Quality Report

Generated with Pix4Dmapper version 4.3.31

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	rtk
Processed	2018-11-10 20:32:06
Camera Model Name(s)	FC6310_8.8_5472x3648 (RGB)
Average Ground Sampling Distance (GSD)	2.21 cm / 0.87 in
Area Covered	0.384 km^2 / 38.4242 ha / 0.15 sq. mi. / 94.9975 acres
Time for Initial Processing (without report)	54m:05s

Quality Check

Images	median of 57059 keypoints per image	✓
Dataset	790 out of 790 images calibrated (100%), all images enabled	✓
Camera Optimization	0.66% relative difference between initial and optimized internal camera parameters	✓
Matching	median of 10718.8 matches per calibrated image	✓
Georeferencing	yes, no 3D GCP	⚠

Preview

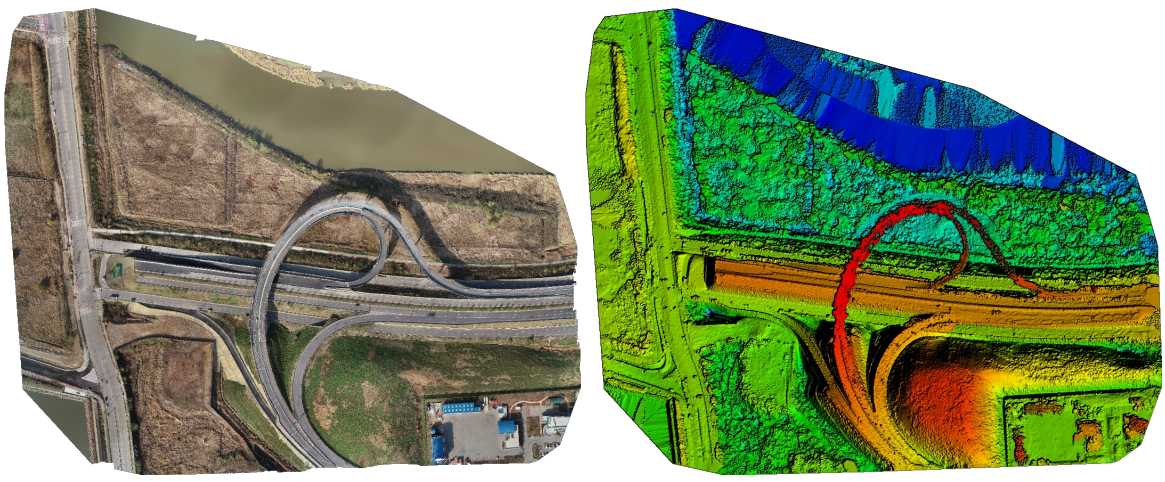


Figure 1: Orthomosaic and the corresponding sparse Digital Surface Model (DSM) before densification.

Calibration Details

Number of Calibrated Images	790 out of 790
Number of Geolocated Images	790 out of 790

