

Quality Report



Generated with Pix4Dmapper 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	Otrar-2016-processedin2019
Processed	2019-12-10 20:04:27
Camera Model Name(s)	FC300X_3.6_4000x3000 (RGB), FC330_3.6_4000x3000 (RGB)
Average Ground Sampling Distance (GSD)	2.45 cm / 0.96 in
Area Covered	0.657 km ² / 65.6571 ha / 0.25 sq. mi. / 162.3261 acres
Time for Initial Processing (without report)	02h:19m:45s

Quality Check



Images	median of 57445 keypoints per image	
Dataset	1463 out of 1463 images calibrated (100%), 1 images disabled	
Camera Optimization	2.26% relative difference between initial and optimized internal camera parameters	
Matching	median of 15820.5 matches per calibrated image	
Georeferencing	yes, no 3D GCP	

Preview

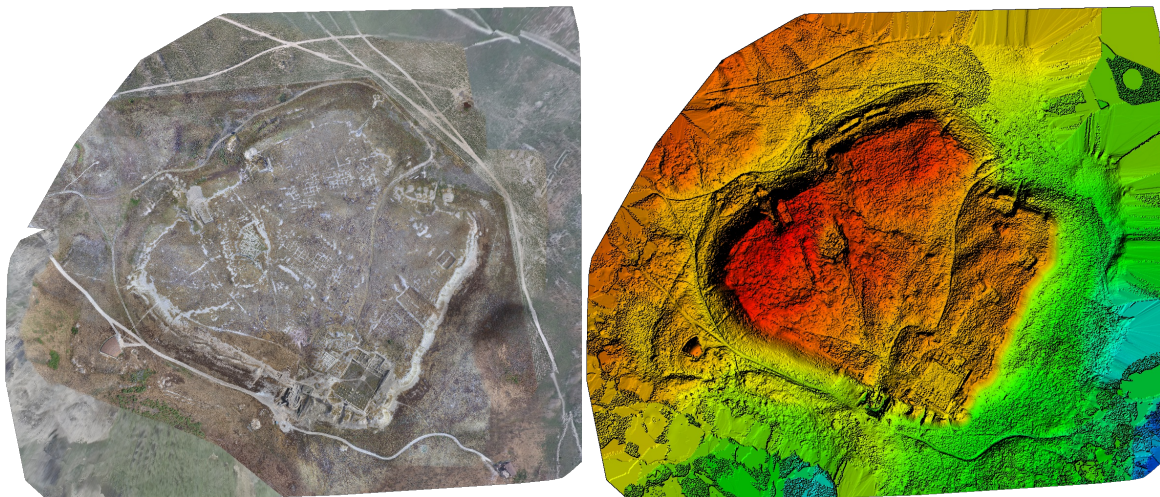


Figure 1: Orthomosaic and the corresponding sparse Digital Surface Model (DSM) before densification.

