Quality Report

Generated with Pix4Ddiscovery version 4.5.6

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	OBrien_GEO
Processed	2020-04-16 18:44:10
Camera Model Name(s)	PeauPro82_3.97_4000x3000 (RGB)
Average Ground Sampling Distance (GSD)	4.75 cm / 1.87 in
Area Covered	0.302 km^2 / 30.1661 ha / 0.12 sq. mi. / 74.5806 acres
Time for Initial Processing (without report)	17m:15s

Quality Check

Images	median of 35812 keypoints per image	✓
Dataset	87 out of 87 images calibrated (100%), all images enabled	✓
Camera Optimization	0% relative difference between initial and optimized internal camera parameters	✓
Matching	median of 26218.9 matches per calibrated image	✓
Georeferencing	yes, no 3D GCP	⚠

Preview

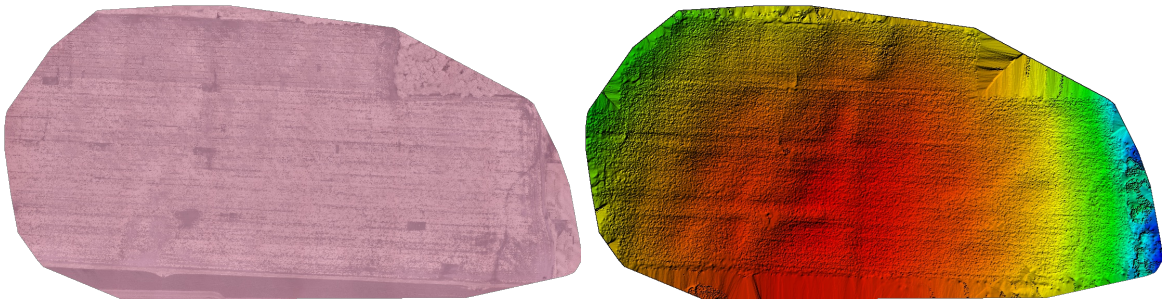


Figure 1: Orthomosaic and the corresponding sparse Digital Surface Model (DSM) before densification.

Calibration Details

Number of Calibrated Images	87 out of 87
Number of Geolocated Images	87 out of 87

