Quality Report

Generated with Pix4Denterprise version 4.4.12

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	tw_miaoli_zhoulan_laozhuang-river_20190326
Processed	2019-12-12 00:17:56
Camera Model Name(s)	FC6310R_8.8_4864x3648 (RGB)
Average Ground Sampling Distance (GSD)	3.60 cm / 1.42 in
Area Covered	0.297 km^2 / 29.7250 ha / 0.11 sq. mi. / 73.4901 acres
Time for Initial Processing (without report)	01h:01m:18s

Quality Check

Images	median of 58530 keypoints per image	✓
Dataset	397 out of 397 images calibrated (100%), all images enabled	✓
Camera Optimization	0.42% relative difference between initial and optimized internal camera parameters	✓
Matching	median of 14288 matches per calibrated image	✓
Georeferencing	yes, no 3D GCP	⚠

Preview

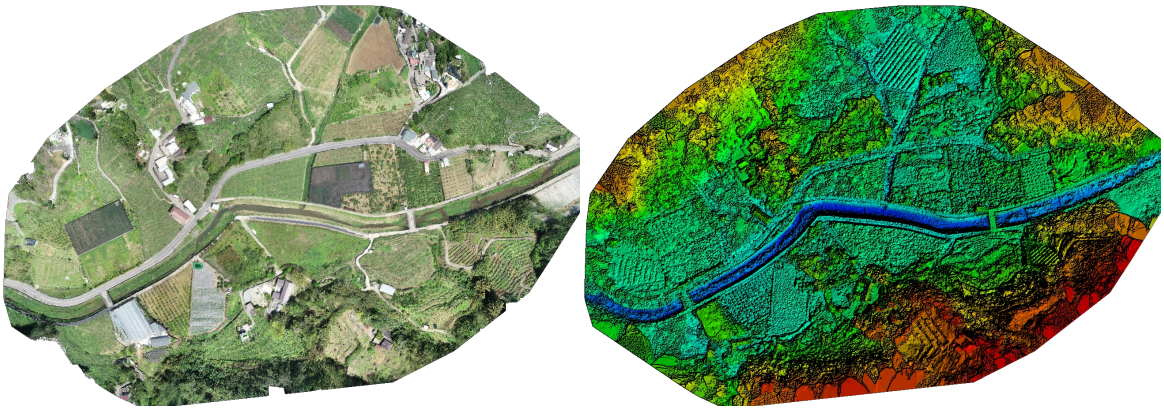


Figure 1: Orthomosaic and the corresponding sparse Digital Surface Model (DSM) before densification.

Calibration Details

Number of Calibrated Images	397 out of 397
Number of Geolocated Images	397 out of 397

Initial Image Positions

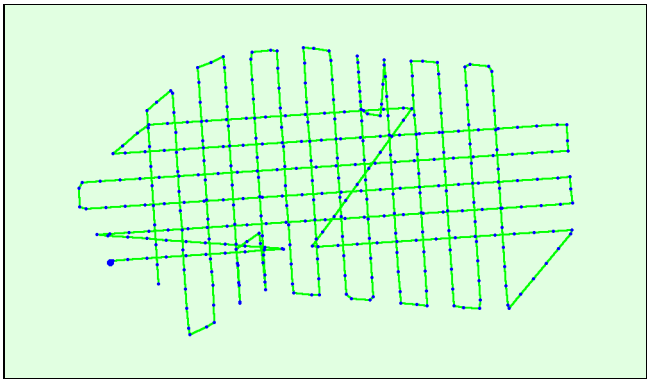


Figure 2: Top view of the initial image position. The green line follows the position of the images in time starting from the large blue dot.

