

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_taichung_fengyuan_beikeng-river_20191017
Processed	2020-01-19 11:49:16
Camera Model Name(s)	L1D-20C_10.3_5472x3648 (RGB)
Average Ground Sampling Distance (GSD)	2.98 cm / 1.17 in
Area Covered	0.290 km ² / 29.0121 ha / 0.11 sq. mi. / 71.7275 acres
Time for Initial Processing (without report)	01h:29m:09s

Quality Check



Images	median of 72118 keypoints per image	
Dataset	460 out of 460 images calibrated (100%), all images enabled	
Camera Optimization	4.04% relative difference between initial and optimized internal camera parameters	
Matching	median of 19223.8 matches per calibrated image	
Georeferencing	yes, no 3D GCP	

Preview

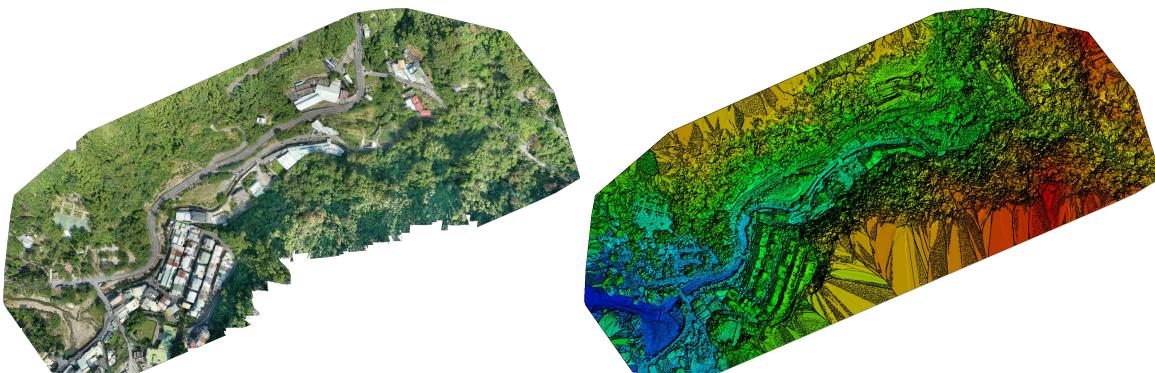


Figure 1: Orthomosaic and the corresponding sparse Digital Surface Model (DSM) before densification.

Calibration Details



Number of Calibrated Images	460 out of 460
Number of Geolocated Images	460 out of 460

