

Quality Report



Generated with PIX4Dmapper version 4.8.0 Preview



Important: Click on the different icons for:



Help to analyze the results in the Quality Report



Additional information about the sections



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Summary



Project	M300-p1 test
Processed	2022-05-13 14:45:16
Camera Model Name(s)	ZenmuseP1_35.0_8192x5460 (RGB)
Average Ground Sampling Distance (GSD)	0.45 cm / 0.18 in
Area Covered	0.028 km ² / 2.7758 ha / 0.01 sq. mi. / 6.8627 acres
Time for Initial Processing (without report)	03m:15s

Quality Check



Images	median of 31799 keypoints per image	
Dataset	346 out of 347 images calibrated (99%), all images enabled, 6 blocks	
Camera Optimization	1.36% relative difference between initial and optimized internal camera parameters	
Matching	median of 5313.5 matches per calibrated image	
Georeferencing	yes, 3 GCPs (3 3D), mean RMS error = 0.008 US survey foot	

Preview

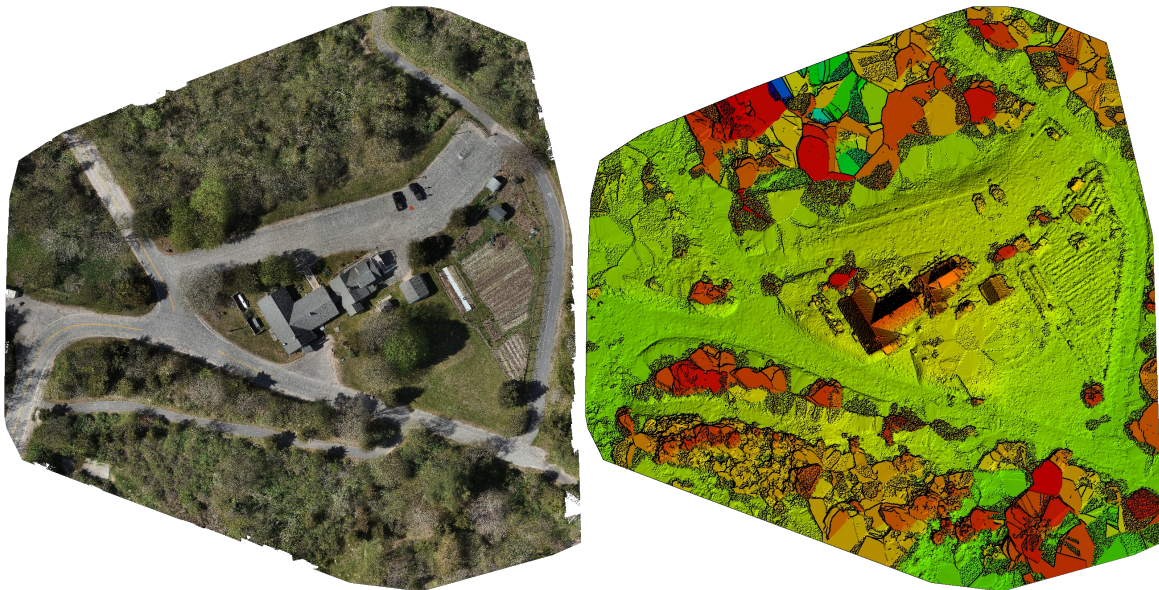


Figure 1: Orthomosaic and the corresponding sparse Digital Surface Model (DSM) before densification.

Calibration Details



Number of Calibrated Images	346 out of 347
Number of Geolocated Images	347 out of 347

