

Quality Report



Generated with PIX4Dmapper version 4.8.0 Preview



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Additional information about the sections



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Summary



Project	M30-TEST
Processed	2022-05-13 12:50:47
Camera Model Name(s)	M30T_4.4_4000x3000 (RGB)
Average Ground Sampling Distance (GSD)	1.24 cm / 0.49 in
Area Covered	0.014 km ² / 1.4005 ha / 0.01 sq. mi. / 3.4625 acres
Time for Initial Processing (without report)	02m:24s

Quality Check



Images	median of 39892 keypoints per image	
Dataset	96 out of 96 images calibrated (100%), all images enabled	
Camera Optimization	3.3% relative difference between initial and optimized internal camera parameters	
Matching	median of 10693.7 matches per calibrated image	
Georeferencing	yes, 3 GCPs (3 3D), mean RMS error = 0.068 US survey foot	

Preview

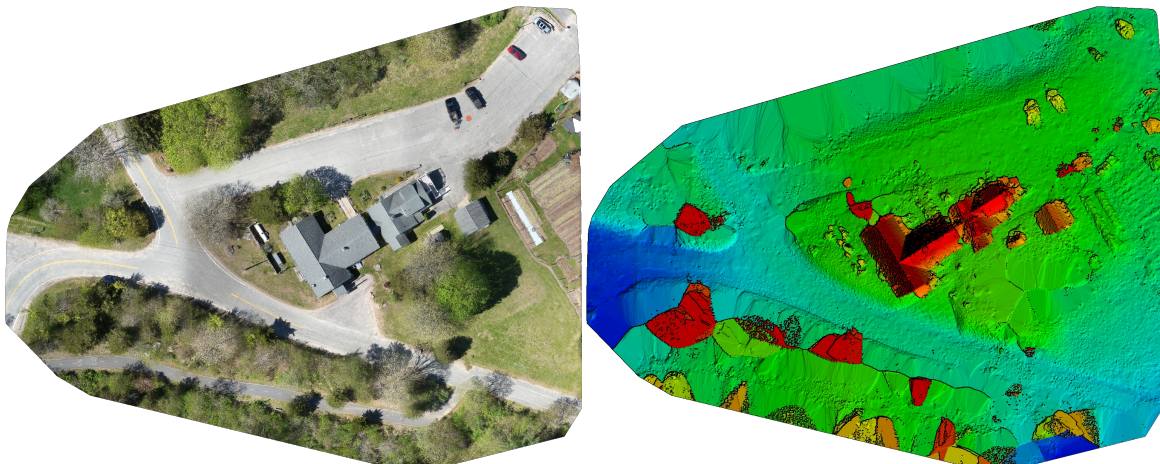
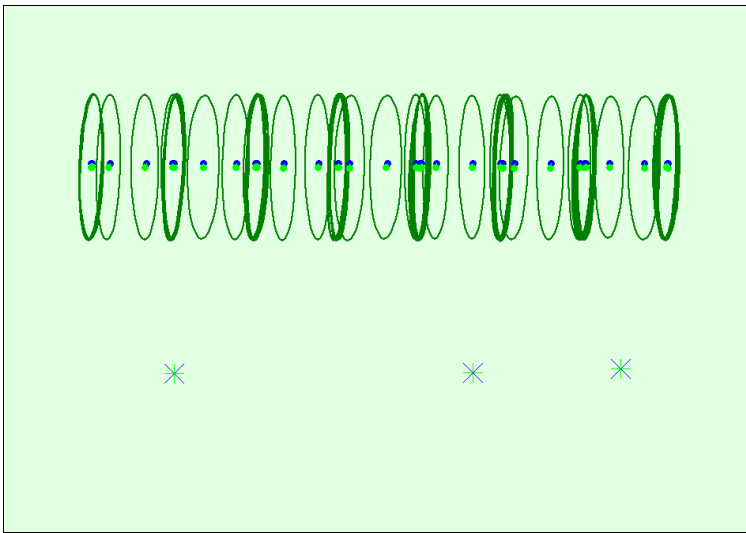


Figure 1: Orthomosaic and the corresponding sparse Digital Surface Model (DSM) before densification.