Computed Image/GCPs/Manual Tie Points Positions

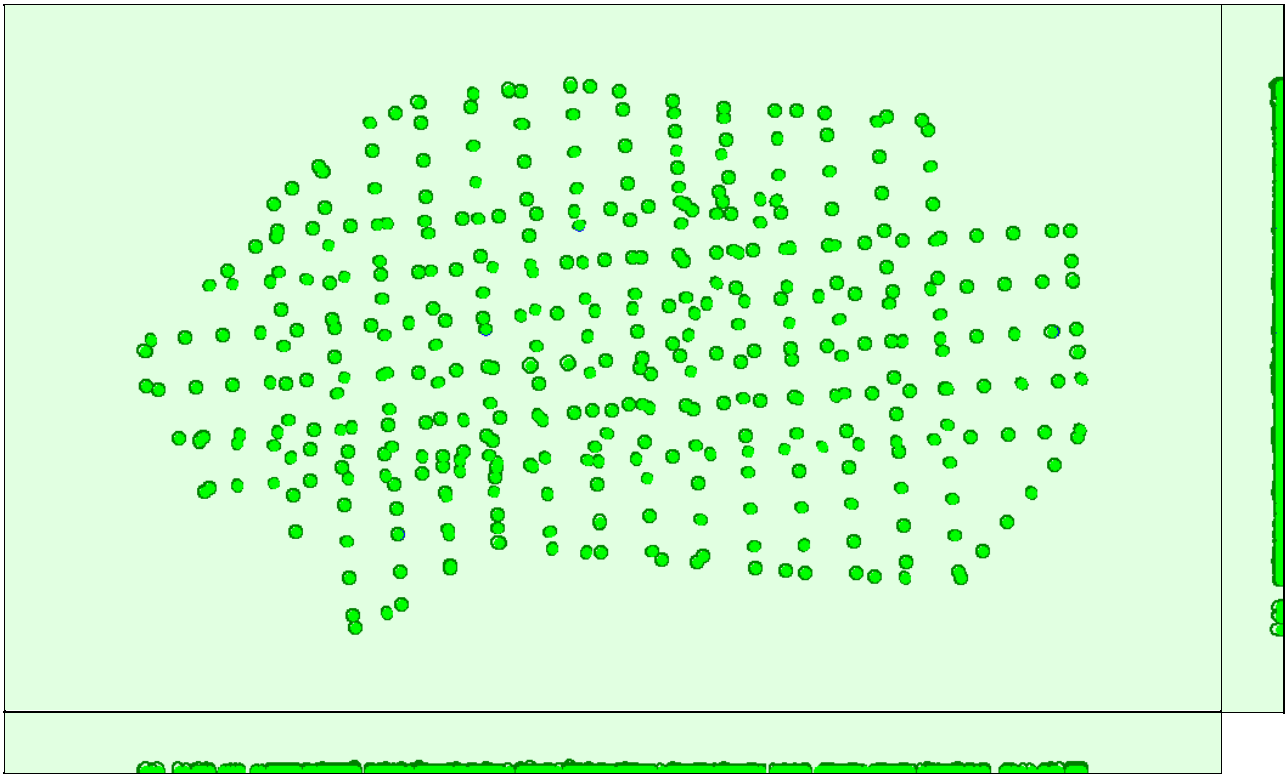


Figure 3: Offset between initial (blue dots) and computed (green dots) image positions as well as the offset between the GCPs initial positions (blue crosses) and their computed positions (green crosses) in the top-view (XY plane), front-view (XZ plane), and side-view (YZ plane). Dark green ellipses 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	0.003	0.003	0.004	0.002	0.002	0.002
Sigma	0.000	0.000	0.000	0.000	0.000	0.001