? Initial Image Positions

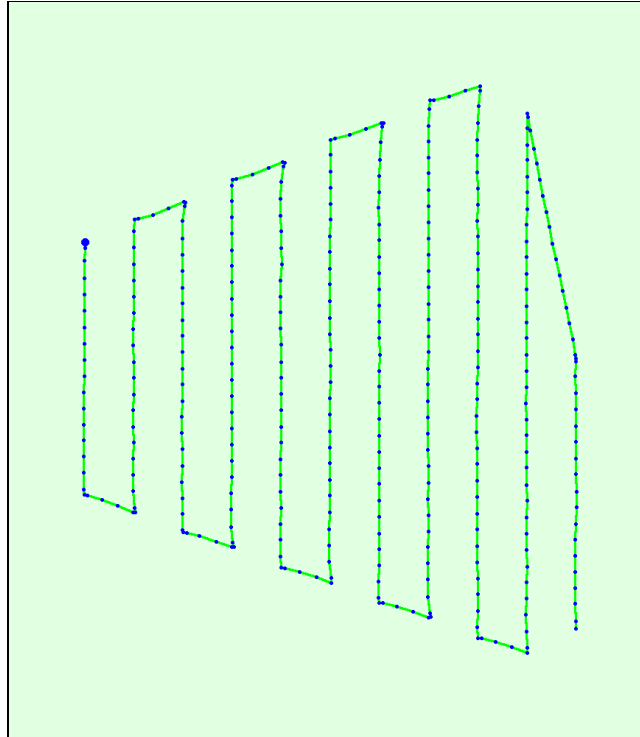
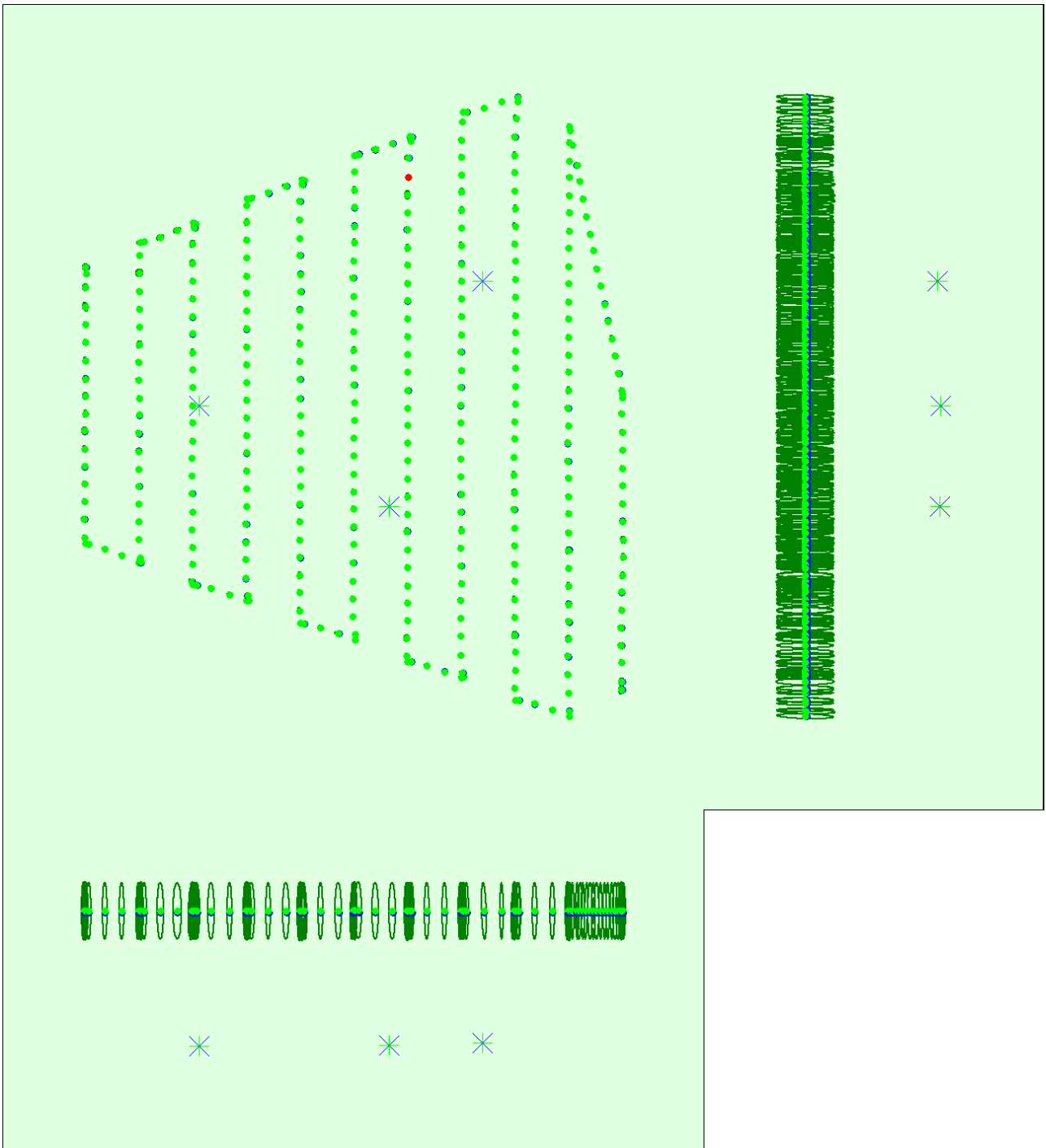


