Summary

Project	LOOP3_st303_st308_20190523_F
Processed	2019-10-17 10:54:07
Camera Model Name(s)	FC6310R_8.8_5472x3648 (RGB)
Average Ground Sampling Distance (GSD)	4.65 cm / 1.83 in
Area Covered	0.355 km^2 / 35.4604 ha / 0.14 sq. mi. / 87.6698 acres
Time for Initial Processing (without report)	03h:09m:39s

Quality Check

Images	median of 52964 keypoints per image	✓
Dataset	216 out of 317 images calibrated (68%), all images enabled, 9 blocks	⚠
Camera Optimization	152.23% relative difference between initial and optimized internal camera parameters	⚠
Matching	median of 2512.11 matches per calibrated image	✓
Georeferencing	yes, no 3D GCP	⚠

Preview

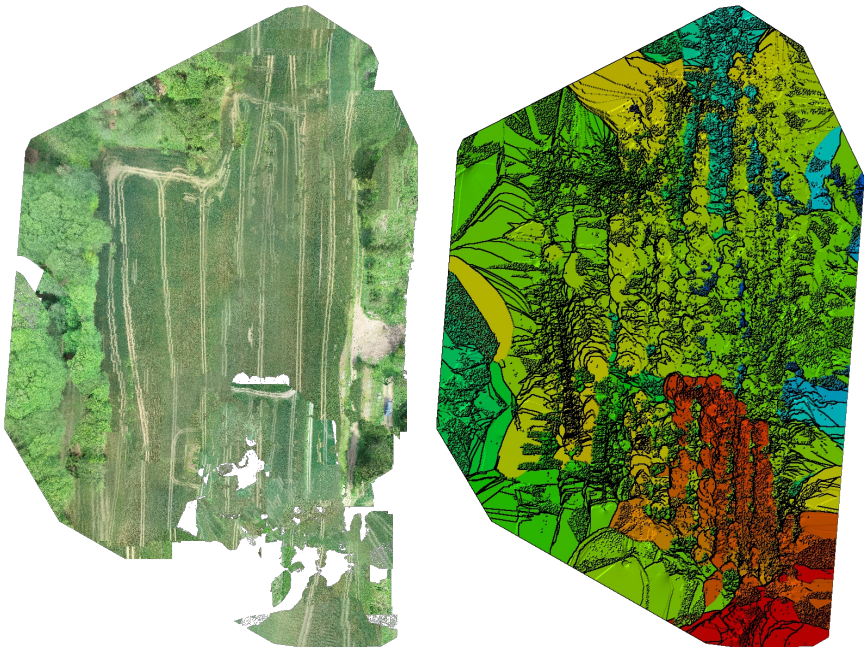


Figure 1: Orthomosaic and the corresponding sparse Digital Surface Model (DSM) before densification.

Calibration Details

Number of Calibrated Images	216 out of 317
Number of Geolocated Images	317 out of 317