Initial Image Positions

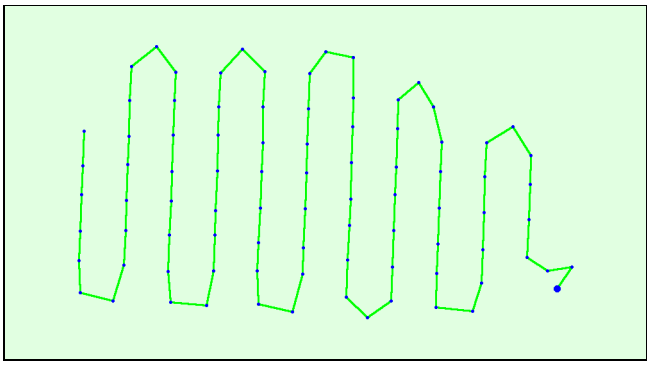
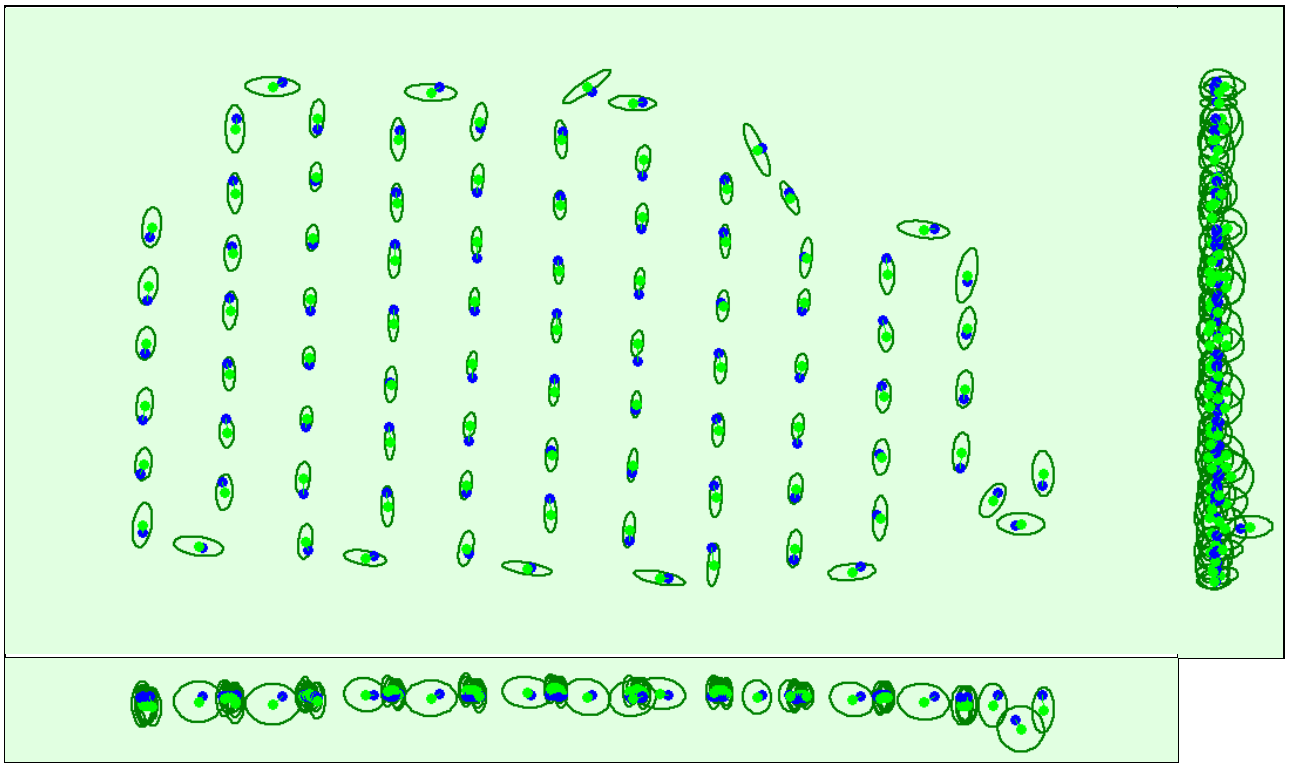


Figure 2: Top view of the initial image position. The green line follows the position of the images in time starting from the large blue dot.

Computed Image/GCPs/Manual Tie Points Positions



Uncertainty ellipses 50x 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	0.152	0.261	0.246	0.136	0.078	0.023	0.025	0.027	0.166
Sigma	0.100	0.069	0.050	0.030	0.049	0.004	0.005	0.005	0.042

Overlap

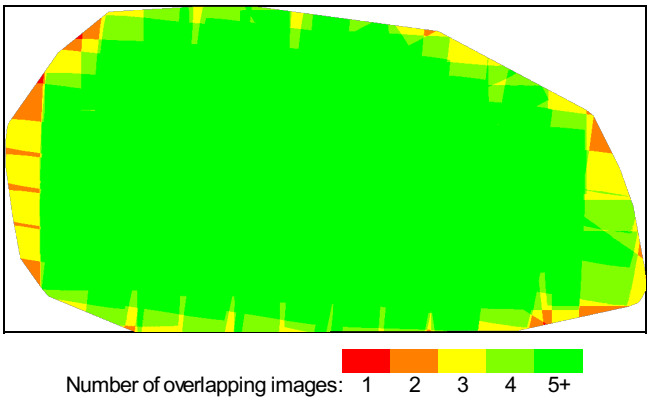


Figure 4: Number of overlapping images computed for each pixel of the orthomosaic.
Red and yellow areas indicate low overlap for which poor results may be generated. Green areas indicate an overlap of over 5 images for every pixel. Good quality results will be generated as long as the number of keypoint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

