Quality Report

Generated with Pix4Dmapper version 4.4.10 Preview

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	Blair_DPRAIL_420ft_3-24-20
Processed	2020-05-28 18:17:02
Camera Model Name(s)	DSC-RX1RM2_35.0_7952x5304 (RGB)
Average Ground Sampling Distance (GSD)	2.17 cm / 0.85 in
Area Covered	1.401 km^2 / 140.1476 ha / 0.54 sq. mi. / 346.4915 acres
Time for Initial Processing (without report)	01h:15m:51s

Quality Check

Images	median of 41961 keypoints per image	✓
Dataset	925 out of 927 images calibrated (99%), all images enabled	✓
Camera Optimization	0.81% relative difference between initial and optimized internal camera parameters	✓
Matching	median of 13748.3 matches per calibrated image	✓
Georeferencing	yes, no 3D GCP	⚠

Preview

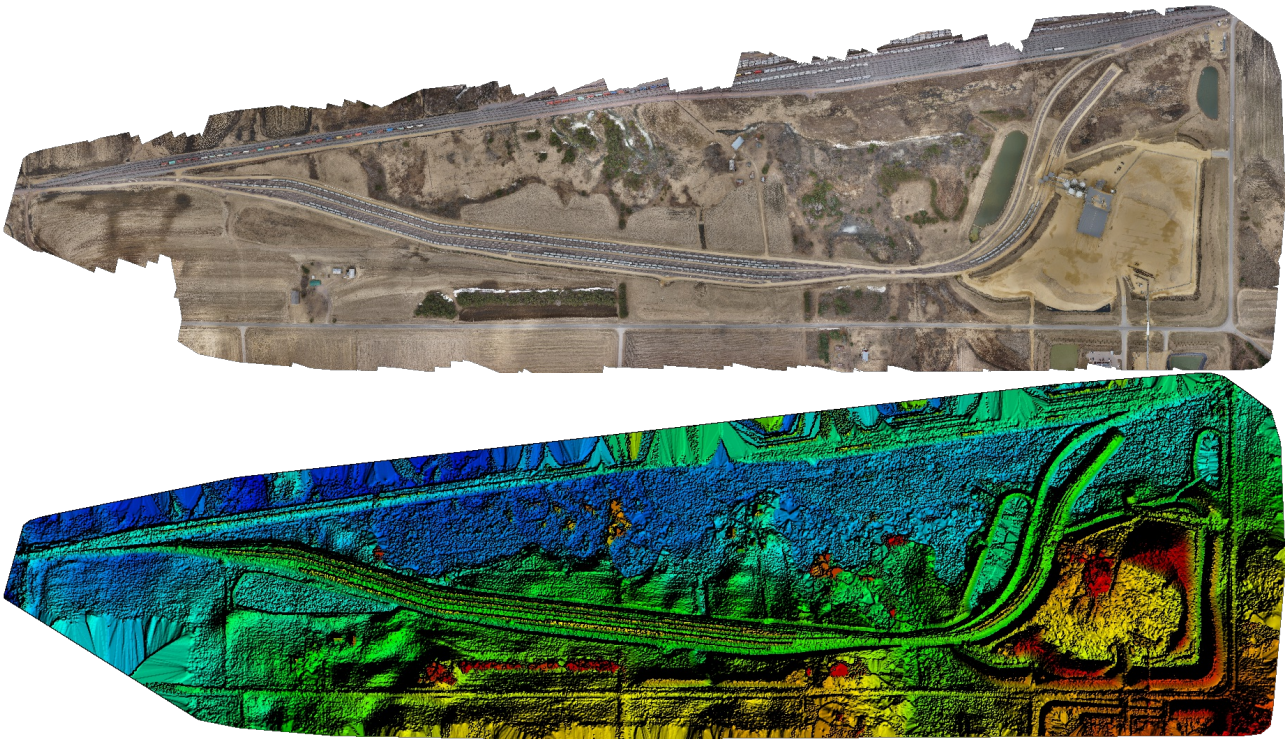


Figure 1: Orthomosaic and the corresponding sparse Digital Surface Model (DSM) before densification.