Initial Image Positions



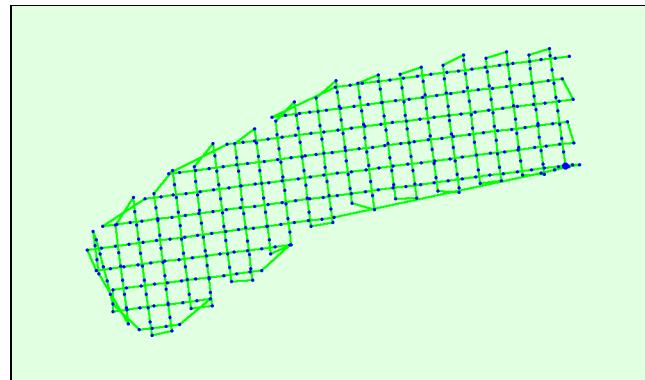
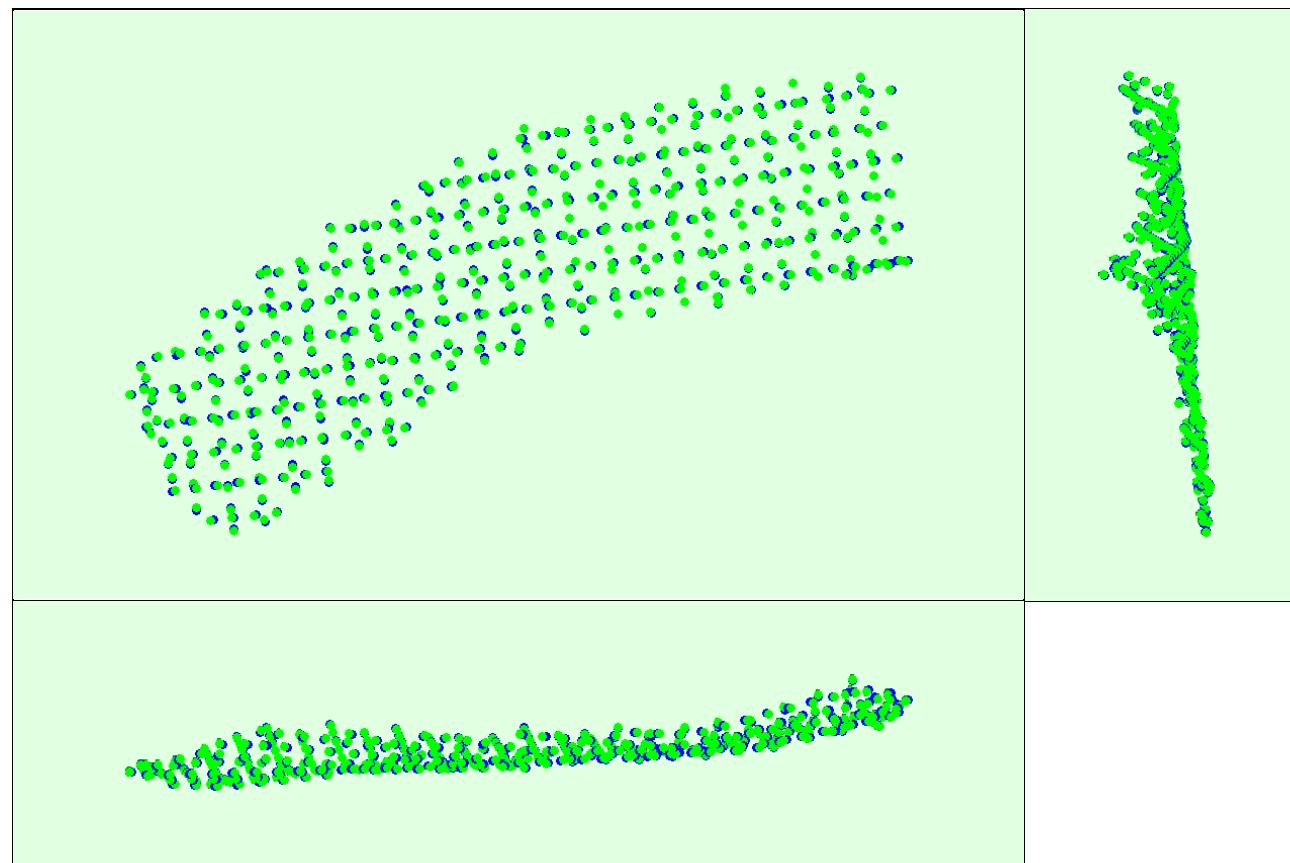


Figure 2: Top view of the initial image position. The green line follows the position of the images in time starting from the large blue dot.

Computed Image/GCPs/Manual Tie Points Positions



Uncertainty ellipses 10x 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]	Camera Displacement X [m]	Camera Displacement Y [m]	Camera Displacement Z [m]
Mean	0.151	0.151	0.285	0.073	0.050	0.034	0.007	0.007	0.016
Sigma	0.030	0.029	0.047	0.002	0.003	0.002	0.002	0.003	0.004

Overlap

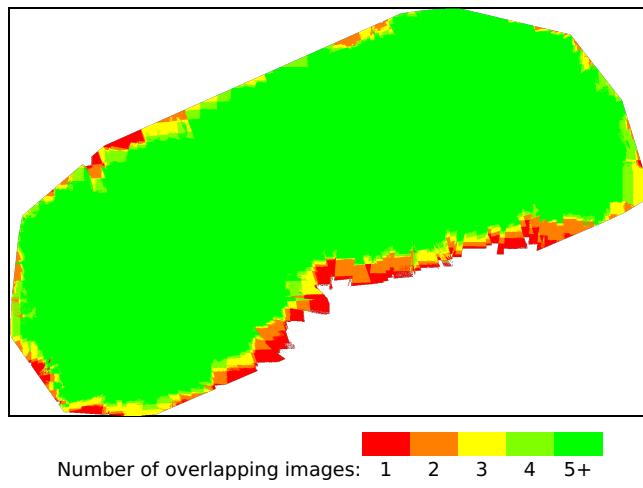


Figure 4: Number of overlapping images computed for each pixel of the orthomosaic.