Bundle Block Adjustment Details

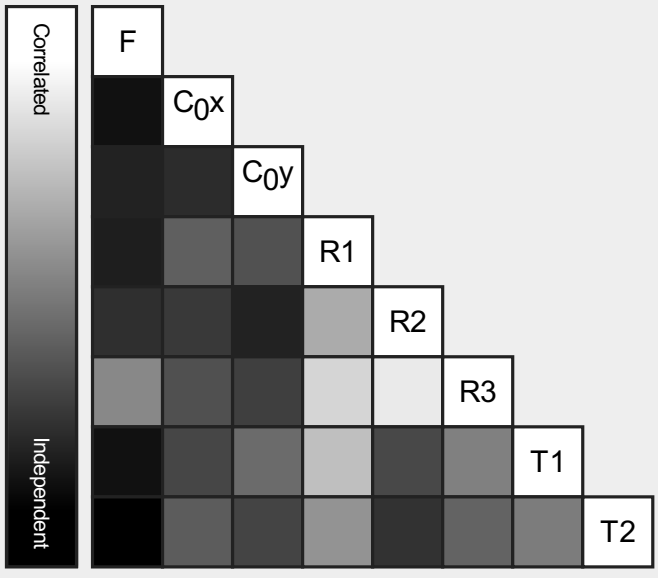
Number of 2D Keypoint Observations for Bundle Block Adjustment	2109530
Number of 3D Points for Bundle Block Adjustment	533052
Mean Reprojection Error [pixels]	0.203

Internal Camera Parameters

PeauPro82_3.97_4000x3000 (RGB). Sensor Dimensions: 6.200 [mm] x 4.650 [mm]

EXIF ID: HERO4Black_3.0_4000x3000

	Focal Length	Principal Point x	Principal Point y	R1	R2	R3	T1	T2
Initial Values	2681.340 [pixel] 4.156 [mm]	2025.170 [pixel] 3.139 [mm]	1483.860 [pixel] 2.300 [mm]	-0.109	0.109	0.035	-0.001	0.001
Optimized Values	2681.463 [pixel] 4.156 [mm]	2033.869 [pixel] 3.152 [mm]	1469.533 [pixel] 2.278 [mm]	-0.127	0.121	0.017	-0.000	0.000
Uncertainties (Sigma)	0.306 [pixel] 0.000 [mm]	0.139 [pixel] 0.000 [mm]	0.129 [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.