Calibration Details

Number of Calibrated Images	925 out of 927
Number of Geolocated Images	927 out of 927

Initial Image Positions

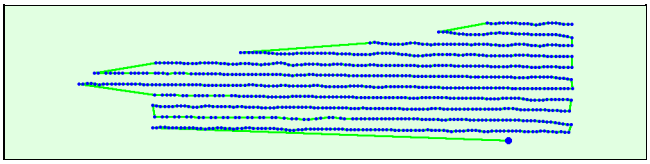
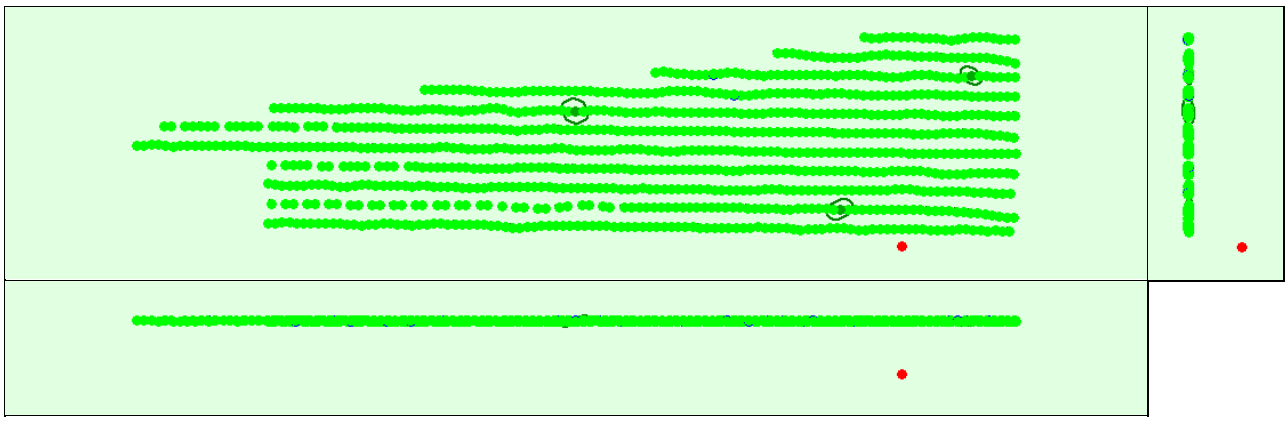


Figure 2: Top view of the initial image position. The green line follows the position of the images in time starting from the large blue dot.

Computed Image/GCPs/Manual Tie Points Positions



Uncertainty ellipses 1000x 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 [ft]	Y [ft]	Z [ft]	Omega [degree]	Phi [degree]	Kappa [degree]
Mean	0.023	0.023	0.014	0.003	0.003	0.003
Sigma	0.005	0.004	0.002	0.001	0.001	0.001

Overlap

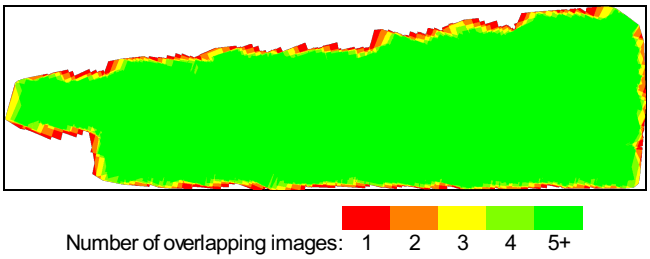


Figure 4: Number of overlapping images computed for each pixel of the orthomosaic.
Red and yellow areas indicate low overlap for which poor results may be generated. Green areas indicate an overlap of over 5 images for every pixel. Good quality results will be generated as long as the number of keypoint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