Overlap

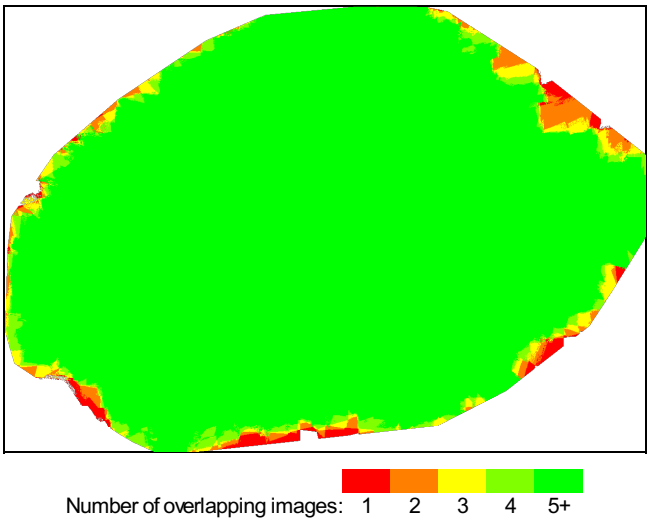


Figure 4: Number of overlapping images computed for each pixel of the orthomosaic.
Red and yellow areas indicate low overlap for which poor results may be generated. Green areas indicate an overlap of over 5 images for every pixel. Good quality results will be generated as long as the number of keypoint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

Bundle Block Adjustment Details

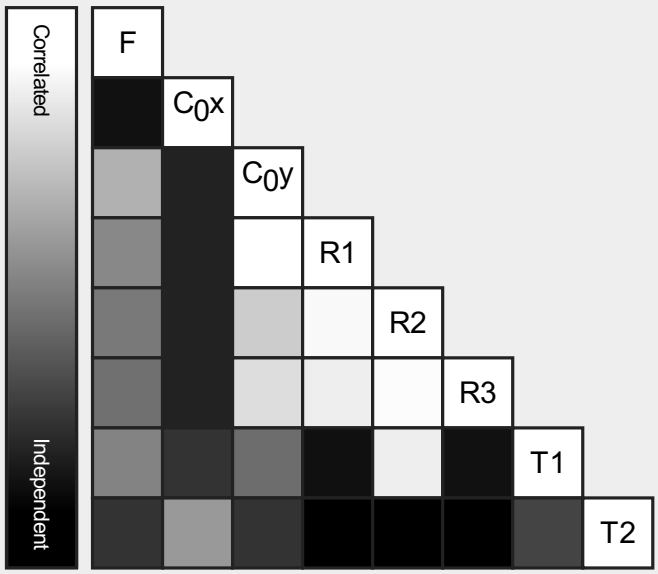
Number of 2D Keypoint Observations for Bundle Block Adjustment	5825629
Number of 3D Points for Bundle Block Adjustment	2202754
Mean Reprojection Error [pixels]	0.168

Internal Camera Parameters

FC6310R_8.8_4864x3648 (RGB). Sensor Dimensions: 11.407 [mm] x 8.556 [mm]

EXIF ID: FC6310R_8.8_4864x3648

	Focal Length	Principal Point x	Principal Point y	R1	R2	R3	T1	T2
Initial Values	3666.840 [pixel] 8.600 [mm]	2420.300 [pixel] 5.676 [mm]	1835.990 [pixel] 4.306 [mm]	-0.270	0.112	-0.032	0.000	-0.001
Optimized Values	3651.127 [pixel] 8.563 [mm]	2421.508 [pixel] 5.679 [mm]	1847.428 [pixel] 4.333 [mm]	-0.269	0.115	-0.036	0.001	0.000
Uncertainties (Sigma)	0.054 [pixel] 0.000 [mm]	0.059 [pixel] 0.000 [mm]	0.069 [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	58530	14288
Min	48855	2771
Max	76241	32028
Mean	58824	14674

3D Points from 2D Keypoint Matches

	Number of 3D Points Observed
In 2 Images	1590993
In 3 Images	330350
In 4 Images	122931
In 5 Images	59084
In 6 Images	32867
In 7 Images	19933
In 8 Images	12746
In 9 Images	8632
In 10 Images	6088
In 11 Images	4411
In 12 Images	3172
In 13 Images	2457
In 14 Images	1794
In 15 Images	1388
In 16 Images	1068
In 17 Images	906
In 18 Images	721
In 19 Images	515
In 20 Images	461
In 21 Images	362
In 22 Images	309
In 23 Images	250
In 24 Images	210
In 25 Images	168
In 26 Images	178
In 27 Images	116
In 28 Images	109
In 29 Images	87
In 30 Images	62
In 31 Images	49
In 32 Images	49
In 33 Images	43
In 34 Images	37
In 35 Images	24
In 36 Images	20
In 37 Images	21
In 38 Images	18
In 39 Images	17
In 40 Images	8