Figure 2: Top view of the initial image position. The green line follows the position of the images in time starting from the large blue dot.

? Computed Image/GCPs/Manual Tie Points Positions





Uncertainty ellipses 100x 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[US survey foot]	Y[US survey foot]	Z[US survey foot]	Omega [degree]	Phi [degree]	Kappa [degree]
Mean	0.018	0.021	0.256	0.010	0.009	0.006
Sigma	0.003	0.004	0.001	0.002	0.002	0.004

? Overlap



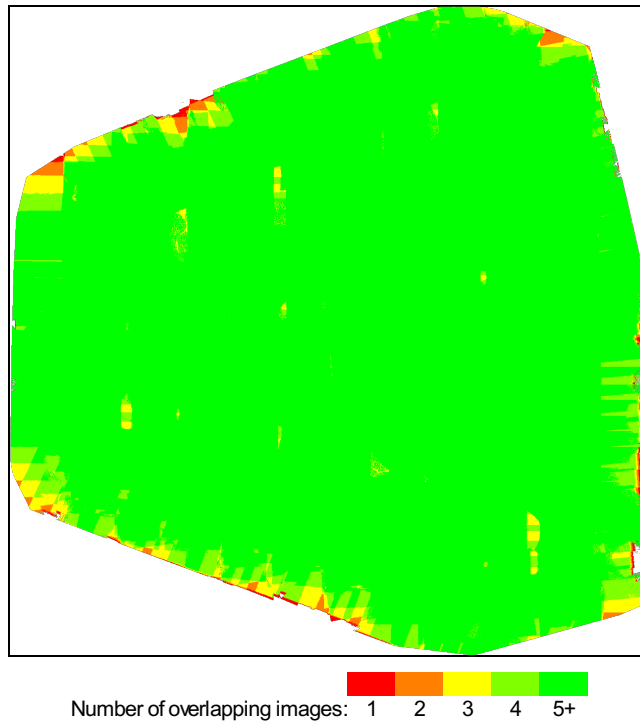


Figure 4: Number of overlapping images computed for each pixel of the orthomosaic. Red and yellow areas indicate low overlap for which poor results may be generated. Green areas indicate an overlap of over 5 images for every pixel. Good quality results will be generated as long as the number of keypoint 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	2027741
Number of 3D Points for Bundle Block Adjustment	653195
Mean Reprojection Error [pixels]	0.127