Calibration Details



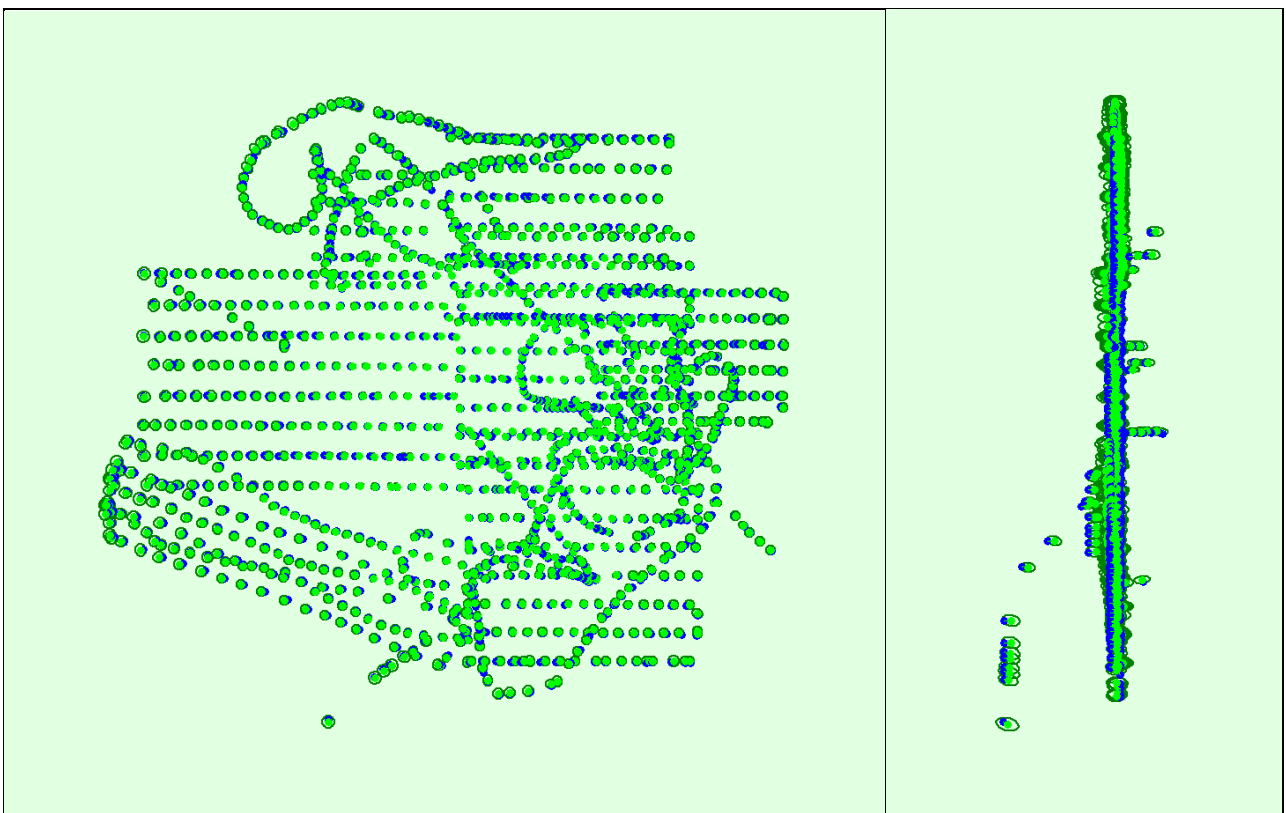
Number of Calibrated Images	1463 out of 1464
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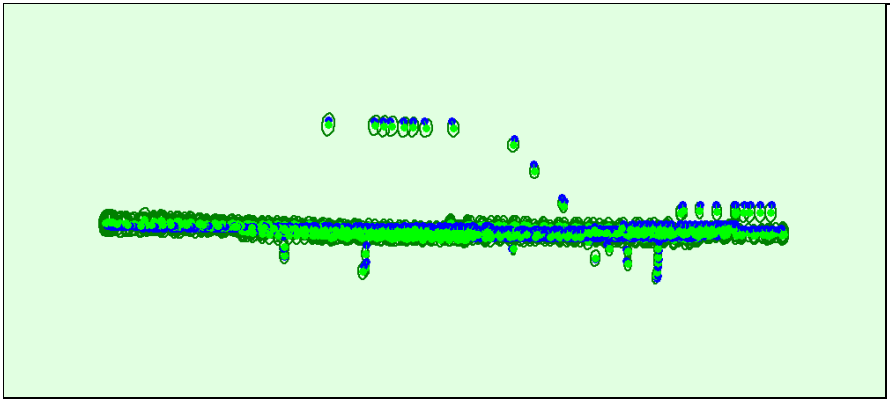
? Initial Image Positions



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). 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[m]	Y[m]	Z[m]	Omega [degree]	Phi [degree]	Kappa [degree]
Mean	0.087	0.087	0.171	0.034	0.034	0.017
Sigma	0.016	0.016	0.029	0.004	0.004	0.003