Initial Image Positions

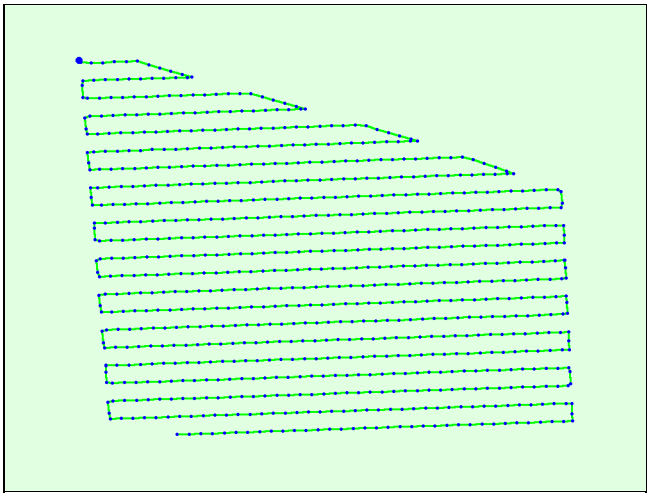
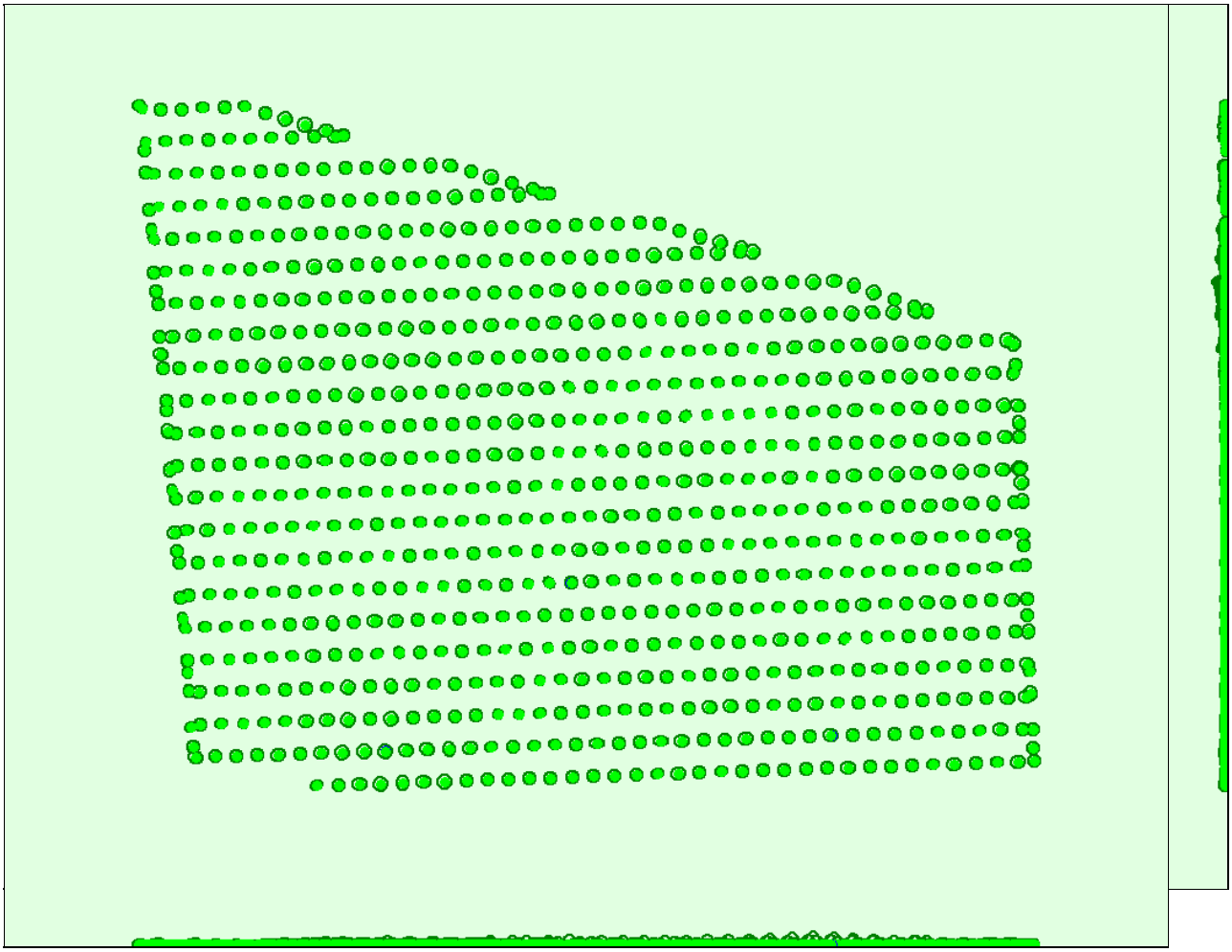


Figure 2: Top view of the initial image position. The green line follows the position of the images in time starting from the large blue dot.

