Quality Report

Generated with Pix4Dmapper 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	T1_PH4_RTK_All_Img_PL_Standard
Processed	2020-04-02 00:17:25
Camera Model Name(s)	FC6310R_8.8_5472x3648 (RGB)
Average Ground Sampling Distance (GSD)	2.77 cm / 1.09 in
Area Covered	0.445 km^2 / 44.4983 ha / 0.17 sq. mi. / 110.0146 acres
Time for Initial Processing (without report)	01h:51m:30s

Quality Check

Images	median of 68041 keypoints per image	✓
Dataset	791 out of 791 images calibrated (100%), 8 images disabled, 2 blocks	⚠
Camera Optimization	148.29% relative difference between initial and optimized internal camera parameters	⚠
Matching	median of 7525.45 matches per calibrated image	✓
Georeferencing	yes, no 3D GCP	⚠

Preview

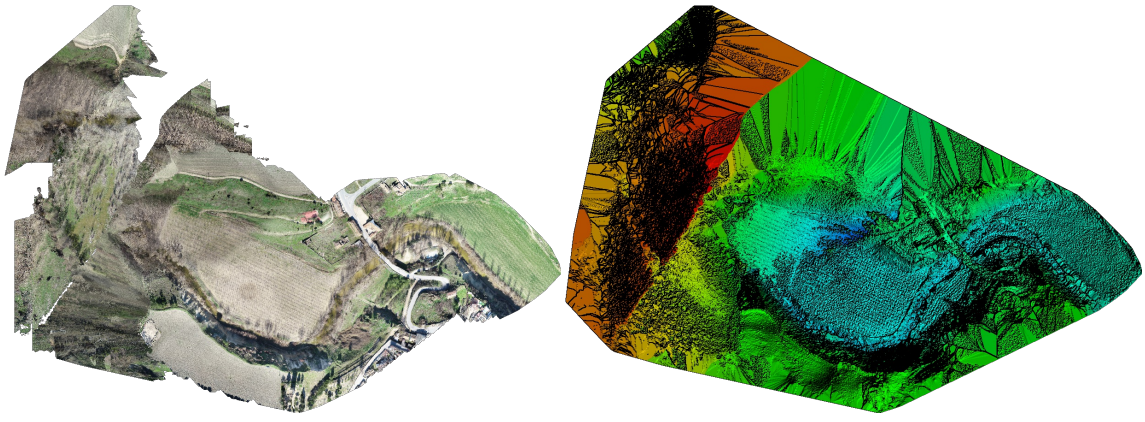


Figure 1: Orthomosaic and the corresponding sparse Digital Surface Model (DSM) before densification.

Calibration Details

Number of Calibrated Images	791 out of 799
Number of Geolocated Images	799 out of 799