Calibration Details



Number of Calibrated Images	96 out of 96
Number of Geolocated Images	96 out of 96



Uncertainty ellipses 500x 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[US survey foot]	Y[US survey foot]	Z [US survey foot]	Omega [degree]	Phi [degree]	Kappa [degree]
Mean	0.012	0.013	0.084	0.006	0.005	0.002
Sigma	0.002	0.003	0.001	0.001	0.001	0.001

? Overlap

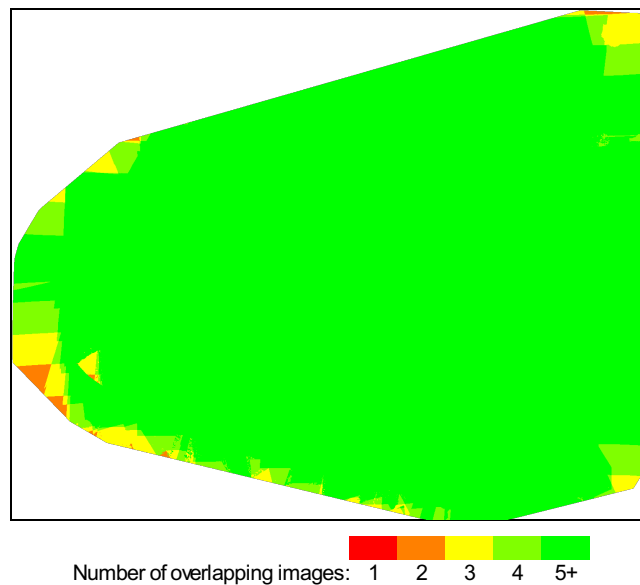


Figure 4: Number of overlapping images computed for each pixel of the orthomosaic. Red and yellow areas indicate low overlap for which poor results may be generated. Green areas indicate an overlap of over 5 images for every pixel. Good quality results will be generated as long as the number of keypoint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

Bundle Block Adjustment Details



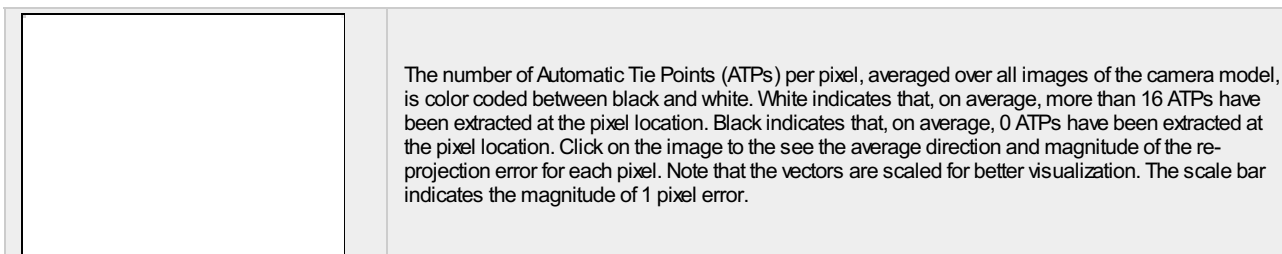
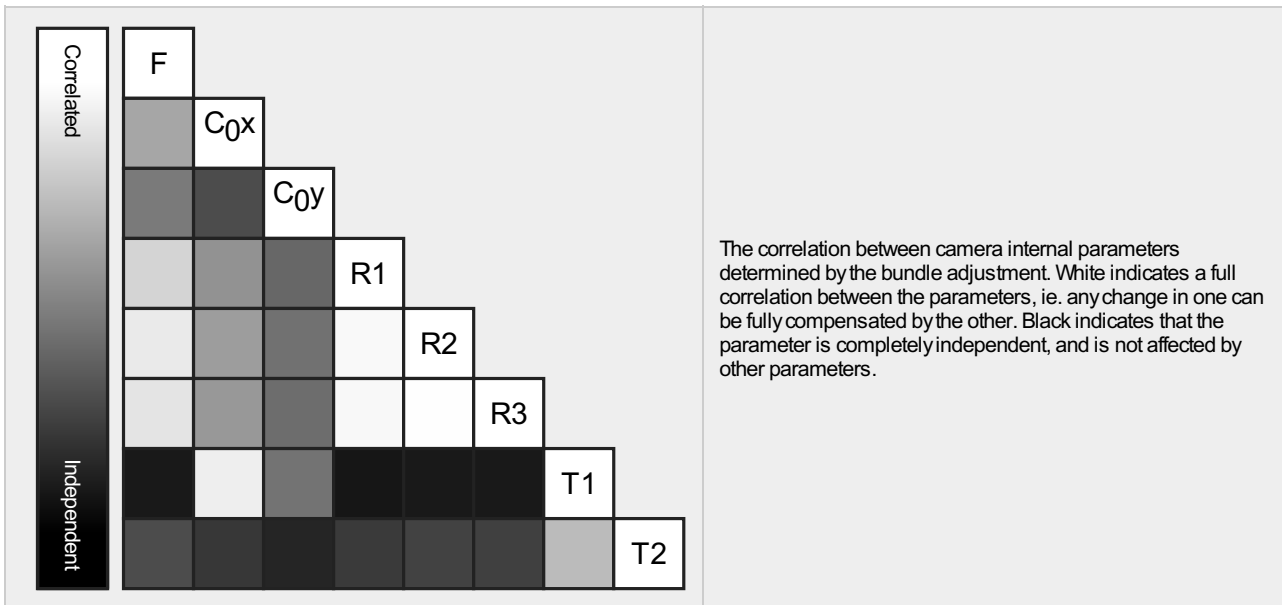
Number of 2D Keypoint Observations for Bundle Block Adjustment	1031854
Number of 3D Points for Bundle Block Adjustment	301706
Mean Reprojection Error [pixels]	0.268