Bundle Block Adjustment Details

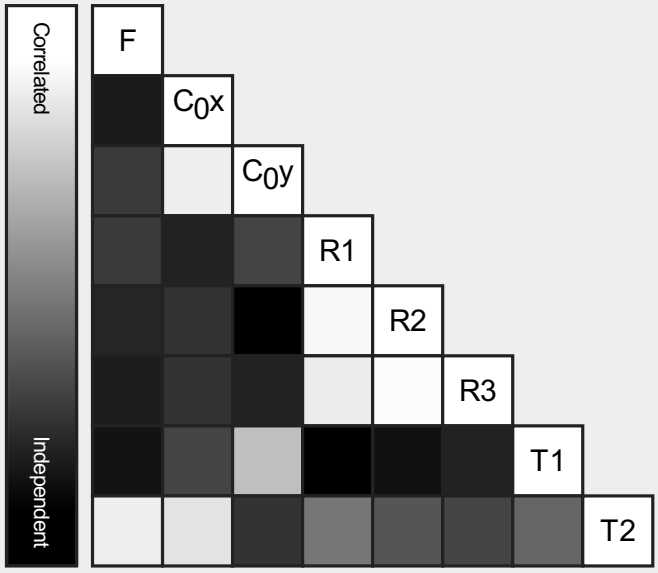
Number of 2D Keypoint Observations for Bundle Block Adjustment	12086578
Number of 3D Points for Bundle Block Adjustment	3360955
Mean Reprojection Error [pixels]	0.164

Internal Camera Parameters

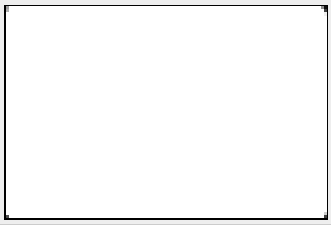
DSC-RX1RM2_35.0_7952x5304 (RGB). Sensor Dimensions: 35.000 [mm] x 23.345 [mm]

EXIF ID: DSC-RX1RM2_35.0_7952x5304

	Focal Length	Principal Point x	Principal Point y	R1	R2	R3	T1	T2
Initial Values	7451.230 [pixel] 32.796 [mm]	3949.280 [pixel] 17.382 [mm]	2642.930 [pixel] 11.633 [mm]	-0.011	0.043	-0.069	0.001	-0.000
Optimized Values	7512.284 [pixel] 33.065 [mm]	3964.054 [pixel] 17.447 [mm]	2659.095 [pixel] 11.704 [mm]	-0.037	-0.263	0.406	0.001	-0.001
Uncertainties (Sigma)	0.348 [pixel] 0.002 [mm]	0.164 [pixel] 0.001 [mm]	0.123 [pixel] 0.001 [mm]	0.000	0.001	0.002	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	41961	13748
Min	18411	54
Max	65091	29269
Mean	39763	13067

3D Points from 2D Keypoint Matches

	Number of 3D Points Observed
In 2 Images	1715855
In 3 Images	634943

In 4 Images	325949
In 5 Images	197956
In 6 Images	126831
In 7 Images	82087
In 8 Images	58531
In 9 Images	45356
In 10 Images	37658
In 11 Images	30132
In 12 Images	24163
In 13 Images	19364
In 14 Images	15995
In 15 Images	13629
In 16 Images	11057
In 17 Images	8513
In 18 Images	5946
In 19 Images	3884
In 20 Images	1934
In 21 Images	757
In 22 Images	284
In 23 Images	97
In 24 Images	32
In 25 Images	2