🔍 Overlap

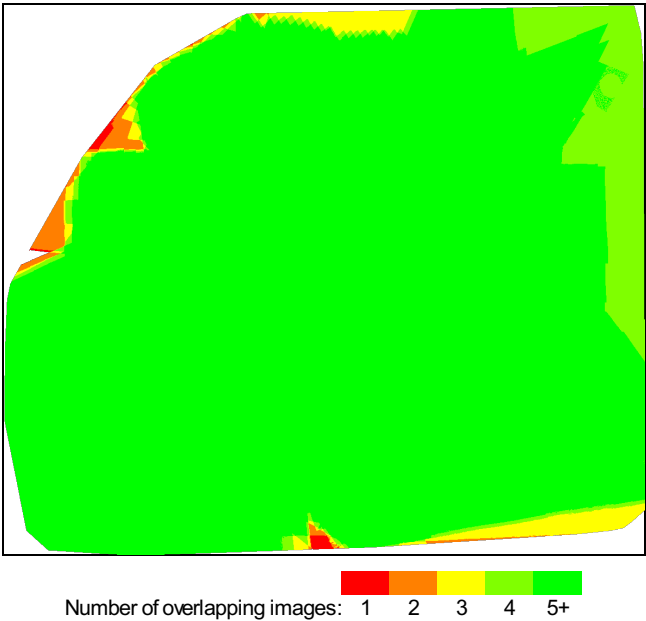


Figure 4: Number of overlapping images computed for each pixel of the orthomosaic. Red and yellow areas indicate low overlap for which poor results may be generated. Green areas indicate an overlap of over 5 images for every pixel. Good quality results will be generated as long as the number of keypoint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

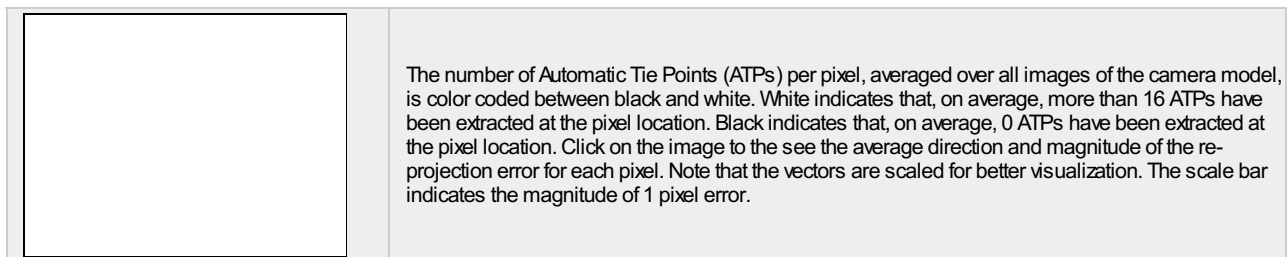
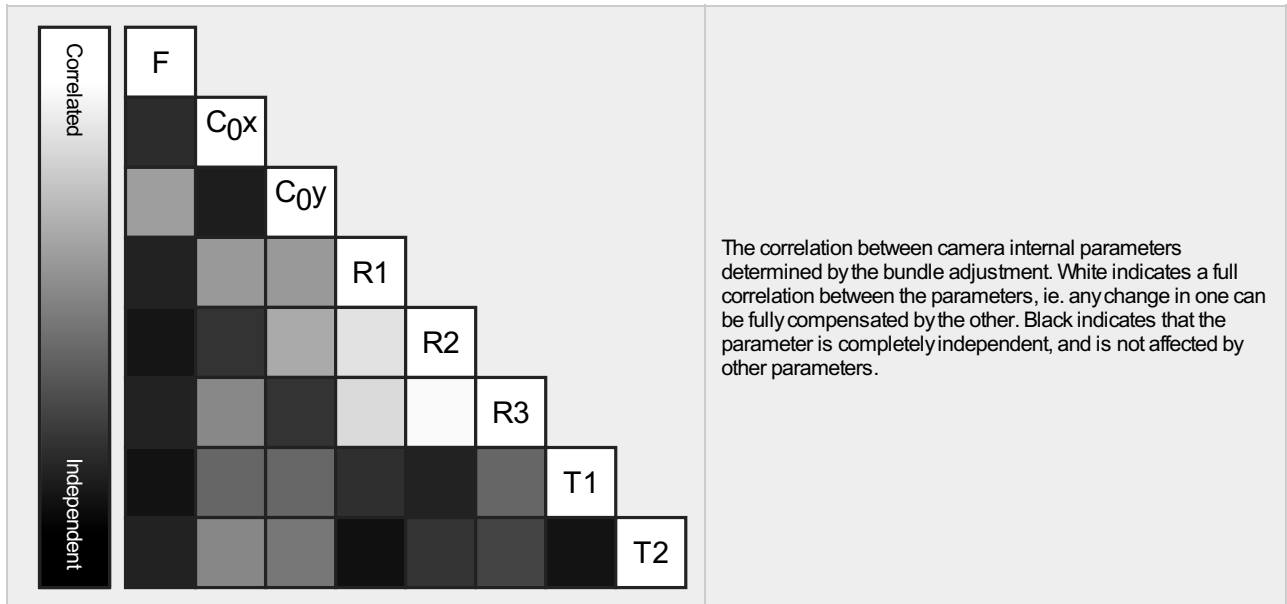
Bundle Block Adjustment Details