Initial Image Positions

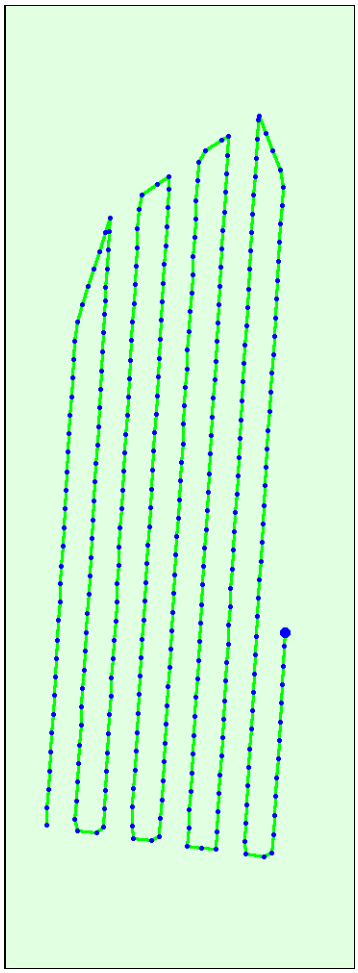
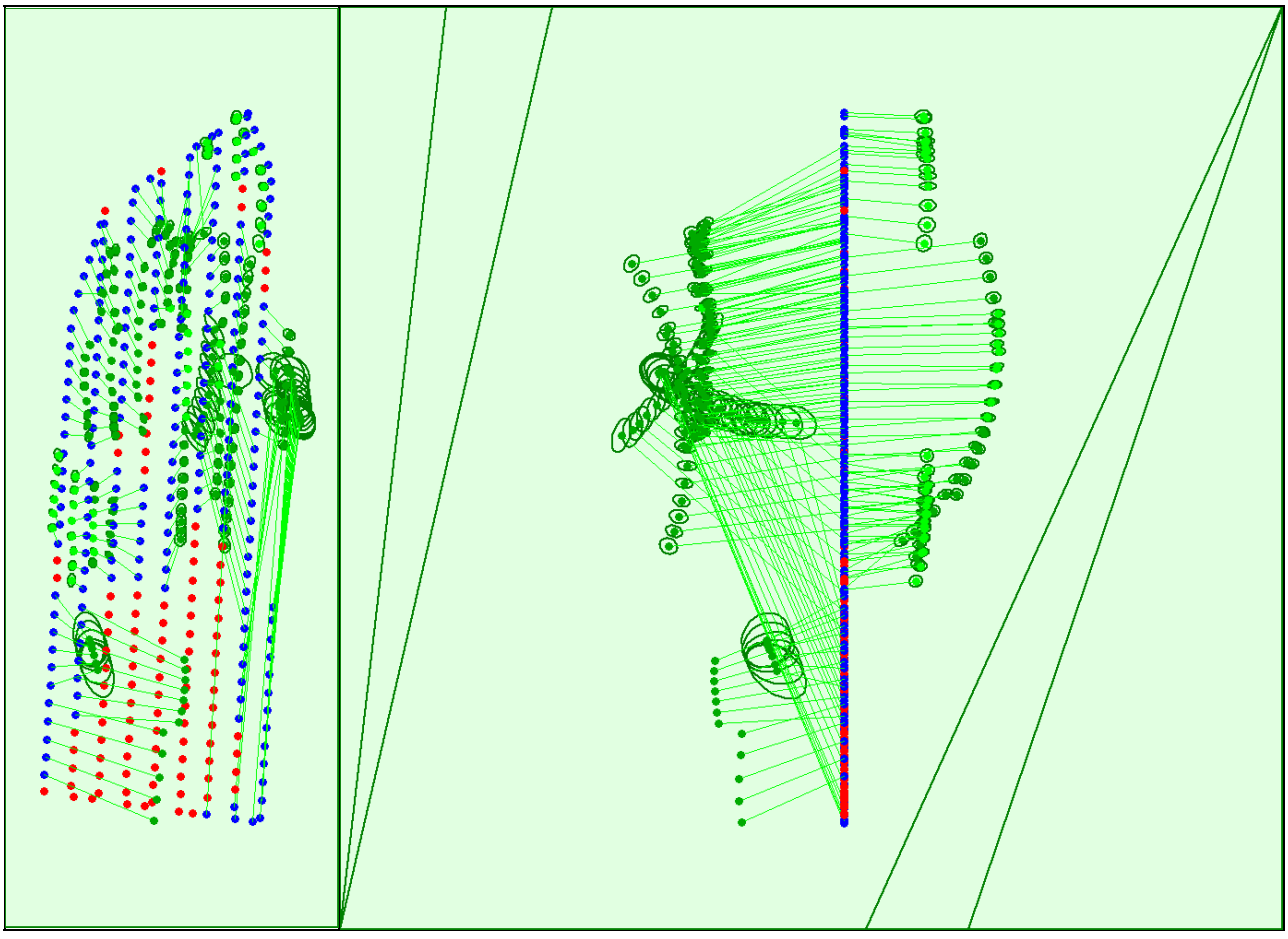
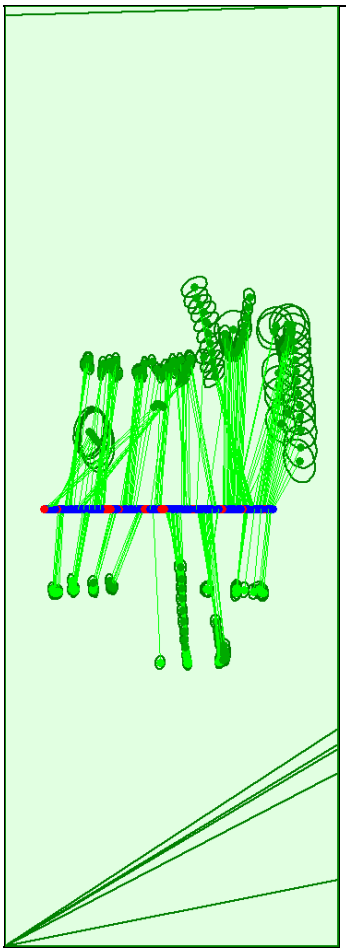


Figure 2: Top view of the initial image position. The green line follows the position of the images in time starting from the large blue dot.