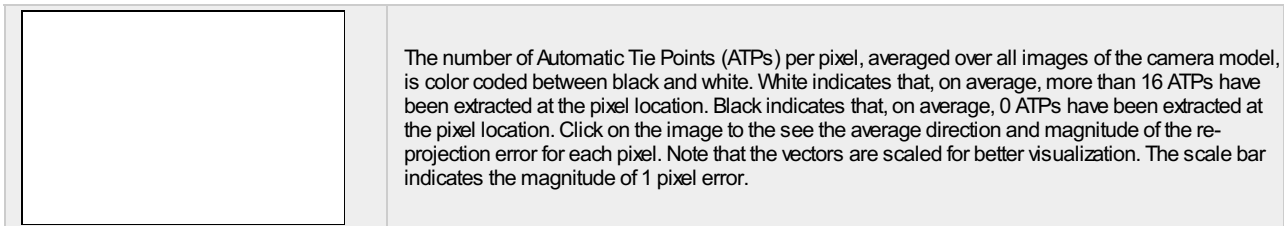
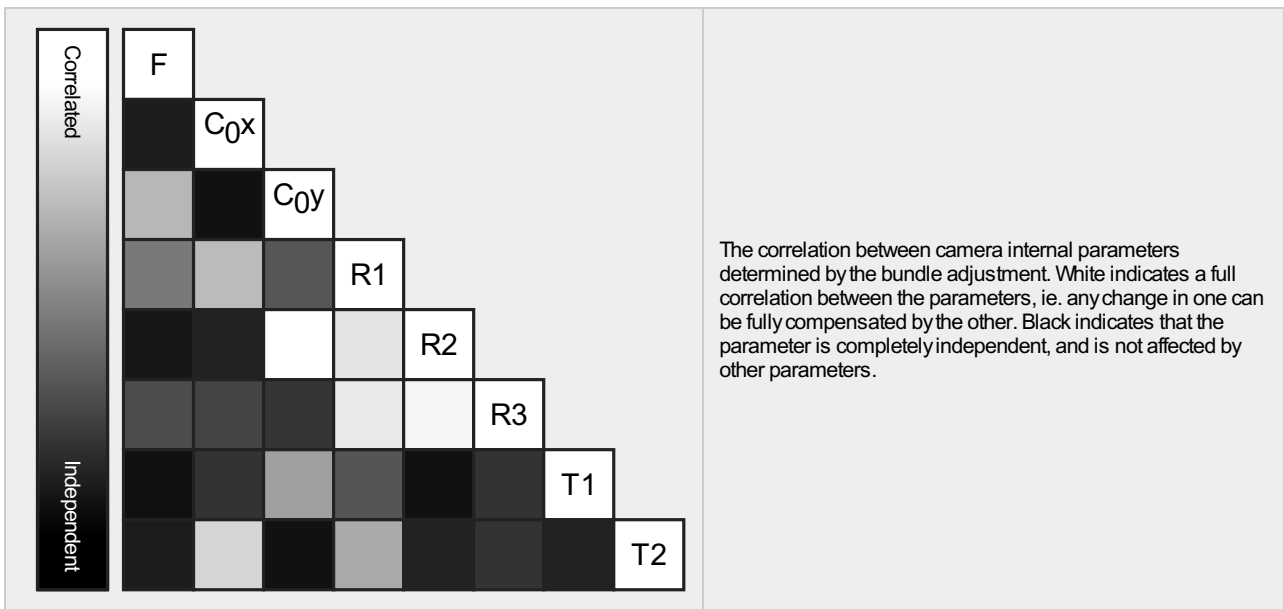
Internal Camera Parameters

ZenmuseP1_35.0_8192x5460 (RGB). Sensor Dimensions: 35.000 [mm] x 23.328 [mm]



EXIF ID: ZenmuseP1_35.0_8192x5460

	Focal Length	Principal Point x	Principal Point y	R1	R2	R3	T1	T2
Initial Values	8194.340 [pixel] 35.010 [mm]	4096.001 [pixel] 17.500 [mm]	2729.996 [pixel] 11.664 [mm]	-0.048	0.021	-0.097	0.002	-0.001
Optimized Values	8306.325 [pixel] 35.488 [mm]	4075.615 [pixel] 17.413 [mm]	2755.301 [pixel] 11.772 [mm]	-0.045	0.021	-0.100	0.001	-0.000
Uncertainties (Sigma)	17.499 [pixel] 0.075 [mm]	0.397 [pixel] 0.002 [mm]	0.501 [pixel] 0.002 [mm]	0.000	0.002	0.004	0.000	0.000



? 2D Keypoints Table



	Number of 2D Keypoints per Image	Number of Matched 2D Keypoints per Image
Median	31799	5314
Mn	13352	35
Max	49670	23478
Mean	30577	5861