Number of 2D Keypoint Observations for Bundle Block Adjustment	23626033
Number of 3D Points for Bundle Block Adjustment	7589734
Mean Reprojection Error [pixels]	0.211

🔍 Internal Camera Parameters

EXIF ID: FC300X_3.6_4000x3000

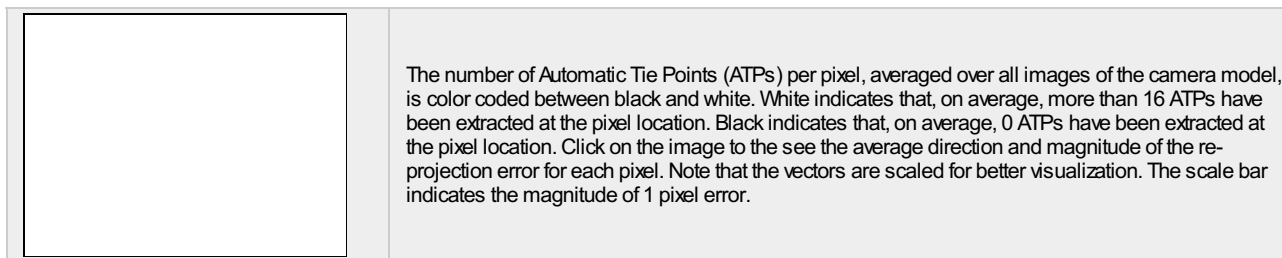
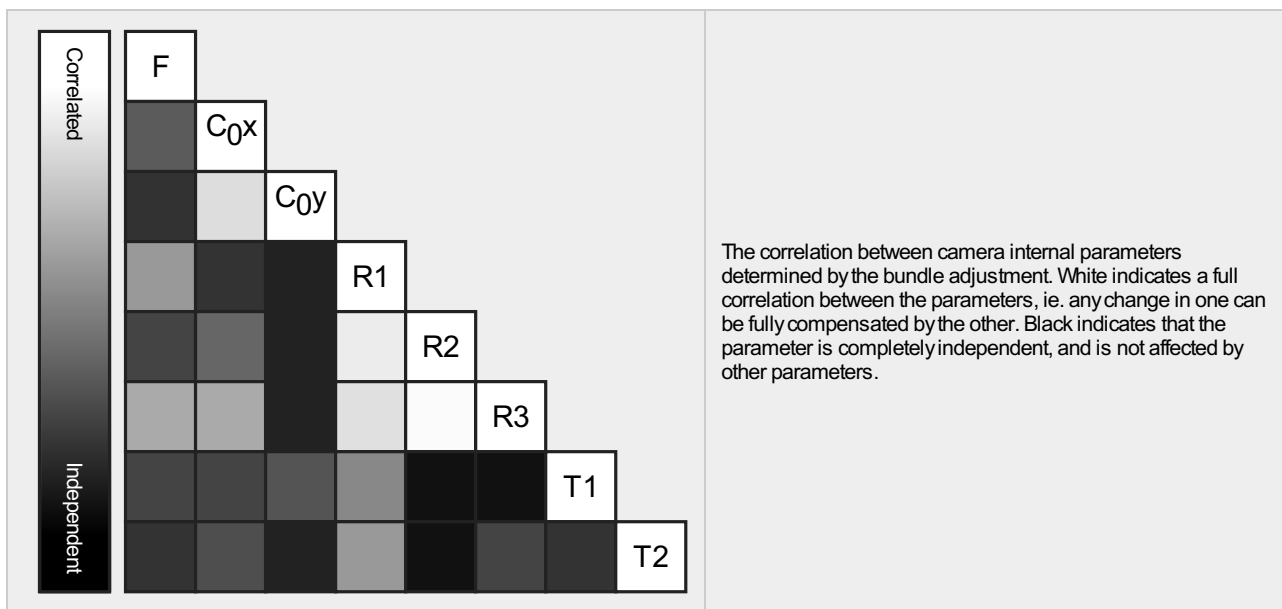
	Focal Length	Principal Point x	Principal Point y	R1	R2	R3	T1	T2
Initial Values	2285.722 [pixel] 3.610 [mm]	2000.006 [pixel] 3.159 [mm]	1500.003 [pixel] 2.369 [mm]	-0.014	0.013	-0.000	0.001	0.000
Optimized Values	2328.934 [pixel] 3.678 [mm]	2017.097 [pixel] 3.186 [mm]	1488.263 [pixel] 2.351 [mm]	-0.012	0.009	0.005	-0.000	0.000
Uncertainties (Sigma)	0.330 [pixel] 0.001 [mm]	0.077 [pixel] 0.000 [mm]	0.099 [pixel] 0.000 [mm]	0.000	0.000	0.000	0.000	0.000