Initial Image Positions

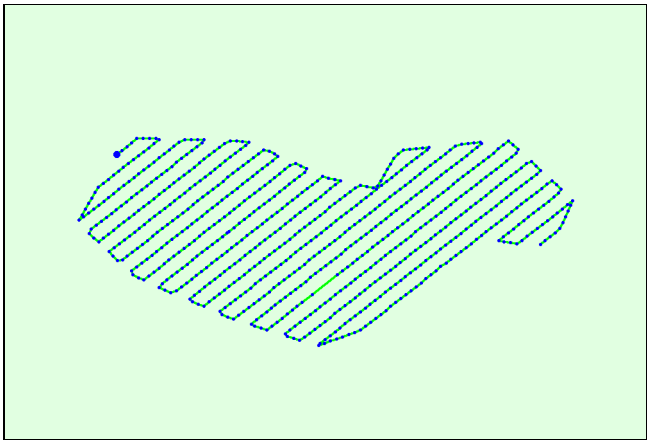
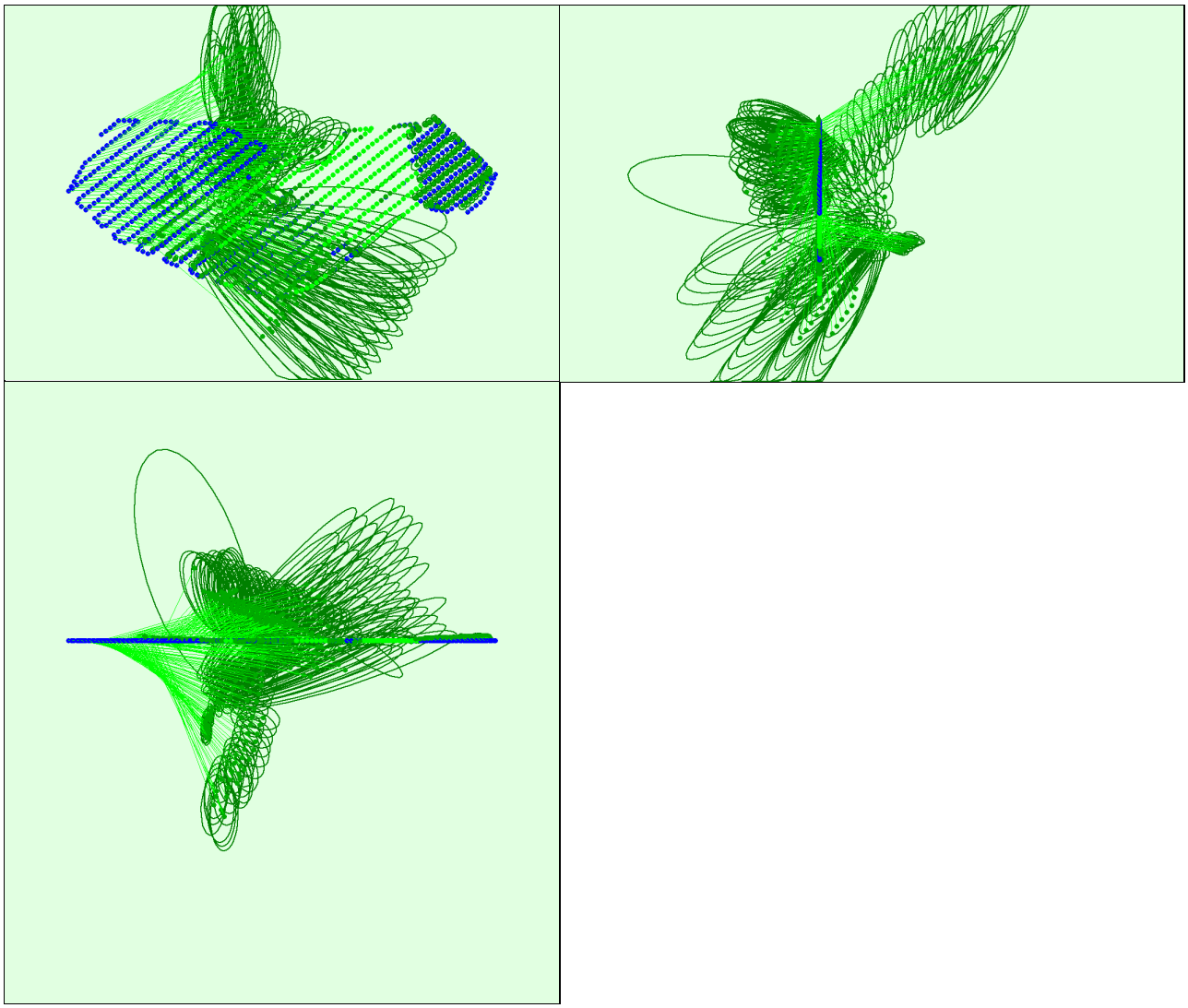


Figure 2: Top view of the initial image position. The green line follows the position of the images in time starting from the large blue dot.