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	0.005	0.004	0.003	0.003	0.003	0.002
Sigma	0.000	0.000	0.001	0.000	0.000	0.001

Overlap

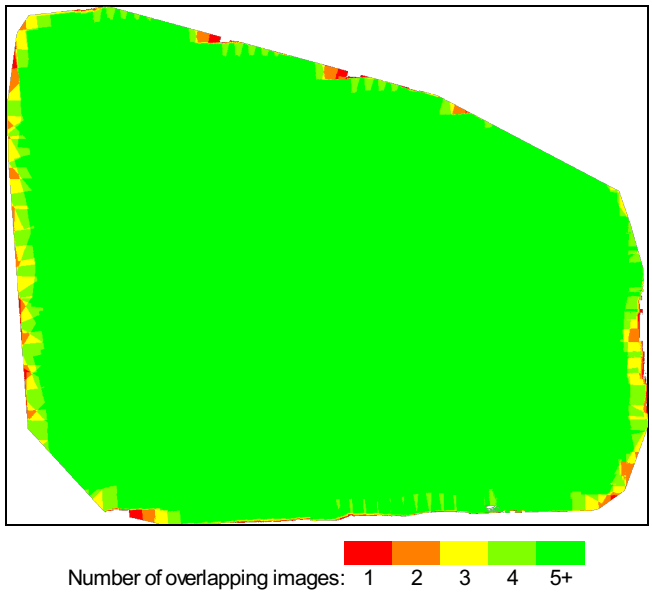


Figure 4: Number of overlapping images computed for each pixel of the orthomosaic.
Red and yellow areas indicate low overlap for which poor results may be generated. Green areas indicate an overlap of over 5 images for every pixel. Good quality results will be generated as long as the number of keypoint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

Bundle Block Adjustment Details

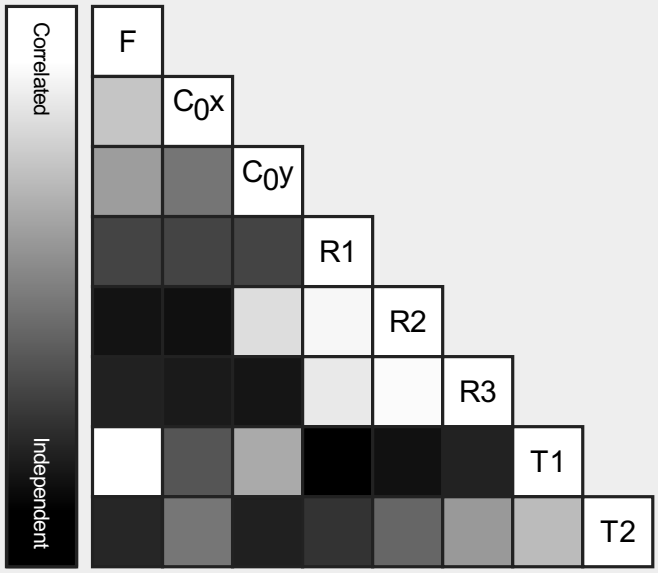
Number of 2D Keypoint Observations for Bundle Block Adjustment	7983550
Number of 3D Points for Bundle Block Adjustment	2442996
Mean Reprojection Error [pixels]	0.137

Internal Camera Parameters

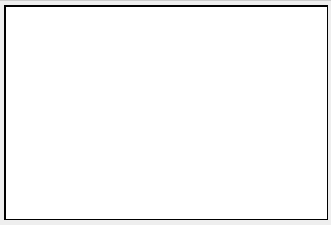
FC6310_8.8_5472x3648 (RGB). Sensor Dimensions: 12.833 [mm] x 8.556 [mm]

EXIF ID: FC6310R_8.8_5472x3648

	Focal Length	Principal Point x	Principal Point y	R1	R2	R3	T1	T2
Initial Values	3668.759 [pixel] 8.604 [mm]	2736.001 [pixel] 6.417 [mm]	1823.999 [pixel] 4.278 [mm]	0.003	-0.008	0.008	-0.000	0.000
Optimized Values	3644.213 [pixel] 8.547 [mm]	2715.693 [pixel] 6.369 [mm]	1841.361 [pixel] 4.318 [mm]	0.002	-0.009	0.008	0.000	-0.001
Uncertainties (Sigma)	1.637 [pixel] 0.004 [mm]	0.067 [pixel] 0.000 [mm]	0.038 [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