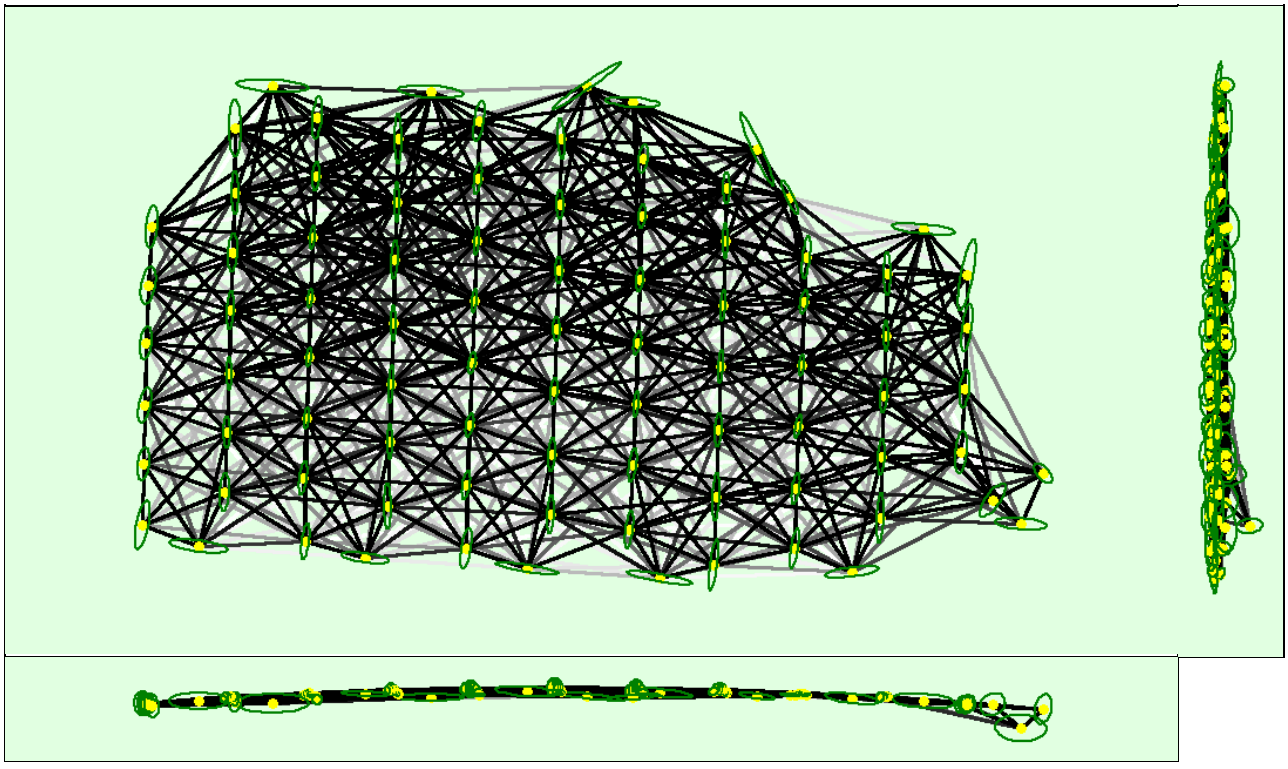
2D Keypoints Table

	Number of 2D Keypoints per Image	Number of Matched 2D Keypoints per Image
Median	35812	26219
Min	20053	7253
Max	46884	38134
Mean	34592	24247

3D Points from 2D Keypoint Matches

	Number of 3D Points Observed
In 2 Images	184658
In 3 Images	102185
In 4 Images	69990
In 5 Images	53773
In 6 Images	43515
In 7 Images	31682
In 8 Images	27239
In 9 Images	16365
In 10 Images	3329
In 11 Images	309
In 12 Images	7

2D Keypoint Matches



Uncertainty ellipses 50x magnified

Number of 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]	Camera Displacement X [m]	Camera Displacement Y [m]	Camera Displacement Z [m]
Mean	0.128	0.266	0.089	0.129	0.076	0.017	0.027	0.029	0.186
Sigma	0.146	0.098	0.050	0.045	0.069	0.007	0.006	0.006	0.065

Geolocation Details

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	8.05	0.00
-12.00	-9.00	0.00	8.05	0.00
-9.00	-6.00	0.00	17.24	2.30
-6.00	-3.00	1.15	11.49	28.74
-3.00	0.00	73.56	3.45	22.99
0.00	3.00	12.64	11.49	22.99
3.00	6.00	4.60	8.05	9.20
6.00	9.00	8.05	12.64	12.64
9.00	12.00	0.00	11.49	0.00
12.00	15.00	0.00	6.90	1.15
15.00	-	0.00	1.15	0.00
Mean [m]		-0.001396	-0.000731	0.001091
Sigma [m]		2.495882	8.567202	4.299167
RMS Error [m]		2.495882	8.567202	4.299167

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]	91.95	26.44	98.85
[-2.00, 2.00]	100.00	70.11	100.00
[-3.00, 3.00]	100.00	98.85	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.