Internal Camera Parameters

M30T_4.4_4000x3000 (RGB). Sensor Dimensions: 6.417 [mm] x 4.813 [mm]

EXIF ID: M30T_4.4_4000x3000

	Focal Length	Principal Point x	Principal Point y	R1	R2	R3	T1	T2
Initial Values	2742.857 [pixel] 4.400 [mm]	2000.000 [pixel] 3.208 [mm]	1500.000 [pixel] 2.406 [mm]	0.000	0.000	0.000	0.000	0.000
Optimized Values	2833.416 [pixel] 4.545 [mm]	2002.595 [pixel] 3.212 [mm]	1528.587 [pixel] 2.452 [mm]	0.171	-0.404	0.198	-0.001	0.000
Uncertainties (Sigma)	2.003 [pixel] 0.003 [mm]	0.109 [pixel] 0.000 [mm]	0.080 [pixel] 0.000 [mm]	0.000	0.001	0.001	0.000	0.000



2D Keypoints Table

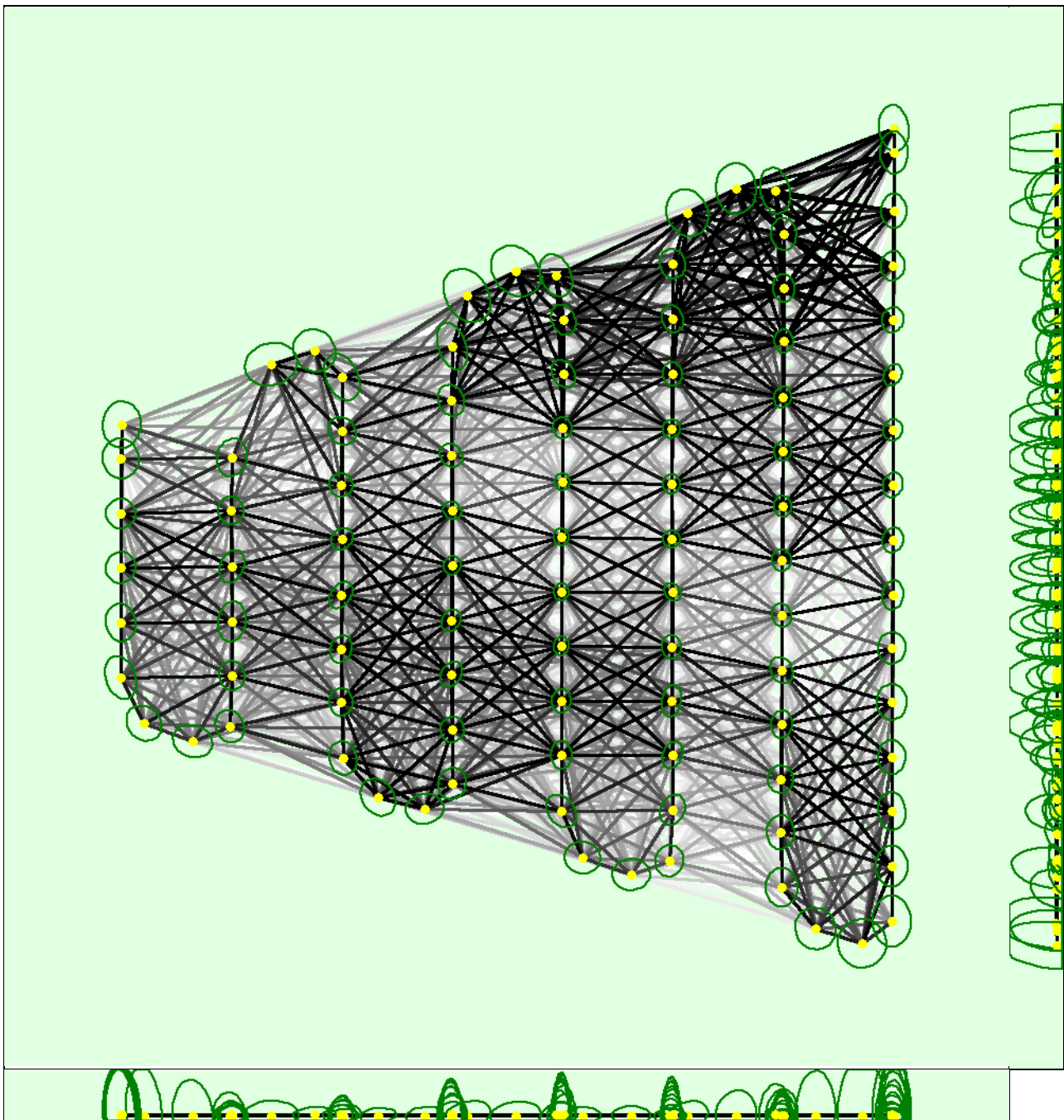
	Number of 2D Keypoints per Image	Number of Matched 2D Keypoints per Image
Median	39892	10694
Mn	26517	4226
Max	54249	18950
Mean	39769	10748

3D Points from 2D Keypoint Matches

	Number of 3D Points Observed
In 2 Images	166325
In 3 Images	52542
In 4 Images	27041
In 5 Images	16069
In 6 Images	9839
In 7 Images	7408
In 8 Images	5374
In 9 Images	4163

In 10 Images	3334
In 11 Images	2467
In 12 Images	2016
In 13 Images	1557
In 14 Images	1099
In 15 Images	868
In 16 Images	583
In 17 Images	365
In 18 Images	203
In 19 Images	154
In 20 Images	117
In 21 Images	81
In 22 Images	73
In 23 Images	28

2D Keypoint Matches



Uncertainty ellipses 500x magnified



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 [US survey foot]	Y [US survey foot]	Z [US survey foot]	Omega [degree]	Phi [degree]	Kappa [degree]
Mean	0.012	0.014	0.022	0.018	0.022	0.003
Sigma	0.004	0.004	0.014	0.010	0.012	0.001