	Number of 2D Keypoints per Image	Number of Matched 2D Keypoints per Image
Median	57059	10719
Min	21714	227
Max	80018	25100
Mean	57150	10106

3D Points from 2D Keypoint Matches

	Number of 3D Points Observed
In 2 Images	1445887
In 3 Images	428435
In 4 Images	199521
In 5 Images	112930
In 6 Images	64806
In 7 Images	44028
In 8 Images	31949
In 9 Images	24293
In 10 Images	18768
In 11 Images	13725
In 12 Images	10884
In 13 Images	8923
In 14 Images	7340
In 15 Images	6069
In 16 Images	4993
In 17 Images	4122
In 18 Images	3355
In 19 Images	2883
In 20 Images	2314
In 21 Images	1892
In 22 Images	1532
In 23 Images	1237

In 24 Images	975
In 25 Images	816
In 26 Images	495
In 27 Images	325
In 28 Images	173
In 29 Images	143
In 30 Images	81
In 31 Images	43
In 32 Images	33
In 33 Images	18
In 34 Images	6
In 35 Images	2

2D Keypoint Matches

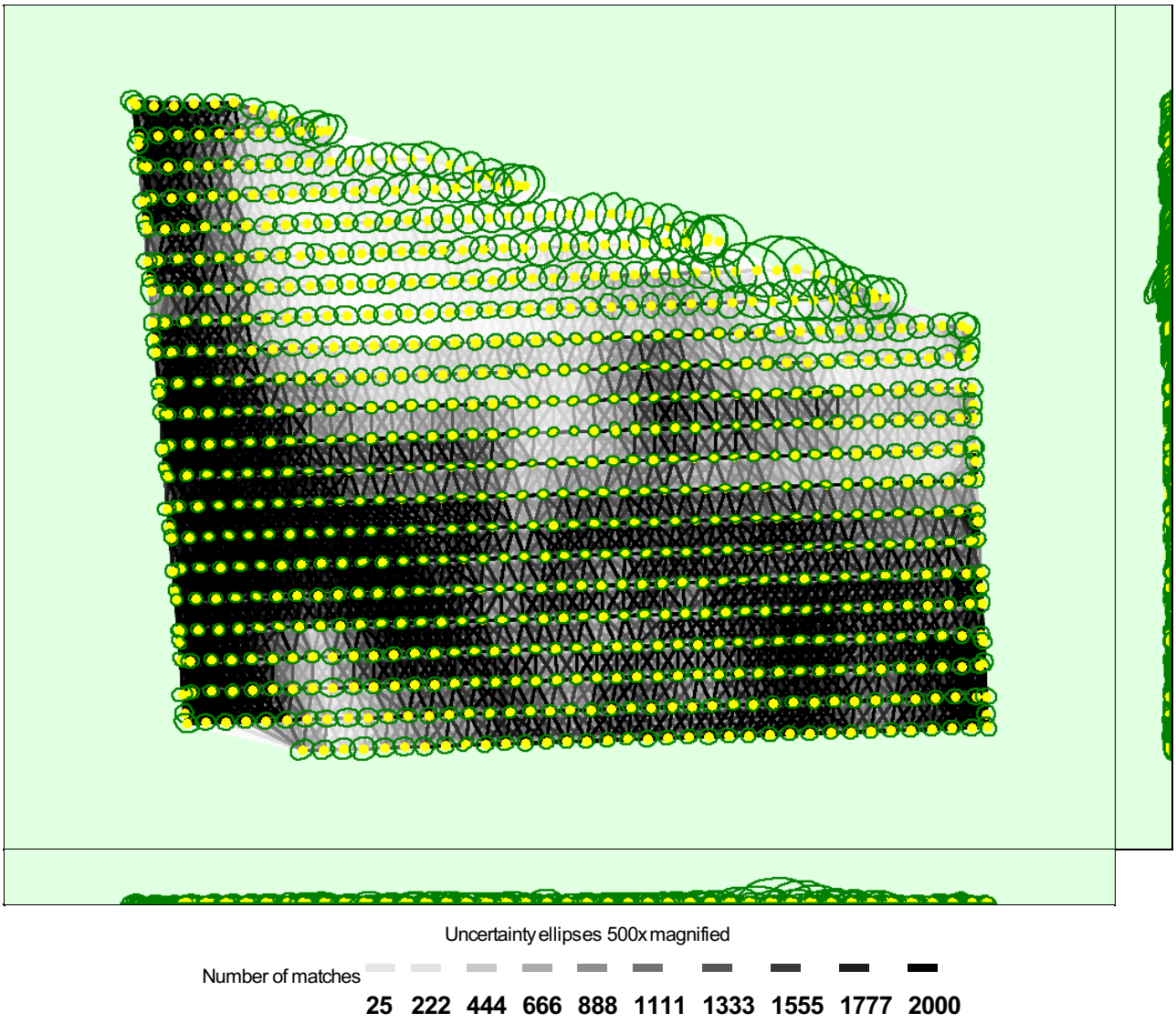


Figure 5: Computed image positions with links between matched images. The darkness of the links indicates the number of matched 2D keypoints between the images. Bright links indicate weak links and require manual tie points or more images. Dark green ellipses indicate the relative camera position uncertainty 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	0.014	0.012	0.008	0.007	0.009	0.003
Sigma	0.006	0.006	0.004	0.004	0.003	0.001

Geolocation Details

Absolute Geolocation Variance

Min Error [m]	Max Error [m]	Geolocation Error X [%]	Geolocation Error Y [%]	Geolocation Error Z [%]
-	-0.07	0.00	0.00	0.13
-0.07	-0.06	0.00	0.00	0.63
-0.06	-0.04	0.00	0.00	2.41
-0.04	-0.03	0.00	0.00	9.24
-0.03	-0.01	0.38	0.76	16.08
-0.01	0.00	50.76	48.73	22.28
0.00	0.01	48.48	50.00	23.80
0.01	0.03	0.38	0.51	13.80
0.03	0.04	0.00	0.00	7.09
0.04	0.06	0.00	0.00	3.42