In 41 Images	14
In 42 Images	7
In 43 Images	4
In 44 Images	14
In 45 Images	6
In 46 Images	5
In 47 Images	5
In 48 Images	3
In 49 Images	4
In 50 Images	4
In 51 Images	3
In 52 Images	6
In 53 Images	4
In 54 Images	2
In 55 Images	1
In 56 Images	2
In 57 Images	2
In 58 Images	1
In 59 Images	1
In 60 Images	2
In 61 Images	2
In 62 Images	2
In 64 Images	1
In 65 Images	2
In 72 Images	2
In 74 Images	1

2D Keypoint Matches

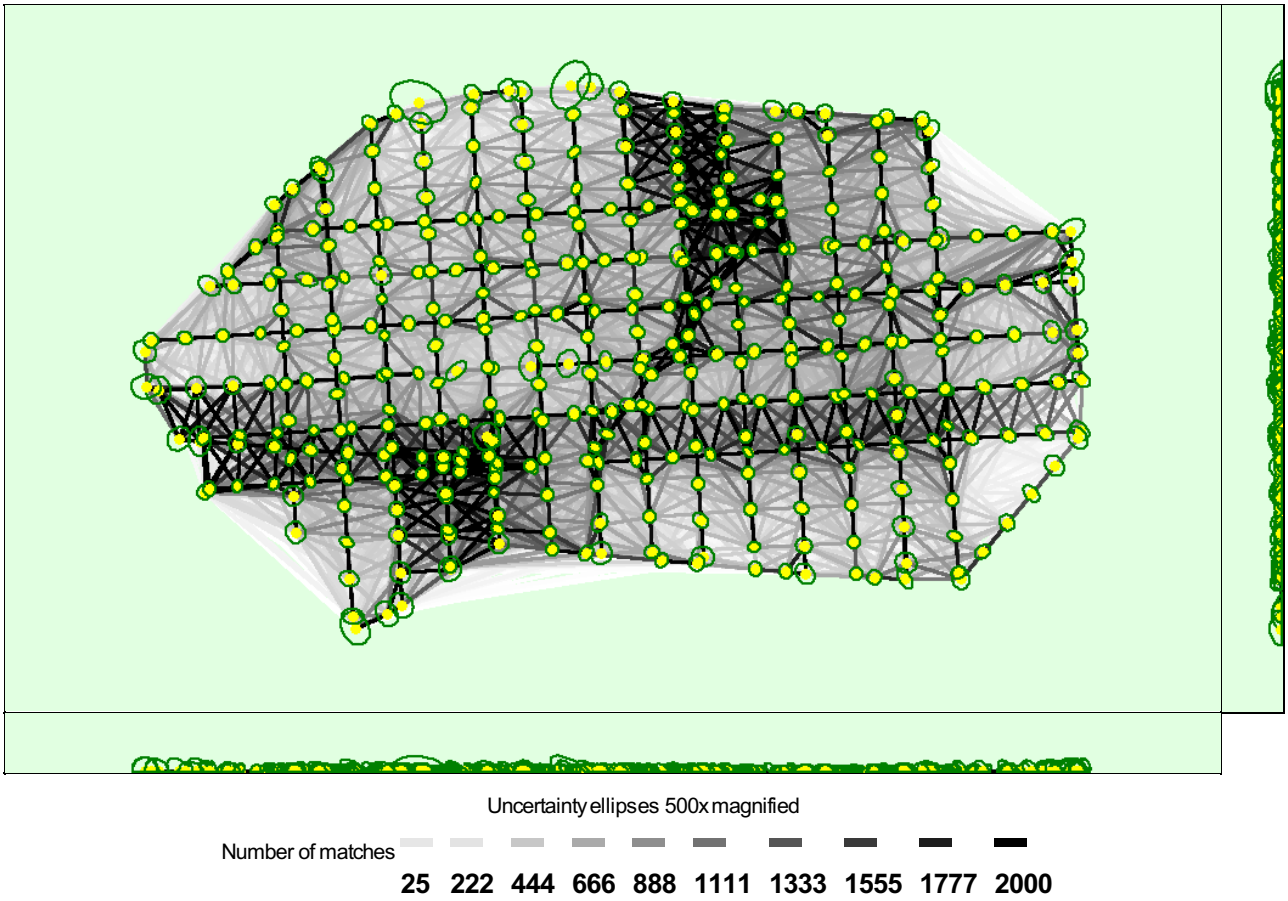


Figure 5: Computed image positions with links between matched images. The darkness of the links indicates the number of matched 2D keypoints between the images. Bright links indicate weak links and require manual tie points or more images. Dark green ellipses indicate the relative camera position uncertainty 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	0.008	0.008	0.007	0.005	0.005	0.003
Sigma	0.002	0.002	0.002	0.002	0.002	0.001

Geolocation Details

Absolute Geolocation Variance

Min Error [m]	Max Error [m]	Geolocation Error X [%]	Geolocation Error Y [%]	Geolocation Error Z [%]
-	-0.03	0.00	0.00	0.76
-0.03	-0.02	0.00	0.00	1.76
-0.02	-0.02	0.00	0.00	5.54
-0.02	-0.01	3.02	0.50	8.31
-0.01	-0.01	10.33	7.05	19.65
-0.01	0.00	30.23	43.32	21.16
0.00	0.01	48.11	42.07	11.59
0.01	0.01	6.80	6.80	10.33
0.01	0.02	0.76	0.25	10.08
0.02	0.02	0.50	0.00	5.54
0.02	0.03	0.00	0.00	2.52
0.03	-	0.25	0.00	2.77
Mean [m]		-0.000089	0.000015	0.000437
Sigma [m]		0.005460	0.003984	0.015216
RMS Error [m]		0.005461	0.003984	0.015223

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]	94.21	97.48	82.62
[-2.00, 2.00]	99.75	100.00	98.74
[-3.00, 3.00]	99.75	100.00	99.24