Computed Image/GCPs/Manual Tie Points Positions





Uncertainty ellipses 1x 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). Red dots indicate disabled or uncalibrated images. 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	878.427	1348.641	1714.832	2.138	1.636	2.467
Sigma	4701.669	6891.553	9207.389	3.459	1.095	4.057

Overlap

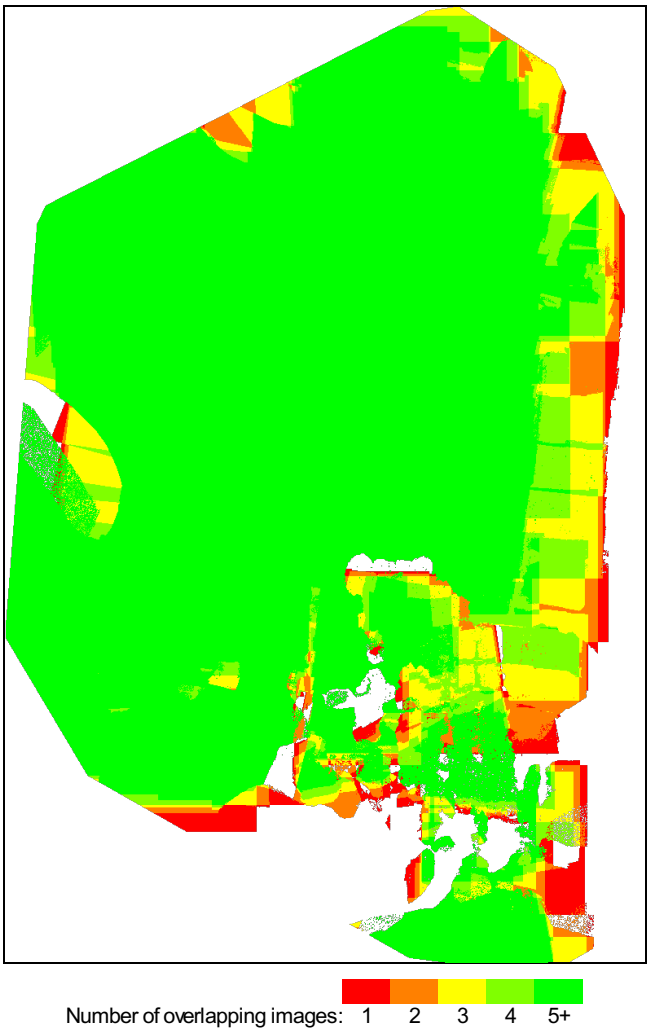


Figure 4: Number of overlapping images computed for each pixel of the orthomosaic.
Red and yellow areas indicate low overlap for which poor results may be generated. Green areas indicate an overlap of over 5 images for every pixel. Good quality results will be generated as long as the number of keypoint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

Bundle Block Adjustment Details

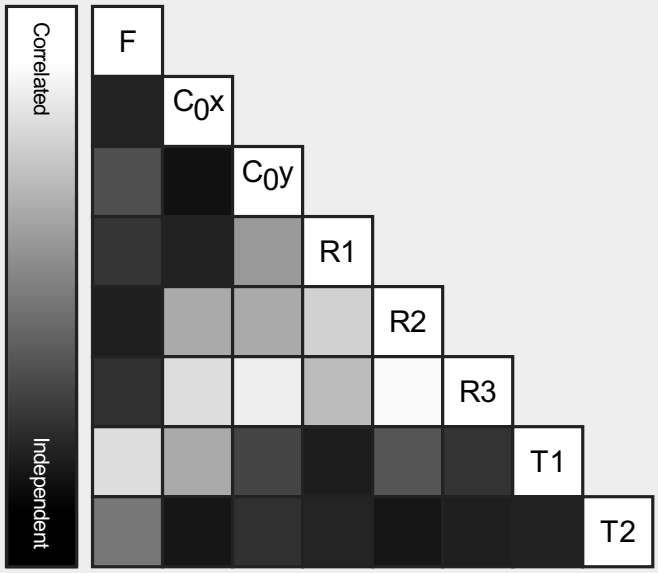
Number of 2D Keypoint Observations for Bundle Block Adjustment	545609
Number of 3D Points for Bundle Block Adjustment	259012
Mean Reprojection Error [pixels]	0.219