Geolocation Details

Ground Control Points

GCP Name	Accuracy XYZ [US survey foot]	Error X [US survey foot]	Error Y [US survey foot]	Error Z [US survey foot]	Projection Error [pixel]	Verified/Marked
2000 (3D)	0.020/ 0.020	0.090	-0.072	-0.059	1.441	8 / 8
2001 (3D)	0.020/ 0.020	-0.015	0.104	-0.037	0.722	8 / 8
2002 (3D)	0.020/ 0.020	-0.060	-0.050	0.087	1.164	8 / 8
Mean [US survey foot]		0.004855	-0.005983	-0.003107		
Sigma [US survey foot]		0.062741	0.078549	0.064165		
RMS Error [US survey foot]		0.062928	0.078776	0.064240		

0 out of 3 check points have been labeled as inaccurate.

Check Point Name	Accuracy XYZ [US survey foot]	Error X [US survey foot]	Error Y [US survey foot]	Error Z [US survey foot]	Projection Error [pixel]	Verified/Marked
2003		-0.0024	-0.0657	-0.0880	0.9526	7 / 7
2004		0.1664	-0.1081	-0.0995	0.8595	8 / 8
2005		0.1368	0.0275	-0.0412	1.0194	7 / 7
Mean [US survey foot]		0.100288	-0.048795	-0.076205		
Sigma [US survey foot]		0.073608	0.056622	0.025214		
RMS Error [US survey foot]		0.124402	0.074746	0.080268		

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

Mn Error [US survey foot]	Max Error [US survey foot]	Geolocation Error X [%]	Geolocation Error Y [%]	Geolocation Error Z [%]
-	-0.28	5.21	26.04	4.17
-0.28	-0.22	5.21	4.17	1.04
-0.22	-0.17	12.50	1.04	2.08
-0.17	-0.11	10.42	4.17	3.13
-0.11	-0.06	7.29	4.17	12.50
-0.06	0.00	7.29	7.29	23.96
0.00	0.06	16.67	2.08	22.92
0.06	0.11	8.33	6.25	14.58
0.11	0.17	9.38	8.33	12.50
0.17	0.22	3.13	5.21	2.08
0.22	0.28	5.21	5.21	1.04

0.28	-	9.38	26.04	0.00
Mean [US survey foot]		0.204772	0.206318	2.365059
Sigma [US survey foot]		0.194848	0.431069	0.119486
RMS Error [US survey foot]		0.282661	0.477899	2.368076

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 [US survey foot]	0.202547	0.201566	2.364740

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]	38.54	16.67	91.67
[-2.00, 2.00]	69.79	36.46	97.92
[-3.00, 3.00]	87.50	50.00	100.00
Mean of Geolocation Accuracy [US survey foot]	0.100187	0.100187	0.183742
Sigma of Geolocation Accuracy [US survey foot]	0.003067	0.003067	0.001313

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

Geolocation Orientational Variance	RMS [degree]
Omega	1.154
Phi	1.527
Kappa	0.627

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: 11th Gen Intel(R) Core(TM) i9-11900H @2.50GHz RAM: 32GB GPU: Intel(R) UHD Graphics (Driver: 30.0.101.1029), NMDIA GeForce RTX 3070 Laptop GPU (Driver: 30.0.14.7141)
Operating System	Windows 10 Home, 64-bit

Coordinate Systems

Image Coordinate System	WGS 84
Ground Control Point (GCP) Coordinate System	NAD83(2011) / Rhode Island (ftUS) (-100US survey foot)
Output Coordinate System	NAD83(2011) / Rhode Island (ftUS) (-100US survey foot)

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: 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	04m:15s
Time for Point Cloud Classification	01m:21s
Time for 3D Textured Mesh Generation	02m:41s

Results

Number of Generated Tiles	1
Number of 3D Densified Points	5908586
Average Density (per US survey foot ³)	52.47

DSM, Orthomosaic and Index Details

Processing Options

DSM and Orthomosaic Resolution	1 x GSD (1.24 [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
Time for DSM Generation	03m:37s
Time for Orthomosaic Generation	04m:21s
Time for DTM Generation	00s
Time for Contour Lines Generation	00s
Time for Reflectance Map Generation	00s
Time for Index Map Generation	00s