Computed Image/GCPs/Manual Tie Points Positions



Uncertainty ellipses 10x 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	1.939	1.806	2.025	0.365	0.209	0.383
Sigma	4.432	3.245	3.641	0.473	0.216	0.580

Overlap

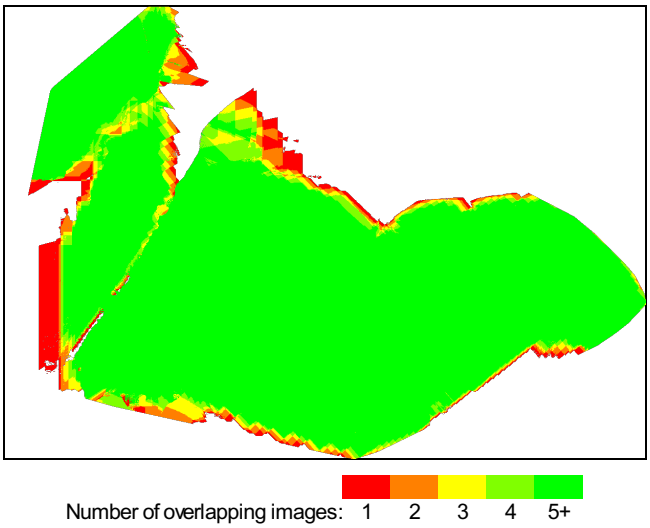


Figure 4: Number of overlapping images computed for each pixel of the orthomosaic.
Red and yellow areas indicate low overlap for which poor results may be generated. Green areas indicate an overlap of over 5 images for every pixel. Good quality results will be generated as long as the number of keypoint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

Bundle Block Adjustment Details

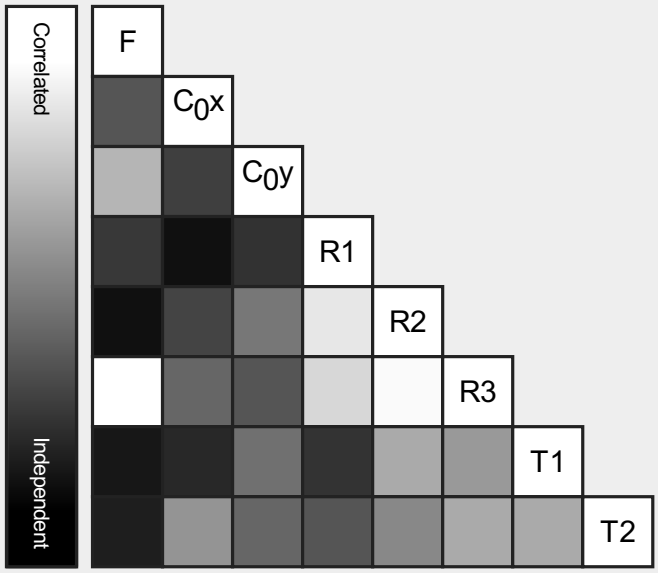
Number of 2D Keypoint Observations for Bundle Block Adjustment	6508099
Number of 3D Points for Bundle Block Adjustment	2210529
Mean Reprojection Error [pixels]	0.183

Internal Camera Parameters

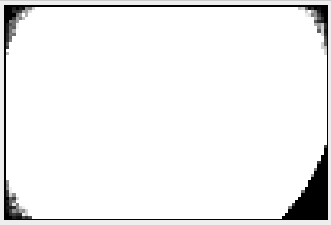
FC6310R_8.8_5472x3648 (RGB). Sensor Dimensions: 12.833 [mm] x 8.556 [mm]