? 3D Points from 2D Keypoint Matches



	Number of 3D Points Observed
In 2 Images	383686
In 3 Images	113102
In 4 Images	58942
In 5 Images	37710
In 6 Images	16523
In 7 Images	11862
In 8 Images	9279
In 9 Images	6961
In 10 Images	5956
In 11 Images	2480
In 12 Images	1945
In 13 Images	1558
In 14 Images	1422
In 15 Images	1287
In 16 Images	257
In 17 Images	149
In 18 Images	53
In 19 Images	15
In 20 Images	7
In 21 Images	1

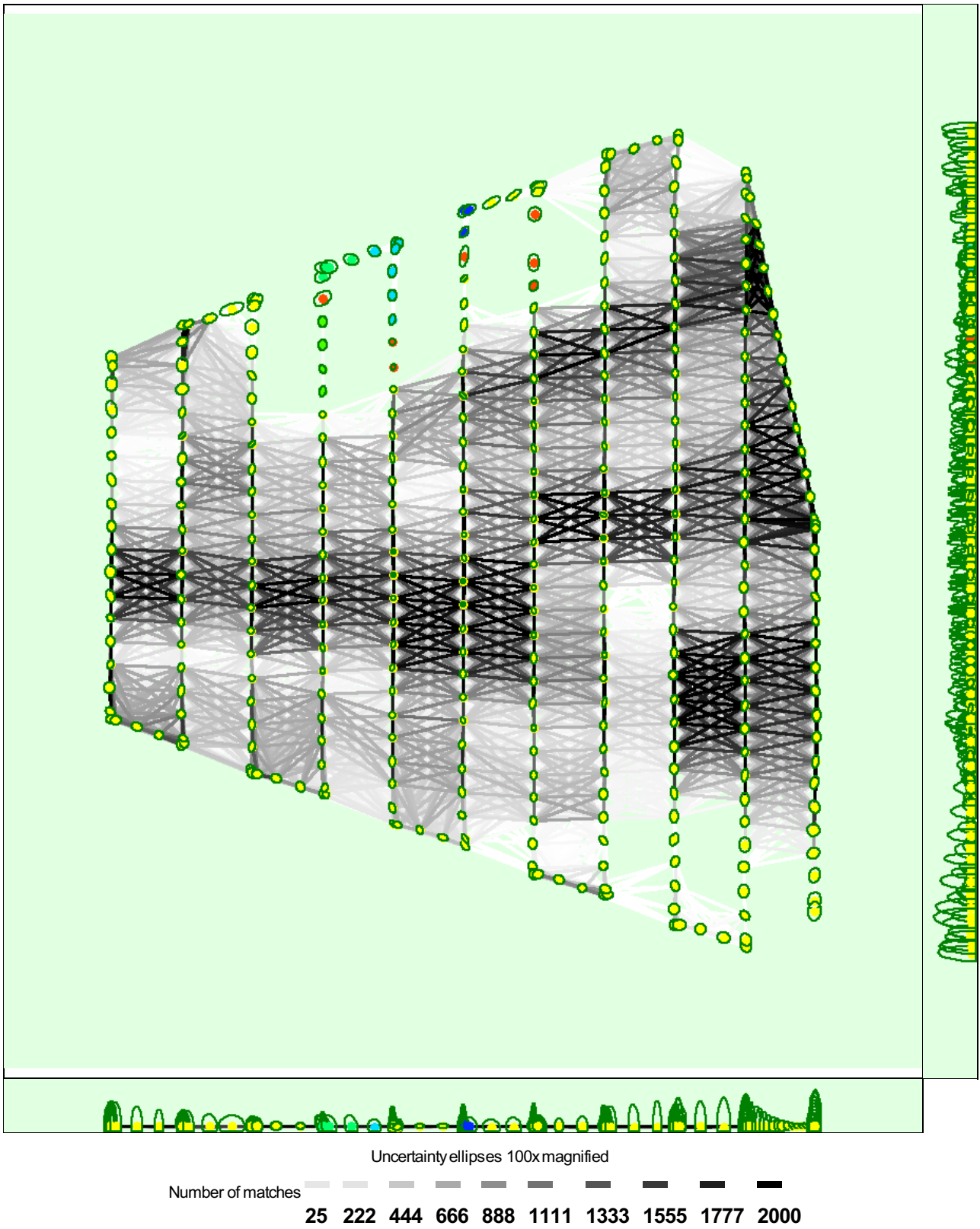


Figure 5: Computed image positions with links between matched images. The darkness of the links indicates the number of matched 2D keypoints between the images. Bright links indicate weak links and require manual tie points or more images. Dark green ellipses indicate the relative camera position uncertainty 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	0.028	0.033	0.082	0.054	0.055	0.007
Sigma	0.009	0.008	0.049	0.029	0.031	0.005

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	-0.004	-0.007	-0.018	0.966	8 / 8
2001 (3D)	0.020/ 0.020	0.012	0.001	0.012	1.214	8 / 8
2002 (3D)	0.020/ 0.020	-0.007	0.006	0.005	0.874	8 / 8
Mean [US survey foot]		-0.000019	0.000049	-0.000489		
Sigma [US survey foot]		0.008360	0.005262	0.012600		
RMS Error [US survey foot]		0.008360	0.005262	0.012610		

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		0.0267	-0.0072	-0.1064	0.9817	8 / 8
2004		0.0265	-0.0394	-0.0005	0.5408	8 / 8
2005		-0.0101	0.0026	0.0297	0.7322	8 / 8
Mean [US survey foot]		0.014366	-0.014648	-0.025741		
Sigma [US survey foot]		0.017309	0.017925	0.058339		
RMS Error [US survey foot]		0.022494	0.023148	0.063765		

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



Min Error [US survey foot]	Max Error [US survey foot]	Geolocation Error X [%]	Geolocation Error Y [%]	Geolocation Error Z [%]
-	-0.34	0.58	0.58	1.16