2D Keypoint Matches

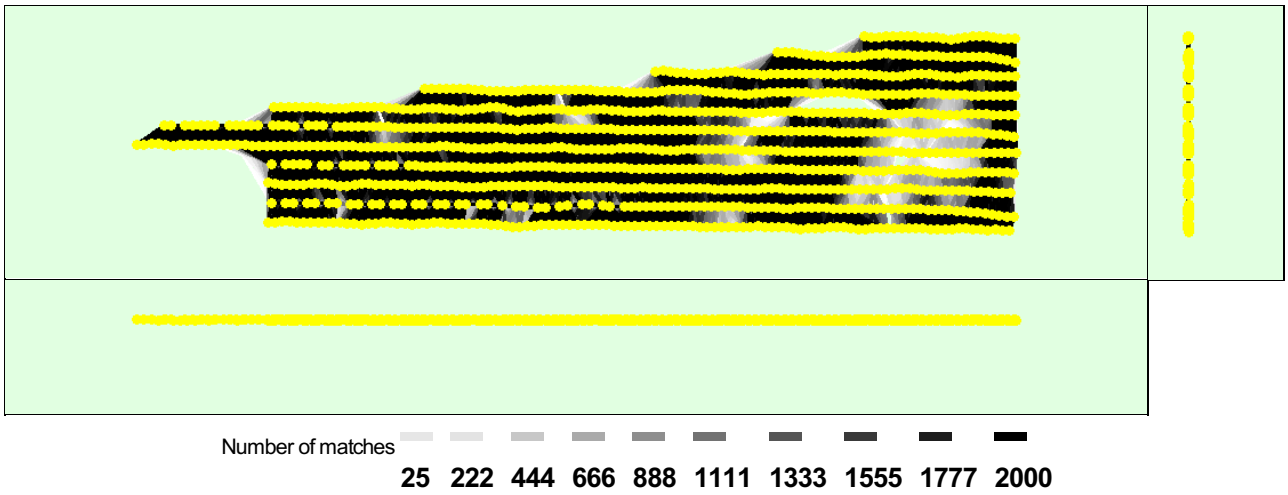


Figure 5: Computed image positions with links between matched images. The darkness of the links indicates the number of matched 2D keypoints between the images. Bright links indicate weak links and require manual tie points or more images.

Geolocation Details

Absolute Geolocation Variance

Min Error [ft]	Max Error [ft]	Geolocation Error X [%]	Geolocation Error Y [%]	Geolocation Error Z [%]
-	-0.07	2.39	2.93	32.21
-0.07	-0.06	1.74	1.19	3.58
-0.06	-0.04	2.93	3.47	4.01
-0.04	-0.03	5.42	6.62	3.58
-0.03	-0.01	12.58	11.61	4.77
-0.01	0.00	25.16	24.84	4.34
0.00	0.01	24.40	22.02	4.34
0.01	0.03	12.15	12.69	2.82

0.03	0.04	4.88	7.27	3.90
0.04	0.06	3.80	3.15	3.25
0.06	0.07	1.74	1.84	3.69
0.07	-	2.82	2.39	29.50
Mean [ft]		-0.000000	-0.000001	0.000220
Sigma [ft]		0.032436	0.032739	0.147058
RMS Error [ft]		0.032436	0.032739	0.147058

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]	86.77	87.85	19.96
[-2.00, 2.00]	97.72	97.94	36.33
[-3.00, 3.00]	99.57	99.24	52.60
Mean of Geolocation Accuracy [ft]	0.045932	0.045932	0.032897
Sigma of Geolocation Accuracy [ft]	0.000000	0.000000	0.000782

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

Geolocation Orientational Variance	RMS [degree]
Omega	2.836
Phi	1.924
Kappa	7.760

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) CPU E5-1660 v4 @ 3.20GHz RAM: 64GB GPU: NVIDIA GeForce GTX 1080 (Driver: 23.21.13.9125)
Operating System	Windows 10 Pro, 64-bit

Coordinate Systems

Image Coordinate System	WGS 84 (EGM96 Geoid)
Output Coordinate System	NAD_1983_StatePlane_Wisconsin_Central_FIPS_4802_Feet (EGM96 Geoid)

Processing Options

Detected Template	3D Maps
Keypoints Image Scale	Full, Image Scale: 0.5
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

DSM, Orthomosaic and Index Details

Processing Options

DSM and Orthomosaic Resolution	1 x GSD (2.17 [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 (2.17 [cm/pixel])
Time for DSM Generation	08h:24m:51s
Time for Orthomosaic Generation	06h:06m:29s
Time for DTM Generation	01h:33m:50s
Time for Contour Lines Generation	00s
Time for Reflectance Map Generation	00s
Time for Index Map Generation	00s