Quality Report

Generated with Pix4Dmapper version 4.6.4

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	LAGO_BURLAN
Processed	2021-04-23 14:01:47
Camera Model Name(s)	FC6310R_8.8_5472x3648 (2f739a8caeeff2558d853a45e32be1bd) (RGB)
Average Ground Sampling Distance (GSD)	4.01 cm / 1.58 in
Area Covered	1.178 km^2 / 117.7646 ha / 0.45 sq. mi. / 291.1533 acres

Quality Check

Images	median of 38155 keypoints per image	✓
Dataset	729 out of 729 images calibrated (100%), all images enabled	✓
Camera Optimization	0.33% relative difference between initial and optimized internal camera parameters	✓
Matching	median of 6027.06 matches per calibrated image	✓
Georeferencing	yes, 9 GCPs (9 3D), mean RMS error = 0.008 m	✓

Preview

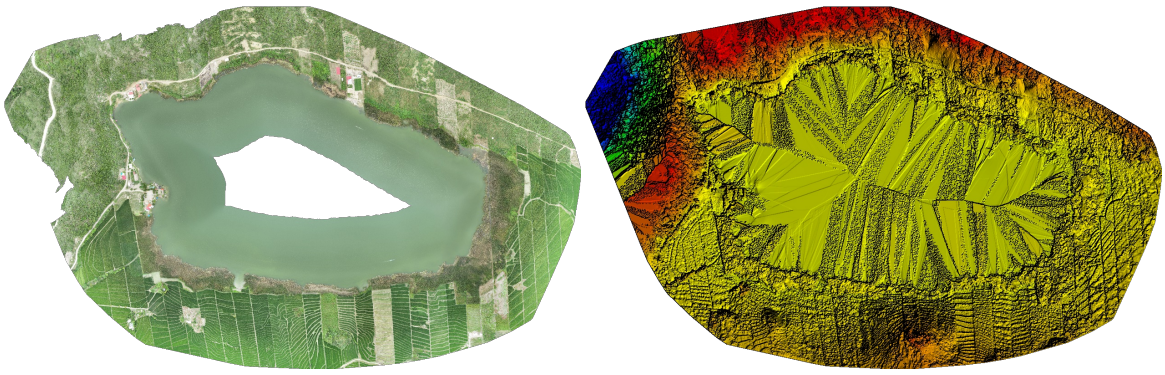


Figure 1: Orthomosaic and the corresponding sparse Digital Surface Model (DSM) before densification.

Calibration Details

Number of Calibrated Images	729 out of 729
Number of Geolocated Images	729 out of 729

Initial Image Positions

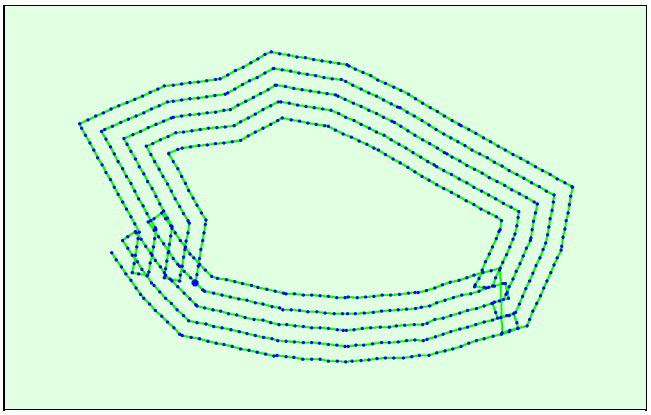


Figure 2: Top view of the initial image position. The green line follows the position of the images in time starting from the large blue dot.