Internal Camera Parameters

EXIF ID: FC330_0.0_4000x3000

	Focal Length	Principal Point x	Principal Point y	R1	R2	R3	T1	T2
Initial Values	2285.722 [pixel] 3.610 [mm]	2000.006 [pixel] 3.159 [mm]	1500.003 [pixel] 2.369 [mm]	-0.001	-0.002	0.000	-0.001	-0.001
Optimized Values	2345.884 [pixel] 3.705 [mm]	1909.908 [pixel] 3.016 [mm]	1506.418 [pixel] 2.379 [mm]	0.003	-0.011	0.006	-0.000	-0.000
Uncertainties (Sigma)	0.576 [pixel] 0.001 [mm]	0.206 [pixel] 0.000 [mm]	0.177 [pixel] 0.000 [mm]	0.000	0.000	0.000	0.000	0.000



2D Keypoints Table

	Number of 2D Keypoints per Image	Number of Matched 2D Keypoints per Image
Median	57445	15821
Mn	41212	311
Max	74018	42584
Mean	57728	16149

2D Keypoints Table for Camera FC300X_3.6_4000x3000 (RGB)

	Number of 2D Keypoints per Image	Number of Matched 2D Keypoints per Image
Median	57275	15296
Mn	45477	311
Max	74018	42584
Mean	57741	15805

2D Keypoints Table for Camera FC330_3.6_4000x3000 (RGB)

	Number of 2D Keypoints per Image	Number of Matched 2D Keypoints per Image
Median	57911	17647
Mn	41212	3719
Max	67235	35466
Mean	57663	17861

Median / 75% / Maximal Number of Matches Between Camera Models

	FC300X_3.6_4000...(RGB)	FC330_3.6_4000x3000 (RGB)
FC300X_3.6_4000x3000 (RGB)	89 / 492 / 34062	54 / 295 / 6101
FC330_3.6_4000x3000 (RGB)		574 / 1962 / 25747