0.06	0.07	0.00	0.00	1.01
0.07	-	0.00	0.00	0.13
Mean [m]		0.000028	-0.000021	-0.000432
Sigma [m]		0.005074	0.004883	0.023741
RMS Error [m]		0.005075	0.004883	0.023745

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]	99.11	98.73	89.49
[-2.00, 2.00]	100.00	100.00	100.00
[-3.00, 3.00]	100.00	100.00	100.00
Mean of Geolocation Accuracy [m]	0.013524	0.013524	0.037670
Sigma of Geolocation Accuracy [m]	0.000587	0.000587	0.006258

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

Geolocation Orientational Variance	RMS [degree]
Omega	0.963
Phi	0.421
Kappa	2.745

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) i7-3930K CPU @ 3.20GHz RAM: 32GB GPU: NVIDIA GeForce GTX 1060 3GB (Driver: 24.21.13.9811)
Operating System	Windows 10 Pro, 64-bit

Coordinate Systems

Image Coordinate System	WGS 84 (EGM96 Geoid)
Output Coordinate System	WGS 84 / UTM zone 52N (EGM96 Geoid)

Processing Options

Detected Template	3D Maps
Keypoints Image Scale	Full, Image Scale: 1
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
Time for Point Cloud Densification	04h:51m:19s
Time for Point Cloud Classification	NA
Time for 3D Textured Mesh Generation	36m:05s

Results

Number of Processed Clusters	2
Number of Generated Tiles	4
Number of 3D Densified Points	92667416
Average Density (per m^3)	315.73

DSM, Orthomosaic and Index Details

Processing Options

DSM and Orthomosaic Resolution	1 x GSD (2.21 [cm/pixel])
DSM Filters	Noise Filtering: yes Surface Smoothing: yes, Type: Sharp
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
Time for DSM Generation	58m:10s
Time for Orthomosaic Generation	01h:21m:11s

Time for DTM Generation	00s
Time for Contour Lines Generation	00s
Time for Reflectance Map Generation	00s
Time for Index Map Generation	00s