Computed Image/GCPs/Manual Tie Points Positions

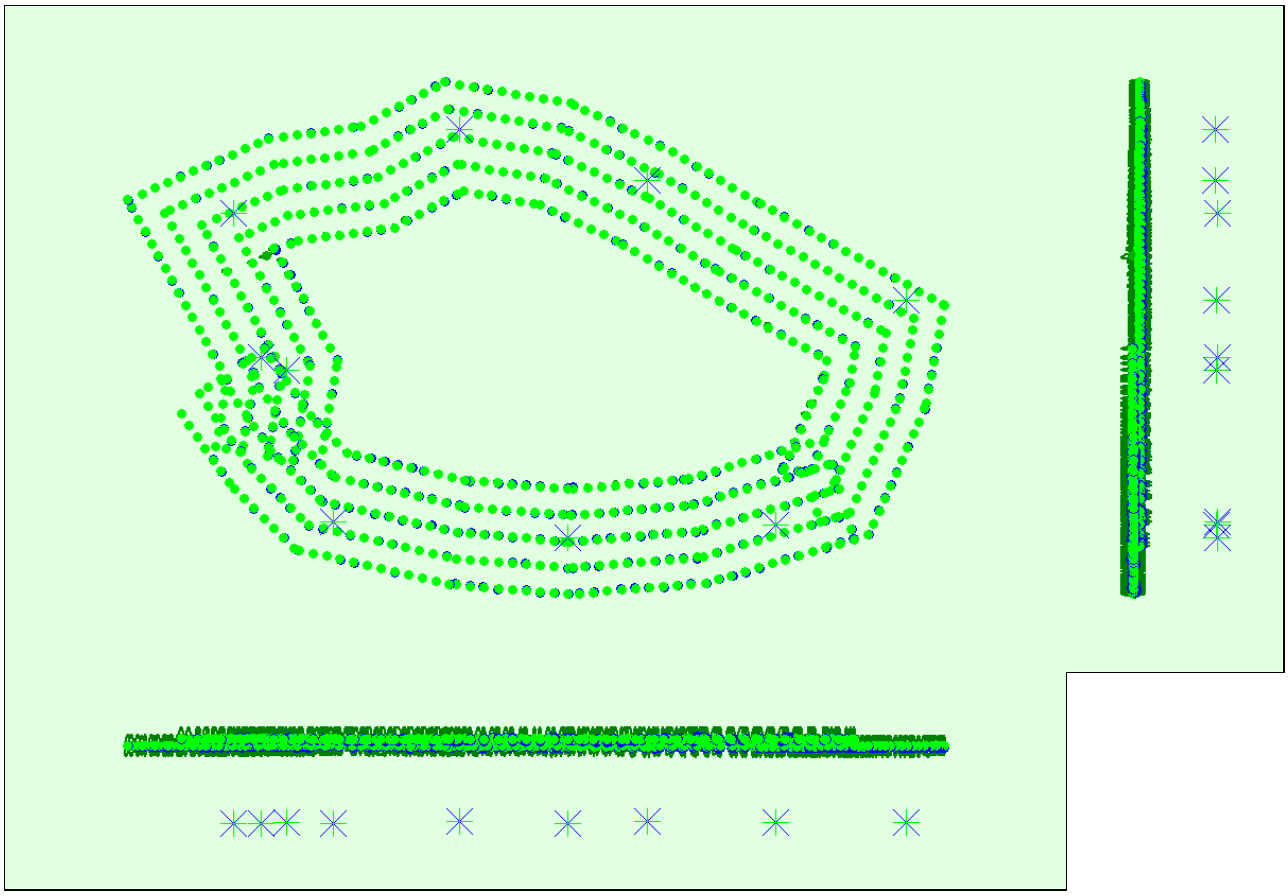


Figure 3: Offset between initial (blue dots) and computed (green dots) image positions as well as the offset between the GCPs initial positions (blue crosses) and their computed positions (green crosses) in the top-view (XY plane), front-view (XZ plane), and side-view (YZ plane). Dark green ellipses 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	0.027	0.027	0.176	0.011	0.010	0.003
Sigma	0.010	0.008	0.008	0.004	0.003	0.002

Overlap

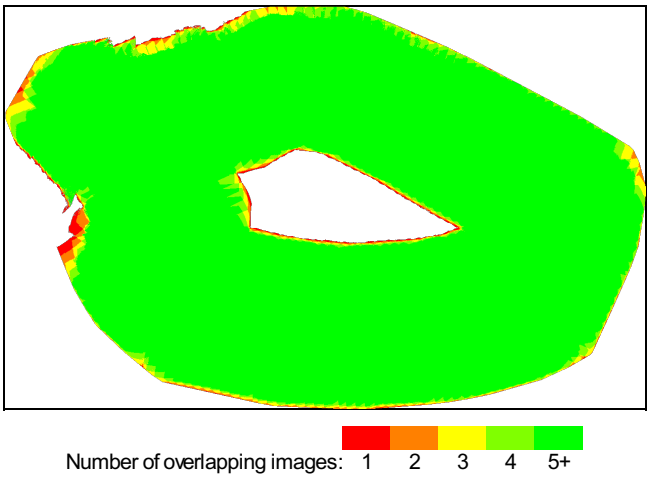


Figure 4: Number of overlapping images computed for each pixel of the orthomosaic.
Red and yellow areas indicate low overlap for which poor results may be generated. Green areas indicate an overlap of over 5 images for every pixel. Good quality results will be generated as long as the number of keypoint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