Internal Camera Parameters

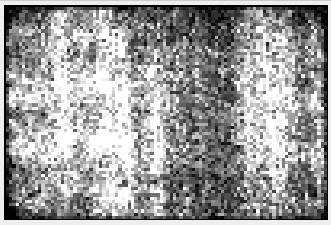
FC6310R_8.8_5472x3648 (RGB). Sensor Dimensions: 12.833 [mm] x 8.556 [mm]

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]	-0.269	0.112	-0.033	0.000	-0.001
Optimized Values	9227.603 [pixel] 21.641 [mm]	2751.219 [pixel] 6.452 [mm]	1955.340 [pixel] 4.586 [mm]	-0.264	-0.161	1.254	0.002	-0.005
Uncertainties (Sigma)	155.176 [pixel] 0.364 [mm]	14.495 [pixel] 0.034 [mm]	12.987 [pixel] 0.030 [mm]	0.008	0.118	0.605	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	52964	2512
Min	38770	74
Max	76506	6145
Mean	54438	2526

3D Points from 2D Keypoint Matches

	Number of 3D Points Observed
In 2 Images	238785
In 3 Images	16047
In 4 Images	2915
In 5 Images	585
In 6 Images	302
In 7 Images	133
In 8 Images	63
In 9 Images	51
In 10 Images	37
In 11 Images	23
In 12 Images	25
In 13 Images	10
In 14 Images	10
In 15 Images	11
In 16 Images	10
In 17 Images	2
In 18 Images	2
In 19 Images	1