3D Points from 2D Keypoint Matches

	Number of 3D Points Observed
In 2 Images	4614912
In 3 Images	1398744
In 4 Images	606656
In 5 Images	319613
In 6 Images	189146
In 7 Images	120926
In 8 Images	80812
In 9 Images	56113
In 10 Images	40984
In 11 Images	31037
In 12 Images	23619
In 13 Images	17886
In 14 Images	14124
In 15 Images	11448
In 16 Images	9589
In 17 Images	7587
In 18 Images	6477
In 19 Images	5706
In 20 Images	4785
In 21 Images	4152
In 22 Images	3505
In 23 Images	2871
In 24 Images	2421
In 25 Images	2184
In 26 Images	2013
In 27 Images	1881
In 28 Images	1522
In 29 Images	1300
In 30 Images	1143
In 31 Images	961
In 32 Images	880
In 33 Images	742
In 34 Images	650
In 35 Images	513
In 36 Images	460
In 37 Images	317
In 38 Images	317
In 39 Images	274
In 40 Images	209
In 41 Images	184
In 42 Images	133
In 43 Images	126
In 44 Images	97
In 45 Images	77
In 46 Images	69
In 47 Images	56
In 48 Images	41
In 49 Images	58
In 50 Images	46
In 51 Images	55
In 52 Images	32
In 53 Images	38
In 54 Images	35
In 55 Images	31
In 56 Images	34
In 57 Images	21
In 58 Images	13
In 59 Images	16

In 60 Images	17
In 61 Images	16
In 62 Images	8
In 63 Images	10
In 64 Images	5
In 65 Images	4
In 66 Images	9
In 67 Images	5
In 68 Images	8
In 69 Images	3
In 70 Images	5
In 71 Images	1
In 72 Images	1
In 73 Images	1