Bundle Block Adjustment Details

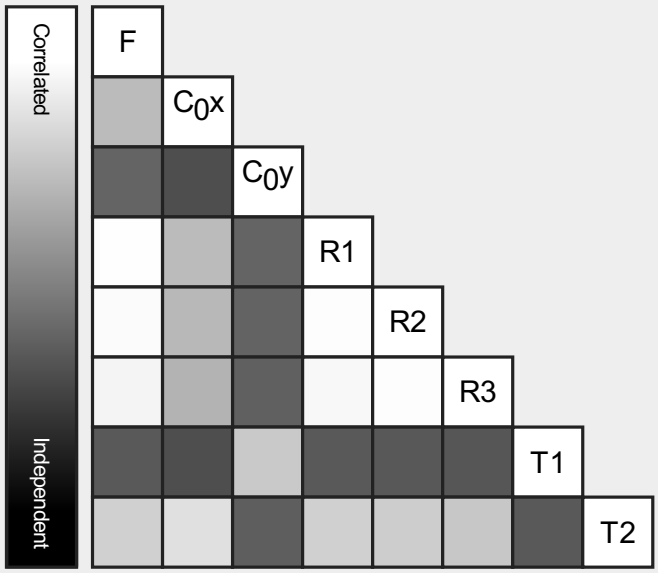
Number of 2D Keypoint Observations for Bundle Block Adjustment	4554388
Number of 3D Points for Bundle Block Adjustment	1531783
Mean Reprojection Error [pixels]	0.100

Internal Camera Parameters

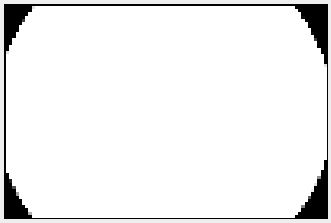
FC6310R_8.8_5472x3648 (2f739a8caeeff2558d853a45e32be1bd) (RGB). Sensor Dimensions: 13.200 [mm] x 8.800 [mm]

EXIF ID: FC6310R_8.8_5472x3648

	Focal Length	Principal Point x	Principal Point y	R1	R2	R3	T1	T2
Initial Values	3719.810 [pixel] 8.973 [mm]	2694.220 [pixel] 6.499 [mm]	1817.210 [pixel] 4.384 [mm]	-0.285	0.129	-0.041	0.001	-0.000
Optimized Values	3707.238 [pixel] 8.943 [mm]	2700.010 [pixel] 6.513 [mm]	1827.854 [pixel] 4.409 [mm]	-0.290	0.133	-0.040	0.000	-0.000
Uncertainties (Sigma)	4.846 [pixel] 0.012 [mm]	0.136 [pixel] 0.000 [mm]	0.091 [pixel] 0.000 [mm]	0.001	0.001	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	38155	6027
Min	16506	182
Max	71589	23730
Mean	40082	6247

3D Points from 2D Keypoint Matches

	Number of 3D Points Observed
In 2 Images	1023678
In 3 Images	241760
In 4 Images	98762
In 5 Images	52189
In 6 Images	31032
In 7 Images	19689
In 8 Images	13619
In 9 Images	10079
In 10 Images	7764
In 11 Images	6000
In 12 Images	4912
In 13 Images	3709
In 14 Images	3015
In 15 Images	2488
In 16 Images	2141
In 17 Images	1827
In 18 Images	1598
In 19 Images	1334
In 20 Images	1014
In 21 Images	885
In 22 Images	788
In 23 Images	668
In 24 Images	595
In 25 Images	461
In 26 Images	384
In 27 Images	255
In 28 Images	194
In 29 Images	160
In 30 Images	120
In 31 Images	106
In 32 Images	74
In 33 Images	69
In 34 Images	43
In 35 Images	51
In 36 Images	34
In 37 Images	40
In 38 Images	28
In 39 Images	30
In 40 Images	26