2D Keypoint Matches

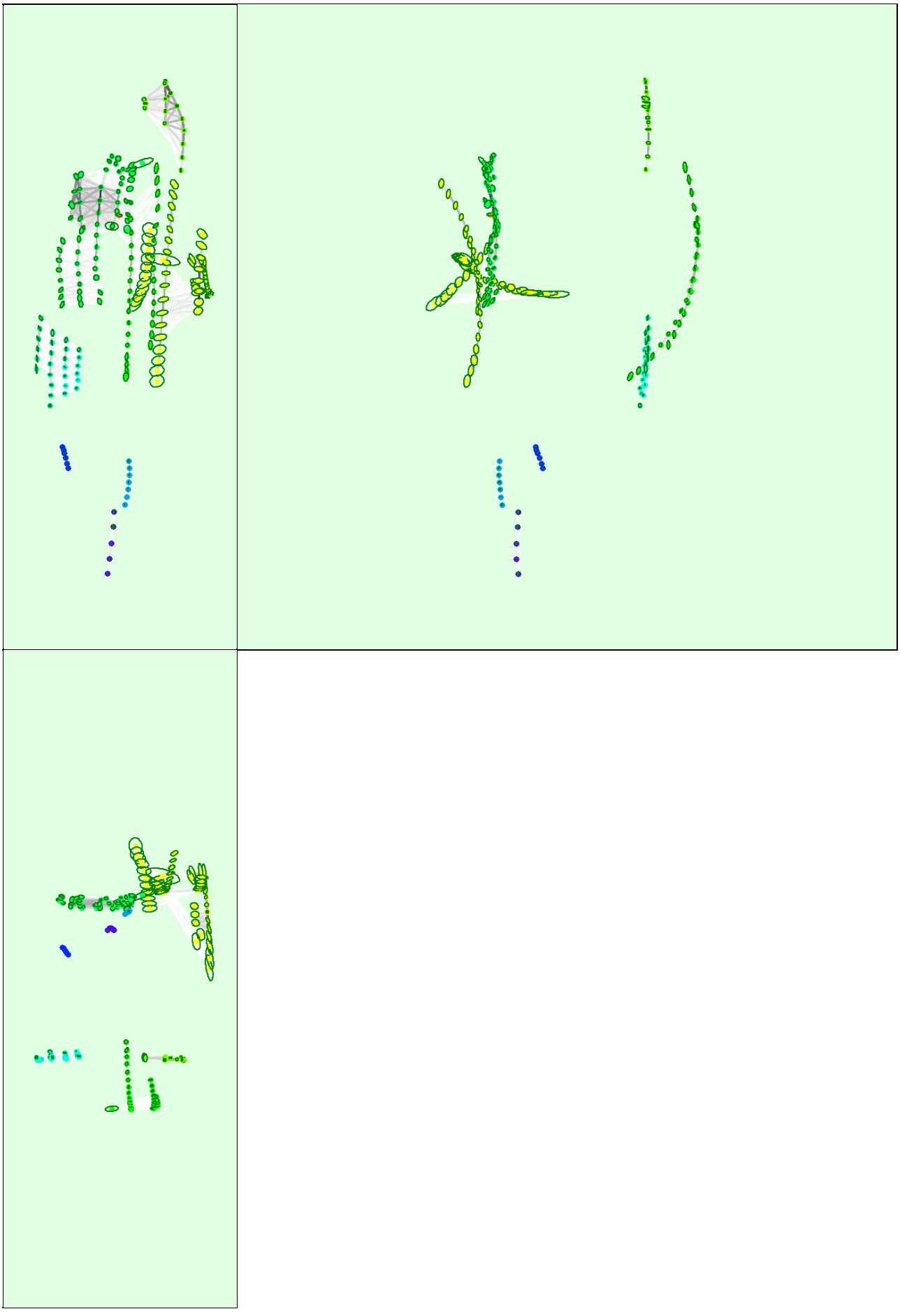


Figure 5: Computed image positions with links between matched images. The darkness of the links indicates the number of matched 2D keypoints between the images. Bright links indicate weak links and require manual tie points or more images. Dark green ellipses indicate the relative camera position uncertainty 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	0.356	0.386	0.295	0.210	0.379	0.221
Sigma	0.305	0.214	0.283	0.178	0.286	0.218

Geolocation Details

Absolute Geolocation Variance

Min Error [m]	Max Error [m]	Geolocation Error X [%]	Geolocation Error Y [%]	Geolocation Error Z [%]
-	-15.00	4.44	2.22	2.22
-15.00	-12.00	4.44	0.00	0.00
-12.00	-9.00	11.11	4.44	0.00
-9.00	-6.00	6.67	6.67	0.00
-6.00	-3.00	0.00	22.22	0.00
-3.00	0.00	0.00	6.67	0.00
0.00	3.00	0.00	13.33	0.00
3.00	6.00	13.33	24.44	0.00
6.00	9.00	22.22	8.89	0.00
9.00	12.00	17.78	6.67	0.00
12.00	15.00	6.67	4.44	0.00
15.00	-	13.33	0.00	97.78
Mean [m]		4.806888	0.727868	93.817882
Sigma [m]		10.643855	6.466424	46.865549
RMS Error [m]		11.678948	6.507260	104.872182

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]	2.22	48.89	0.00
[-2.00, 2.00]	46.67	88.89	0.00
[-3.00, 3.00]	82.22	97.78	0.00
Mean of Geolocation Accuracy [m]	5.000000	5.000000	10.000000
Sigma of Geolocation Accuracy [m]	0.000000	0.000000	0.000000

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

Geolocation Orientational Variance	RMS [degree]
Omega	8.477
Phi	4.717
Kappa	134.702

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) i5-6300U CPU @ 2.40GHz RAM: 16GB GPU: Intel(R) HD Graphics 520 (Driver: 22.20.16.4836)
Operating System	Windows 10 Enterprise 2016 LTSB, 64-bit

Coordinate Systems

Image Coordinate System	WGS 84
Output Coordinate System	WGS_1984_UTM_Zone_32N (EGM96 Geoid)

Processing Options

Detected Template	2D Full
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, yes

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	no
LOD	Generated: no
Advanced: Image Groups	group1
Advanced: Use Processing Area	yes
Advanced: Use Annotations	yes
Time for Point Cloud Densification	01h:20m:20s
Time for Point Cloud Classification	25m:37s
Time for 3D Textured Mesh Generation	NA

Results

Number of Generated Tiles	1
Number of 3D Densified Points	27720476
Average Density (per m^3)	14.64

DSM, Orthomosaic and Index Details

Processing Options

DSM and Orthomosaic Resolution	1 x GSD (4.65 [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
Raster DTM	Generated: yes Merge Tiles: yes
DTM Resolution	5 x GSD (4.65 [cm/pixel])

Time for DSM Generation	01h:00m:52s
Time for Orthomosaic Generation	53m:35s
Time for DTM Generation	06m:19s
Time for Contour Lines Generation	00s
Time for Reflectance Map Generation	00s
Time for Index Map Generation	00s