? 2D Keypoint Matches

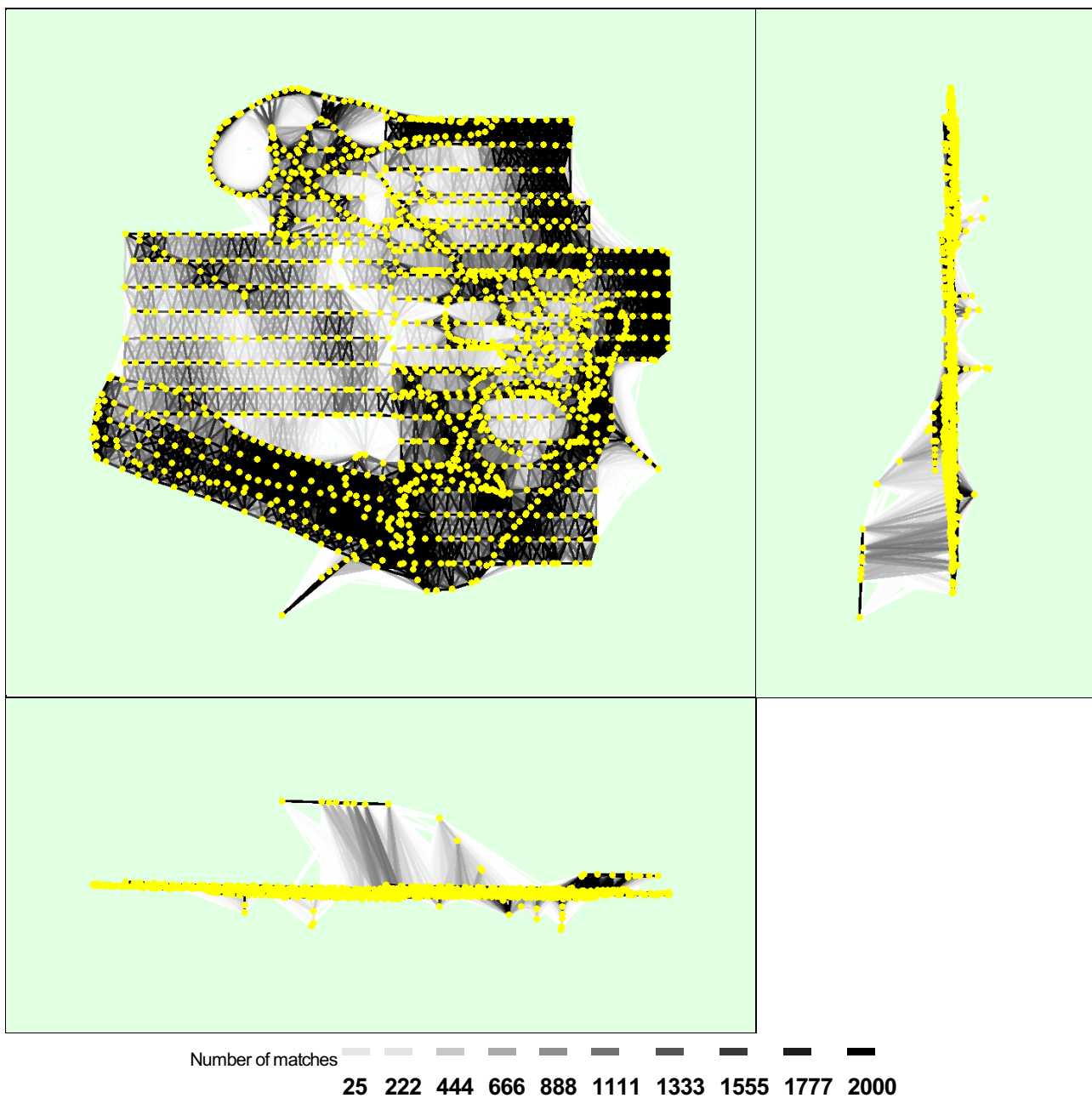


Figure 5: Computed image positions with links between matched images. The darkness of the links indicates the number of matched 2D keypoints between the images. Bright links indicate weak links and require manual tie points or more images.

Geolocation Details



? Absolute Geolocation Variance



Min Error [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	1.30
-9.00	-6.00	0.48	0.00	6.43
-6.00	-3.00	11.76	1.85	21.12
-3.00	0.00	30.42	48.67	26.18
0.00	3.00	48.12	48.53	15.93
3.00	6.00	8.68	0.89	16.61
6.00	9.00	0.48	0.07	11.48
9.00	12.00	0.07	0.00	0.96
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]		2.409403	1.254444	4.494024
RMS Error [m]		2.409403	1.254444	4.494024

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]	95.01	99.59	99.32
[-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	2.294
Phi	1.770
Kappa	3.173

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: AMD Ryzen Threadripper 1920X 12-Core Processor RAM: 128GB GPU: NVIDIA GeForce GTX 1070 (Driver: 26.21.14.3200)
Operating System	Windows 10 Enterprise, 64-bit

Coordinate Systems



Image Coordinate System	WGS 84 (EGM96 Geoid)
Output Coordinate System	WGS 84 / UTM zone 42N (EGM96 Geoid)

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: 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

Point Cloud Densification details



Processing Options



Image Scale	multiscale, 1 (Original image size, Slow)
Point Density	Optimal
Minimum Number of Matches	3
3D Textured Mesh Generation	yes
3D Textured Mesh Settings:	Resolution: High Resolution Color Balancing: no
LOD	Generated: no
Advanced: 3D Textured Mesh Settings	Sample Density Divider: 1
Advanced: Image Groups	group1
Advanced: Use Processing Area	no
Advanced: Use Annotations	no
Time for Point Cloud Densification	15h:32m:09s
Time for Point Cloud Classification	23m:22s
Time for 3D Textured Mesh Generation	03h:02m:28s

Results



Number of Processed Clusters	2
Number of Generated Tiles	12
Number of 3D Densified Points	402828809
Average Density (per m ³)	464.54

DSM, Orthomosaic and Index Details



Processing Options



DSM and Orthomosaic Resolution	1 x GSD (2.45 [cm/pixel])
DSM Filters	Noise Filtering: yes Surface Smoothing: no
Raster DSM	Generated: yes Method: Triangulation Merge Tiles: yes
Orthomosaic	Generated: yes Merge Tiles: yes GeoTIFF Without Transparency: no Google Maps Tiles and KML: yes
Raster DTM	Generated: yes Merge Tiles: yes

DTMResolution	5 x GSD (2.45 [cm/pixel])
Time for DSMGeneration	07h:01m:54s
Time for Orthomosaic Generation	05h:36m:04s
Time for DTMGeneration	01h:44m:27s
Time for Contour Lines Generation	00s
Time for Reflectance Map Generation	00s
Time for IndexMap Generation	00s