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	8467968
Number of 3D Points for Bundle Block Adjustment	2895454
Mean Reprojection Error [pixels]	0.237

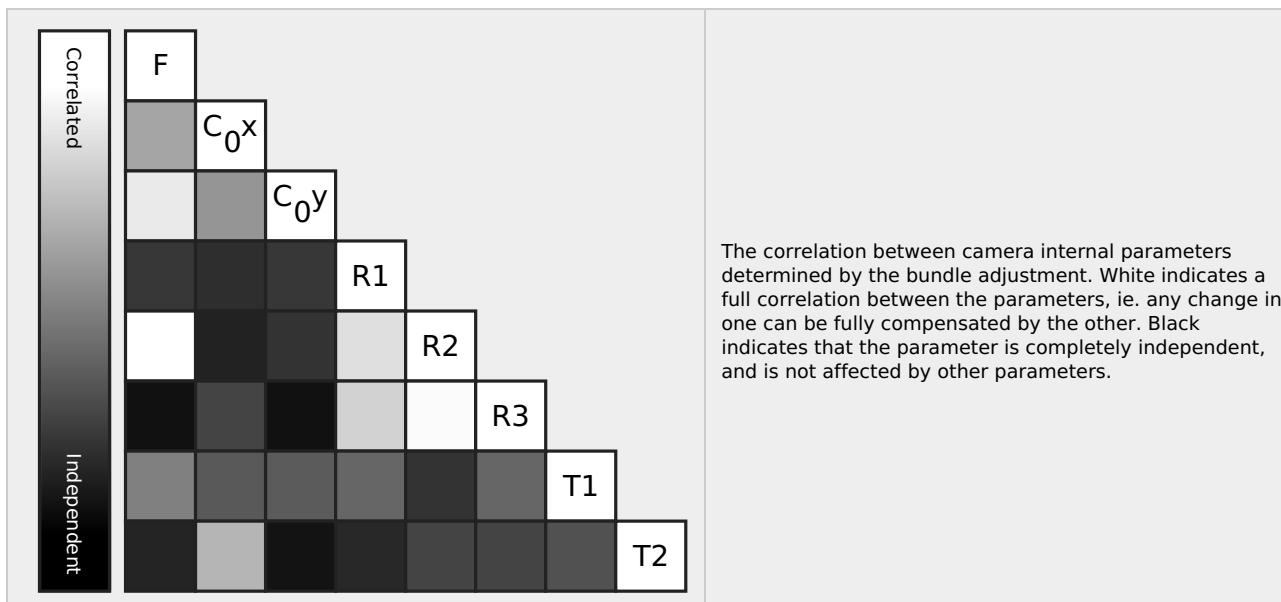
Internal Camera Parameters

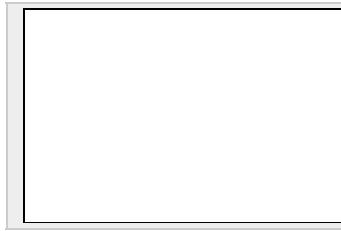
L1D-20c_10.3_5472x3648 (RGB). Sensor Dimensions: 12.825 [mm] x 8.550 [mm]



EXIF ID: L1D-20c_10.3_5472x3648

	Focal Length	Principal Point x	Principal Point y	R1	R2	R3	T1	T2
Initial Values	4470.830 [pixel] 10.479 [mm]	2770.870 [pixel] 6.494 [mm]	1698.700 [pixel] 3.981 [mm]	0.009	0.040	-0.050	-0.003	0.002
Optimized Values	4289.892 [pixel] 10.054 [mm]	2705.423 [pixel] 6.341 [mm]	1838.023 [pixel] 4.308 [mm]	-0.007	0.010	-0.009	0.000	-0.001
Uncertainties (Sigma)	1.235 [pixel] 0.003 [mm]	0.171 [pixel] 0.000 [mm]	0.889 [pixel] 0.002 [mm]	0.000	0.001	0.001	0.000	0.000





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 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	72118	19224
Min	39987	707
Max	81980	37514
Mean	70394	18409