Mean of Geolocation Accuracy [m]	0.010233	0.010233	0.017816
Sigma of Geolocation Accuracy [m]	0.000329	0.000329	0.000573

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

Geolocation Orientational Variance	RMS [degree]
Omega	0.899
Phi	0.740
Kappa	2.584

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) Platinum 8124M CPU @ 3.00GHz RAM: 69GB GPU: no info (Driver: unknown)
Operating System	Linux 4.15.0-1054-aws x86_64

Coordinate Systems

Image Coordinate System	WGS 84
Output Coordinate System	TWD97 / TM2 zone 121

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: yes
Advanced: Keypoint Extraction	Targeted Number of Keypoints: Automatic
Advanced: Calibration	Calibration Method: Geolocation Based 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	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	38m:04s
Time for Point Cloud Classification	02m:54s
Time for 3D Textured Mesh Generation	21m:43s

Results

Number of Generated Tiles	4
Number of 3D Densified Points	36440468
Average Density (per m^3)	65.52

DSM, Orthomosaic and Index Details

Processing Options

DSM and Orthomosaic Resolution	1 x GSD (3.6 [cm/pixel])

DSM Filters	Noise Filtering: yes Surface Smoothing: yes, Type: Sharp
Orthomosaic	Generated: yes Merge Tiles: yes GeoTIFF Without Transparency: no Google Maps Tiles and KML: yes
Raster DTM	Generated: yes Merge Tiles: yes
DTM Resolution	10 x GSD (3.6 [cm/pixel])
Time for DSM Generation	00s
Time for Orthomosaic Generation	01h:52m:45s
Time for DTM Generation	00s
Time for Contour Lines Generation	00s
Time for Reflectance Map Generation	00s
Time for Index Map Generation	00s