Keypoint Matches   ℹ

	Number of 3D Points Observed
In 2 Images	604932
In 3 Images	218964
In 4 Images	128073
In 5 Images	86803
In 6 Images	57846
In 7 Images	42863
In 8 Images	33945
In 9 Images	27442
In 10 Images	22961
In 11 Images	17496
In 12 Images	13075
In 13 Images	10446
In 14 Images	8721
In 15 Images	7689
In 16 Images	6184
In 17 Images	4876
In 18 Images	4037
In 19 Images	3512
In 20 Images	2898
In 21 Images	2241
In 22 Images	1729
In 23 Images	1420

In 24 Images	1020
In 25 Images	704
In 26 Images	413
In 27 Images	181
In 28 Images	96
In 29 Images	96
In 30 Images	63
In 31 Images	19
In 32 Images	10
In 33 Images	5
In 35 Images	2

2D Keypoint Matches
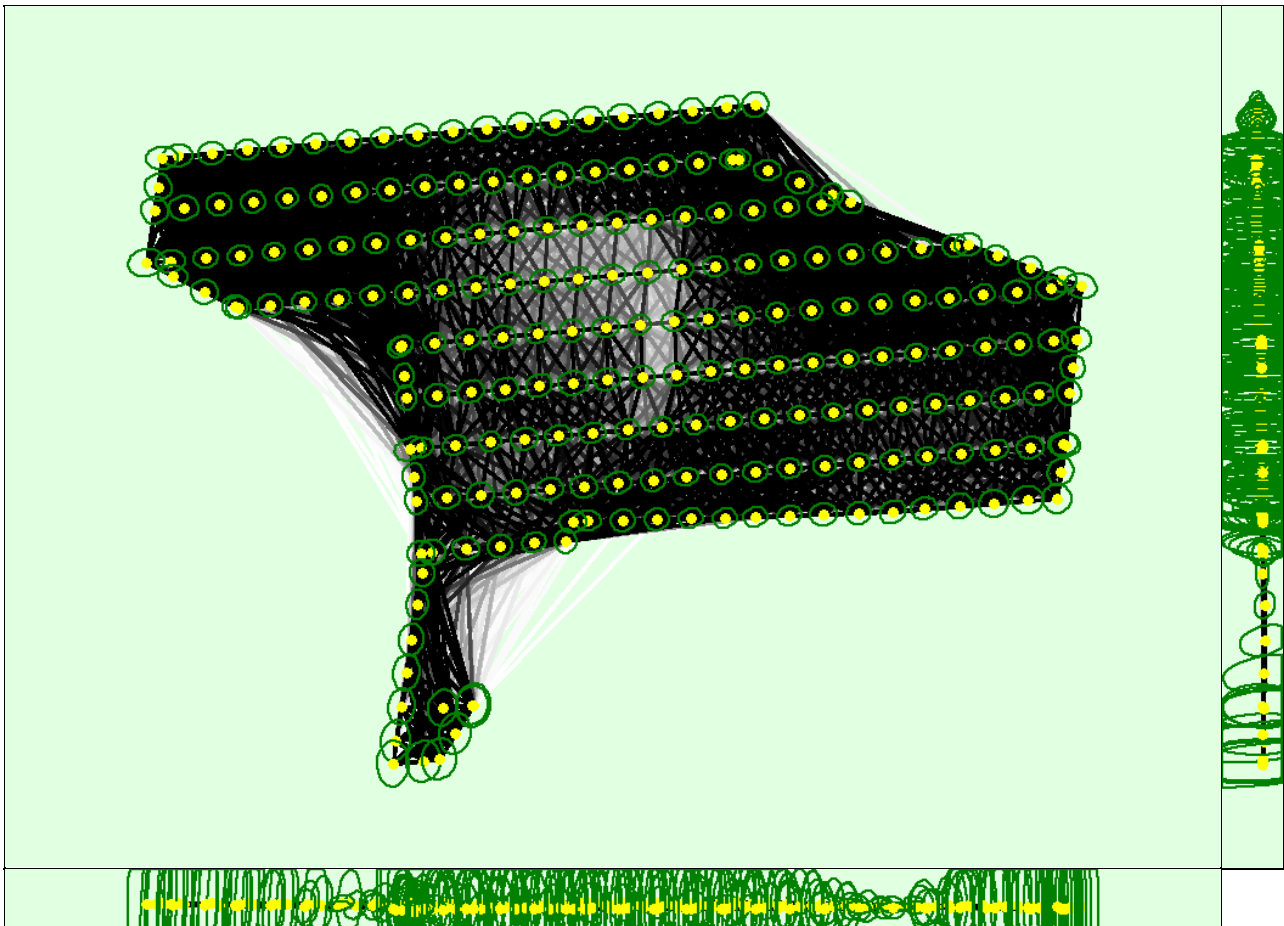
Uncertainty ellipses 1000x magnified

Number of matches

25   222   444   666   888   1111   1333   1555   1777   2000

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	0.008	0.007	0.030	0.014	0.019	0.001
Sigma	0.001	0.002	0.019	0.009	0.011	0.000

Manual Tie Points

MTP Name	Projection Error [pixel]	Verified/Marked
LP01	0.719	18 / 18

LP02	0.518		21 / 21
LP04	0.800		27 / 27

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	-0.032	-0.004	0.068	0.747	5 / 5
GC14 (3D)	0.020/ 0.020	0.004	-0.002	-0.001	0.501	25 / 25
GC17 (3D)	0.020/ 0.020	-0.016	0.011	-0.025	0.763	10 / 10
GC19 (3D)	0.020/ 0.020	0.024	0.002	0.022	0.584	19 / 19
GC21 (3D)	0.020/ 0.020	-0.021	-0.008	-0.020	0.567	15 / 15
GC22 (3D)	0.020/ 0.020	-0.005	0.004	-0.019	0.403	10 / 10
GC23 (3D)	0.020/ 0.020	0.020	0.019	0.082	0.633	5 / 5
Mean [m]		-0.003804	0.003273	0.015384		
Sigma [m]		0.019350	0.008593	0.040583		
RMS Error [m]		0.019720	0.009195	0.043401		

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 [%]
-	-6.84	0.00	0.00	0.00
-6.84	-5.47	0.00	0.00	0.92
-5.47	-4.10	0.00	0.00	5.53
-4.10	-2.74	0.00	0.00	3.69
-2.74	-1.37	3.69	6.91	15.67
-1.37	0.00	45.62	39.17	28.11
0.00	1.37	47.93	50.23	18.43
1.37	2.74	2.76	3.69	16.59
2.74	4.10	0.00	0.00	8.76
4.10	5.47	0.00	0.00	1.38
5.47	6.84	0.00	0.00	0.46
6.84	-	0.00	0.00	0.46
Mean [m]		-0.922365	0.190245	2.883167
Sigma [m]		0.683866	0.792067	2.267445
RMS Error [m]		1.148229	0.814594	3.667964

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]	-0.918860	0.196688	2.900310

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]	95.85	93.09	84.79
[-2.00, 2.00]	100.00	100.00	99.54
[-3.00, 3.00]	100.00	100.00	100.00
Mean of Geolocation Accuracy [m]	1.468191	1.468191	3.325689
Sigma of Geolocation Accuracy [m]	0.054226	0.054226	0.222102

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

Geolocation Orientational Variance	RMS [degree]
Omega	0.266
Phi	0.573
Kappa	2.547

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: NVIDIA 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 / UTM zone 13N (2D)
Output Coordinate System	WGS 84 / UTM zone 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