3D Points from 2D Keypoint Matches



	Number of 3D Points Observed
In 2 Images	1928268
In 3 Images	468406
In 4 Images	198439
In 5 Images	102959
In 6 Images	59072
In 7 Images	36031
In 8 Images	23601
In 9 Images	16230
In 10 Images	11967
In 11 Images	9027
In 12 Images	7110
In 13 Images	5732
In 14 Images	4400
In 15 Images	3721
In 16 Images	3025
In 17 Images	2474
In 18 Images	2095
In 19 Images	1775
In 20 Images	1545
In 21 Images	1271
In 22 Images	1106
In 23 Images	919
In 24 Images	775
In 25 Images	721
In 26 Images	585
In 27 Images	506
In 28 Images	442
In 29 Images	352
In 30 Images	333
In 31 Images	280
In 32 Images	271
In 33 Images	214
In 34 Images	213
In 35 Images	189
In 36 Images	163
In 37 Images	157
In 38 Images	141
In 39 Images	105
In 40 Images	101

In 41 Images	105
In 42 Images	89
In 43 Images	80
In 44 Images	79
In 45 Images	55
In 46 Images	65
In 47 Images	67
In 48 Images	43
In 49 Images	26
In 50 Images	32
In 51 Images	28
In 52 Images	16
In 53 Images	13
In 54 Images	6
In 55 Images	10
In 56 Images	5
In 57 Images	3
In 58 Images	1
In 59 Images	1
In 60 Images	4
In 61 Images	1
In 62 Images	2
In 63 Images	2

2D Keypoint Matches

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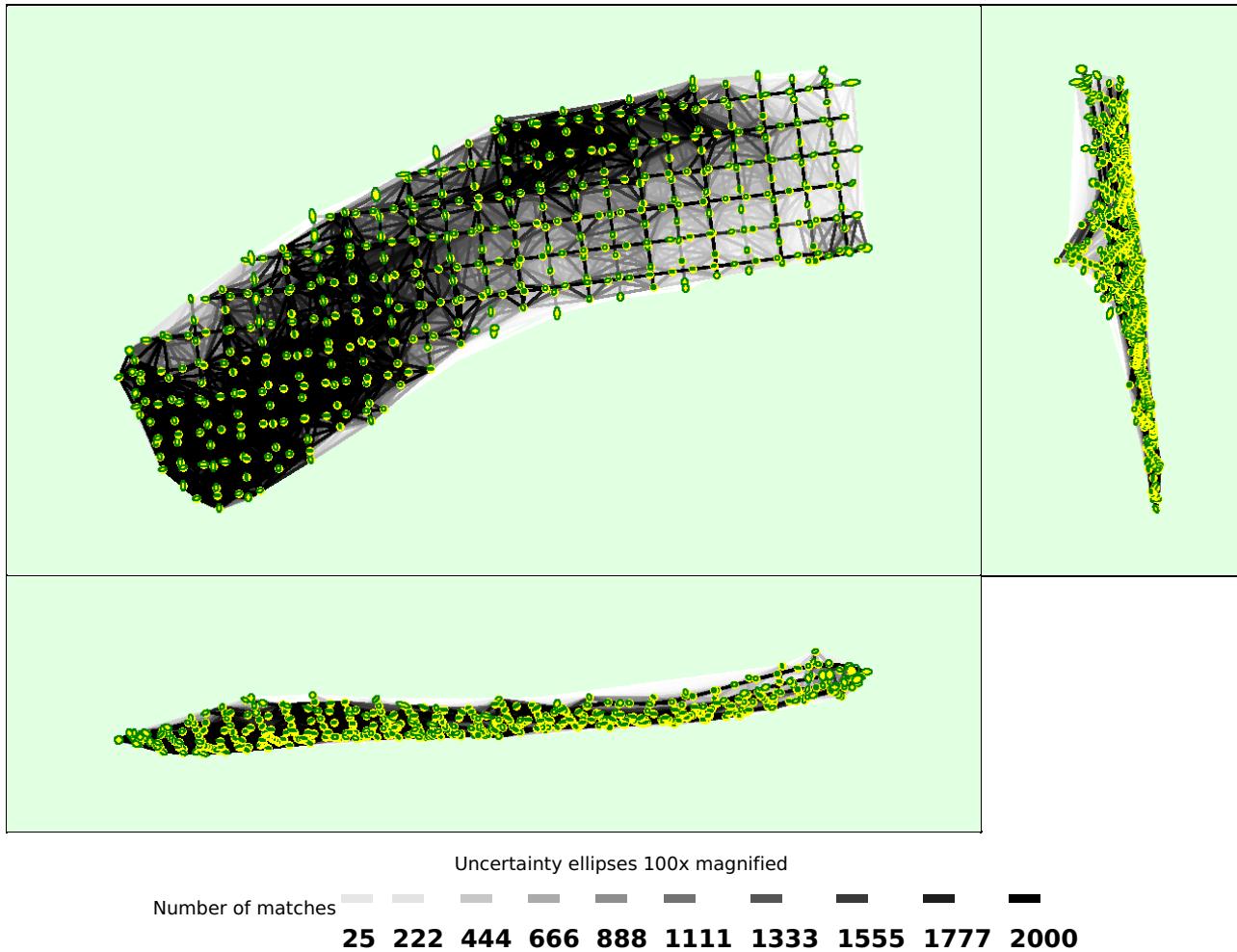