EXIF ID: FC6310R_8.8_5472x3648

	Focal Length	Principal Point x	Principal Point y	R1	R2	R3	T1	T2
Initial Values	3658.300 [pixel] 8.580 [mm]	2722.500 [pixel] 6.385 [mm]	1835.100 [pixel] 4.304 [mm]	-0.269	0.112	-0.033	0.000	-0.001
Optimized Values	9083.371 [pixel] 21.303 [mm]	2195.573 [pixel] 5.149 [mm]	1262.331 [pixel] 2.961 [mm]	-0.034	0.085	-0.221	-0.006	-0.004
Uncertainties (Sigma)	44.099 [pixel] 0.103 [mm]	10.200 [pixel] 0.024 [mm]	13.765 [pixel] 0.032 [mm]	0.001	0.017	0.078	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

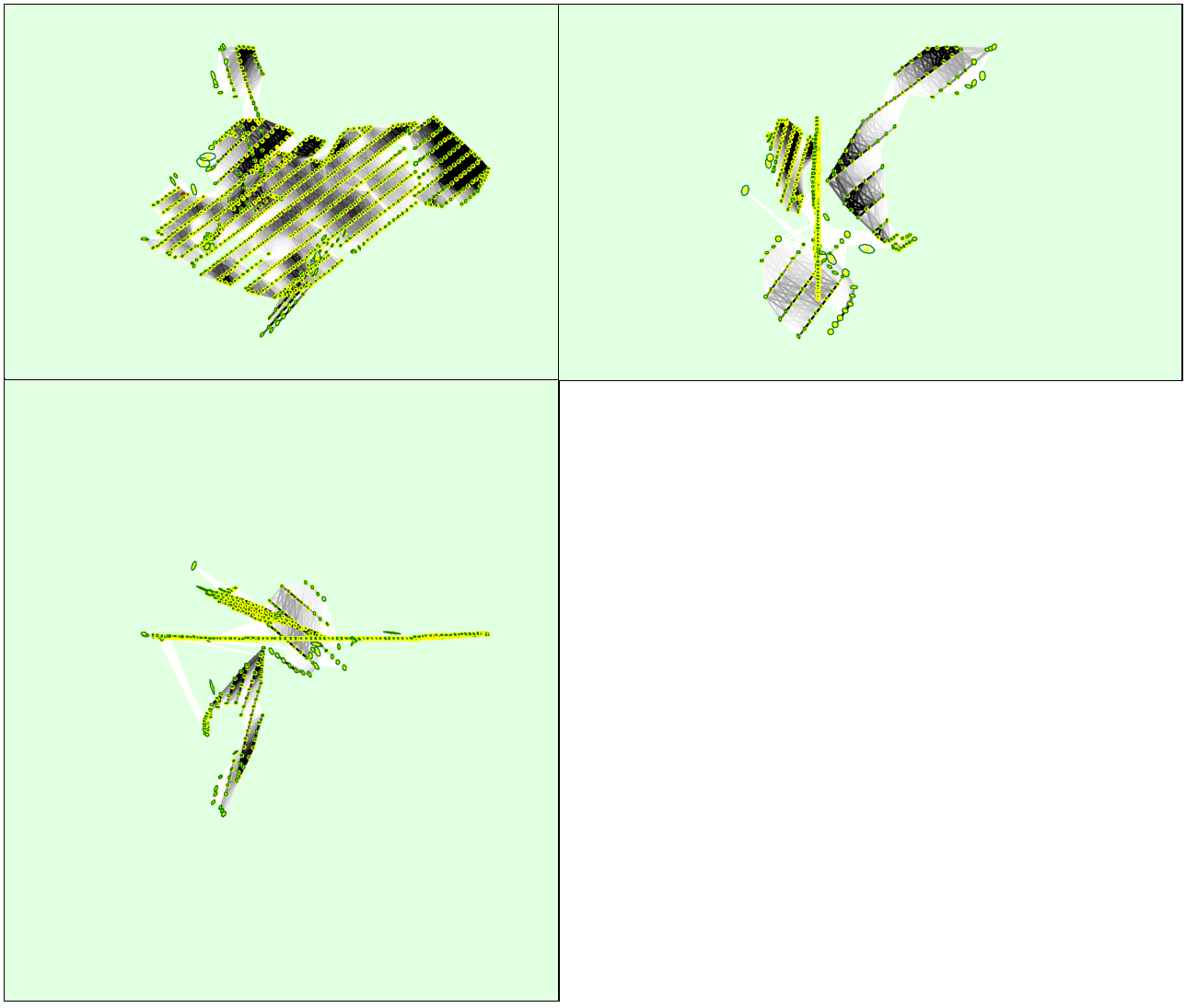
	Number of 2D Keypoints per Image	Number of Matched 2D Keypoints per Image
Median	68041	7525
Min	38029	31
Max	79904	31131
Mean	67219	8228