In 41 Images	32
In 42 Images	28
In 43 Images	13
In 44 Images	16
In 45 Images	15
In 46 Images	14
In 47 Images	10
In 48 Images	11
In 49 Images	11
In 50 Images	2
In 51 Images	1
In 52 Images	1
In 53 Images	1
In 54 Images	3
In 55 Images	1
In 56 Images	1
In 59 Images	1
In 63 Images	1

2D Keypoint Matches

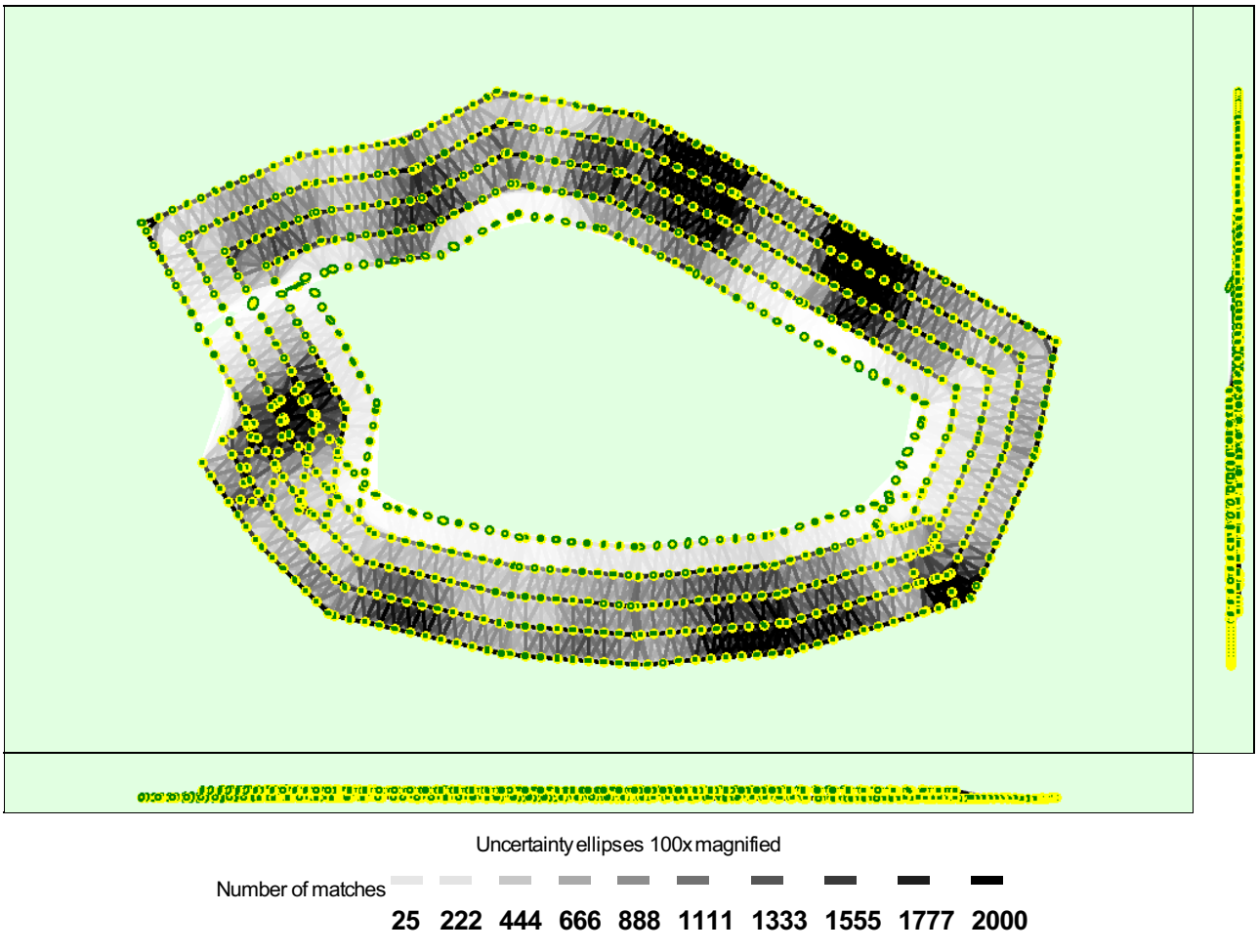


Figure 5: Computed image positions with links between matched images. The darkness of the links indicates the number of matched 2D keypoints between the images. Bright links indicate weak links and require manual tie points or more images. Dark green ellipses indicate the relative camera position uncertainty 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	0.032	0.031	0.032	0.014	0.013	0.005
Sigma	0.010	0.008	0.012	0.003	0.004	0.002