Rolling Shutter Statistics

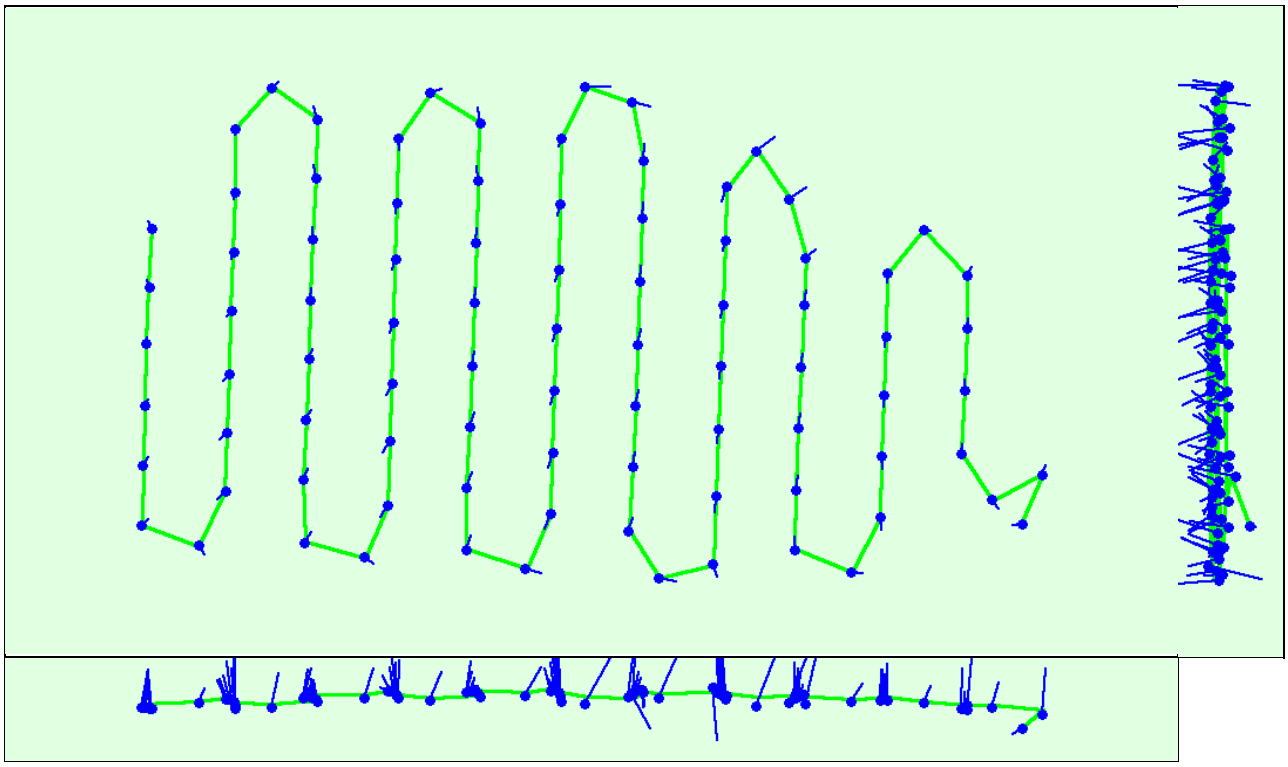


Figure 6: Camera movement estimated by the rolling shutter camera model. The green line follows the computed image positions. The blue dots represent the camera position at the start of the exposure. The blue lines represent the camera motion during the rolling shutter readout, re-scaled by a project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

Median Camera Speed	10.1848 [m/s]
Median Camera Displacement During Sensor Readout)	4.6565 [m]
Median Rolling Shutter Readout Time	457.1951 [ms]

Initial Processing Details

System Information

Hardware	CPU: Intel(R) Core(TM) i7-6700K CPU @ 4.00GHz RAM: 32GB GPU: NVIDIA GeForce GTX 1050 Ti (Driver: 26.21.14.4587)
Operating System	Windows 10 Pro, 64-bit

Coordinate Systems

Image Coordinate System	WGS 84 (EGM96 Geoid)
Output Coordinate System	WGS 84 / UTM zone 18N (EGM96 Geoid)

Processing Options

Detected Template	No Template Available
Keypoints Image Scale	Custom, Image Scale: 2
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: Alternative Internal Parameters Optimization: All prior External Parameters Optimization: All Rematch: Custom, yes