-0.34	-0.27	0.58	0.29	0.87
-0.27	-0.20	2.02	2.02	0.87
-0.20	-0.14	3.76	6.07	2.31
-0.14	-0.07	10.98	10.69	10.69
-0.07	0.00	29.77	32.95	32.37
0.00	0.07	36.71	25.14	36.71
0.07	0.14	8.09	13.58	6.07
0.14	0.20	5.49	5.20	6.36
0.20	0.27	1.16	2.60	1.16
0.27	0.34	0.58	0.29	0.87
0.34	-	0.29	0.58	0.58
Mean [US survey foot]		0.104015	-0.023482	-1.450225
Sigma [US survey foot]		0.095922	0.109516	0.108812
RMS Error [US survey foot]		0.141492	0.112005	1.454301

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]	0.104043	-0.023359	-1.451509

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]	78.90	72.83	94.80
[-2.00, 2.00]	95.09	93.64	98.84
[-3.00, 3.00]	98.27	98.55	100.00
Mean of Geolocation Accuracy [US survey foot]	0.100818	0.100818	0.210893
Sigma of Geolocation Accuracy [US survey foot]	0.000503	0.000503	0.005980

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

Geolocation Orientational Variance	RMS [degree]
Omega	0.588
Phi	0.237
Kappa	0.915

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: 0.5
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	no
LOD	Generated: no

Advanced: Image Groups	group1
Advanced: Use Processing Area	yes
Advanced: Use Annotations	yes
Time for Point Cloud Densification	23m:53s
Time for Point Cloud Classification	08m:56s
Time for 3D Textured Mesh Generation	NA

Results



Number of Processed Clusters	5
Number of Generated Tiles	4
Number of 3D Densified Points	46001839
Average Density (per US survey foot ³)	635.01

DSM, Orthomosaic and Index Details



Processing Options



DSM and Orthomosaic Resolution	1 x GSD (0.45 [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	23m:49s
Time for Orthomosaic Generation	56m:48s
Time for DTM Generation	00s
Time for Contour Lines Generation	00s
Time for Reflectance Map Generation	00s
Time for Index Map Generation	00s