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
P1 (3D)	0.020/ 0.020	-0.009	-0.011	-0.008	0.787	6 / 6
P1-1 (3D)	0.020/ 0.020	0.015	0.006	0.001	0.160	2 / 2
P2 (3D)	0.020/ 0.020	0.002	0.007	0.022	0.826	4 / 4
P3 (3D)	0.020/ 0.020	-0.007	0.000	-0.004	0.675	6 / 6
P4 (3D)	0.020/ 0.020	0.006	-0.000	0.000	0.718	5 / 5
P5 (3D)	0.020/ 0.020	-0.003	-0.000	0.000	0.764	6 / 6
P6 (3D)	0.020/ 0.020	0.003	-0.003	-0.004	0.818	6 / 6
P7 (3D)	0.020/ 0.020	-0.000	-0.002	0.030	0.872	5 / 5
P8 (3D)	0.020/ 0.020	0.002	0.006	-0.012	0.916	5 / 5
Mean [m]		0.000903	0.000392	0.002781		
Sigma [m]		0.006787	0.005346	0.013173		
RMS Error [m]		0.006847	0.005360	0.013463		

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 [%]
-	-4.33	0.00	0.00	0.41
-4.33	-3.46	0.00	0.00	0.14
-3.46	-2.60	0.00	0.00	1.79
-2.60	-1.73	0.82	0.96	5.08
-1.73	-0.87	10.03	10.03	14.97
-0.87	0.00	44.37	36.68	32.14
0.00	0.87	34.20	43.41	22.39
0.87	1.73	7.69	7.69	11.68
1.73	2.60	2.47	0.96	6.59
2.60	3.46	0.41	0.27	3.71
3.46	4.33	0.00	0.00	0.82
4.33	-	0.00	0.00	0.27
Mean [m]		0.111300	0.112971	-1.343309
Sigma [m]		0.764925	0.692651	1.364819
RMS Error [m]		0.772980	0.701803	1.914996

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]	0.113012	0.111368	-1.357249

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]	87.64	89.56	94.09
[-2.00, 2.00]	98.49	99.31	99.86

[-3.00, 3.00]	100.00	100.00	100.00
Mean of Geolocation Accuracy [m]	1.150149	1.150149	2.606027
Sigma of Geolocation Accuracy [m]	0.029879	0.029879	0.093085

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

Geolocation Orientational Variance	RMS [degree]
Omega	0.651
Phi	0.464
Kappa	6.893

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) Xeon(R) W-2133 CPU @ 3.60GHz RAM: 64GB GPU: NVIDIA Quadro P4000 (Driver: 27.21.14.6172)
Operating System	Windows 10 Enterprise LTSC 2019, 64-bit

Coordinate Systems

Image Coordinate System	WGS 84
Ground Control Point (GCP) Coordinate System	WGS 84 / UTM zone 17S
Output Coordinate System	WGS 84 / UTM zone 17S

Processing Options

Detected Template	No Template Available
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	01h:33m:50s
Time for Point Cloud Classification	NA
Time for 3D Textured Mesh Generation	20m:11s

Results

Number of Generated Tiles	7
Number of 3D Densified Points	67822131
Average Density (per m^3)	42.79

DSM, Orthomosaic and Index Details

Processing Options

DSM and Orthomosaic Resolution	1 x GSD (4.01 [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
Raster DTM	Generated: yes Merge Tiles: yes
DTM Resolution	5 x GSD (4.01 [cm/pixel])
Time for DSM Generation	43m:15s
Time for Orthomosaic Generation	56m:48s
Time for DTM Generation	18m:52s
Time for Contour Lines Generation	00s
Time for Reflectance Map Generation	00s
Time for Index Map Generation	00s