Figure 5: Computed image positions with links between matched images. The darkness of the links indicates the number of matched 2D keypoints between the images. Bright links indicate weak links and require manual tie points or more images. Dark green ellipses indicate the relative camera position uncertainty of the bundle block adjustment result.

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Relative camera position and orientation uncertainties


	X [m]	Y [m]	Z [m]	Omega [degree]	Phi [degree]	Kappa [degree]	Camera Displacement X [m]	Camera Displacement Y [m]	Camera Displacement Z [m]
Mean	0.024	0.025	0.021	0.014	0.014	0.007	0.007	0.007	0.016
Sigma	0.008	0.010	0.007	0.006	0.005	0.003	0.002	0.003	0.004

Geolocation Details



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Absolute Geolocation Variance


Min Error [m]	Max Error [m]	Geolocation Error X [%]	Geolocation Error Y [%]	Geolocation Error Z [%]
-	-15.00	0.00	0.00	0.00
-15.00	-12.00	0.00	0.00	0.00
-12.00	-9.00	0.00	0.00	0.00
-9.00	-6.00	0.00	0.00	0.00
-6.00	-3.00	0.00	0.00	0.00
-3.00	0.00	47.83	48.48	47.17
0.00	3.00	51.96	51.52	52.83
3.00	6.00	0.22	0.00	0.00
6.00	9.00	0.00	0.00	0.00
9.00	12.00	0.00	0.00	0.00
12.00	15.00	0.00	0.00	0.00
15.00	-	0.00	0.00	0.00
Mean [m]		-0.000000	0.000000	0.000000
Sigma [m]		1.476222	1.209833	0.733833
RMS Error [m]		1.476222	1.209833	0.733833

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.

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Relative Geolocation Variance


Relative Geolocation Error	Images X [%]	Images Y [%]	Images Z [%]
[-1.00, 1.00]	100.00	100.00	100.00
[-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]	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	1.316
Phi	1.698
Kappa	3.113

Geolocation RMS error of the orientation angles given by the difference between the initial and computed image orientation angles.