3D Points from 2D Keypoint Matches

	Number of 3D Points Observed
In 2 Images	1422443
In 3 Images	393582
In 4 Images	160075
In 5 Images	80562
In 6 Images	46250
In 7 Images	29003
In 8 Images	18763
In 9 Images	12505
In 10 Images	9395
In 11 Images	7031
In 12 Images	5608
In 13 Images	4608
In 14 Images	3542
In 15 Images	2813
In 16 Images	2211
In 17 Images	1721
In 18 Images	1505
In 19 Images	1217
In 20 Images	1078
In 21 Images	964
In 22 Images	882
In 23 Images	742

In 24 Images	621
In 25 Images	569
In 26 Images	499
In 27 Images	409
In 28 Images	405
In 29 Images	328
In 30 Images	296
In 31 Images	260
In 32 Images	178
In 33 Images	156
In 34 Images	109
In 35 Images	65
In 36 Images	56
In 37 Images	31
In 38 Images	11
In 39 Images	11
In 40 Images	14
In 41 Images	7
In 42 Images	2
In 44 Images	1
In 45 Images	1

2D Keypoint Matches



Uncertainty ellipses 10x magnified

Number of matches

25 222 444 666 888 1111 1333 1555 1777 2000

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]
Mean	0.193	0.187	0.173	0.108	0.068	0.075
Sigma	0.140	0.141	0.127	0.094	0.039	0.099

Geolocation Details

Absolute Geolocation Variance

Min Error [m]	Max Error [m]	Geolocation Error X [%]	Geolocation Error Y [%]	Geolocation Error Z [%]
-	-0.08	0.00	0.00	22.90
-0.08	-0.06	0.00	0.00	7.01
-0.06	-0.05	0.00	0.00	6.07
-0.05	-0.03	0.47	0.00	2.80
-0.03	-0.02	0.00	0.47	6.54
-0.02	0.00	50.93	54.21	5.14
0.00	0.02	46.73	42.06	5.14
0.02	0.03	1.40	2.80	4.67
0.03	0.05	0.47	0.47	5.61
0.05	0.06	0.00	0.00	5.61
0.06	0.08	0.00	0.00	5.14
0.08	-	0.00	0.00	23.36
Mean [m]		0.000392	0.000363	0.001045
Sigma [m]		0.007363	0.006985	0.112588
RMS Error [m]		0.007374	0.006995	0.112593

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]	93.46	92.99	28.50
[-2.00, 2.00]	98.60	97.66	58.41
[-3.00, 3.00]	99.53	99.53	73.83
Mean of Geolocation Accuracy [m]	0.011834	0.011834	0.044567
Sigma of Geolocation Accuracy [m]	0.000172	0.000172	0.004885

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

Geolocation Orientational Variance	RMS [degree]
Omega	4.456
Phi	5.930
Kappa	5.562

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 E5-1620 v3 @ 3.50GHz RAM: 32GB GPU: NVIDIA Quadro M2000 (Driver: 23.21.13.8816)
Operating System	Windows 10 Pro, 64-bit

Coordinate Systems

Image Coordinate System	WGS 84
Output Coordinate System	ETRS89 / UTM zone 30N (+52.786m)

Processing Options

Detected Template	3D Maps
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