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Rolling Shutter Statistics

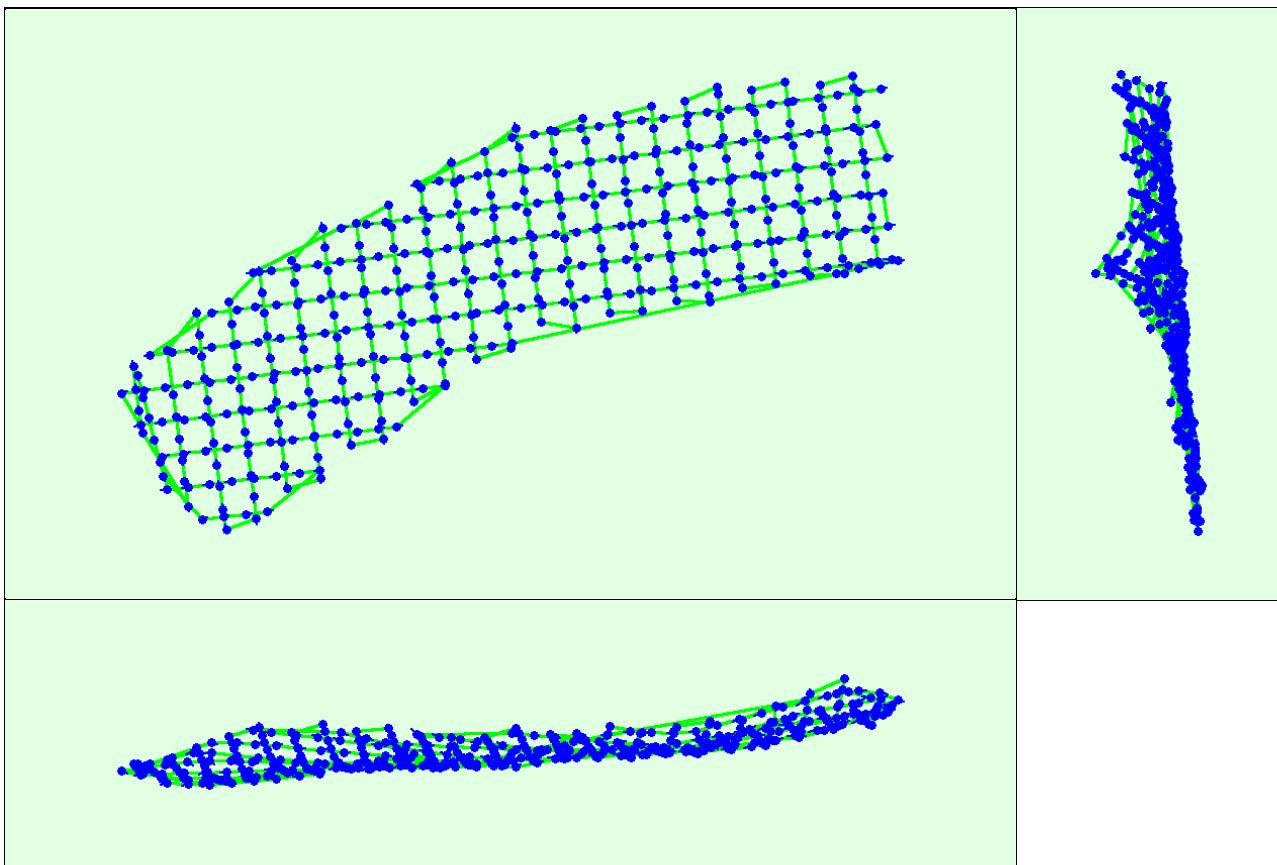



Figure 6: Camera movement estimated by the rolling shutter camera model. The green line follows the computed image positions. The blue dots represent the camera position at the start of the exposure. The blue lines represent the camera motion during the rolling shutter readout, re-scaled by a project dependant scaling factor for better visibility.

Median Camera Speed	6.9687 [m/s]
Median Camera Displacement During Sensor Readout)	0.5119 [m]
Median Rolling Shutter Readout Time	61.6428 [ms]

Initial Processing Details

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System Information

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Hardware	CPU: Intel(R) Xeon(R) Platinum 8124M CPU @ 3.00GHz RAM: 69GB GPU: no info (Driver: unknown)
Operating System	Linux 4.15.0-1057-aws x86_64

Coordinate Systems

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Image Coordinate System	WGS 84 (EGM 96 Geoid)
Output Coordinate System	TWD97 / TM2 zone 121 (EGM 96 Geoid)

Processing Options

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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: 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	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	01h:09m:50s
Time for Point Cloud Classification	02m:52s
Time for 3D Textured Mesh Generation	29m:38s

Results



Number of Generated Tiles	4
Number of 3D Densified Points	50754422
Average Density (per m ³)	92.18

DSM, Orthomosaic and Index Details



Processing Options



DSM and Orthomosaic Resolution	1 x GSD (2.98 [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	10 x GSD (2.98 [cm/pixel])
Time for DSM Generation	11m:23s
Time for Orthomosaic Generation	19m:48s
Time for DTM Generation	01m:13s
Time for Contour Lines Generation	00s
Time for Reflectance Map Generation	00s
Time for Index Map Generation	00s