Quality Report

Generated with Pix4Dmapper Pro version 4.2.27

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	Bebop-aero
Processed	2018-07-11 16:30:05
Camera Model Name(s)	Bebop2_1.8_4096x3320 (RGB)
Average Ground Sampling Distance (GSD)	1.72 cm / 0.68 in
Time for Initial Processing (without report)	05m:16s

Quality Check

Images	median of 34227 keypoints per image	✓
Dataset	52 out of 52 images calibrated (100%), all images enabled	✓
Camera Optimization	0.02% relative difference between initial and optimized internal camera parameters	✓
Matching	median of 10954.1 matches per calibrated image	✓
Georeferencing	yes, 5 GCPs (5 3D), mean RMS error = 0.01 m	✓

Calibration Details

Number of Calibrated Images	52 out of 52
Number of Geolocated Images	52 out of 52

Initial Image Positions

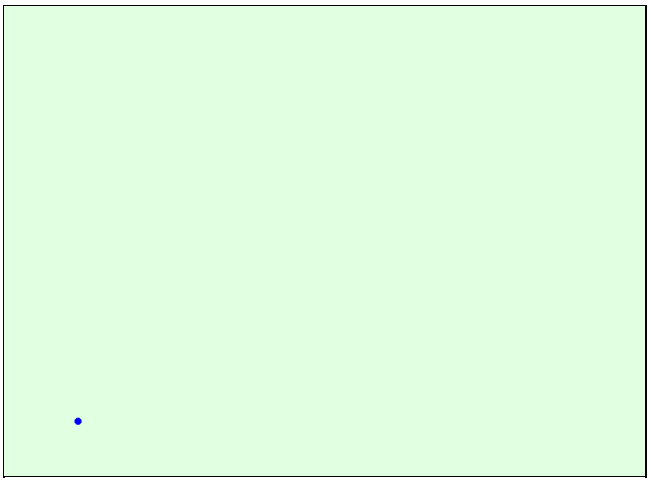
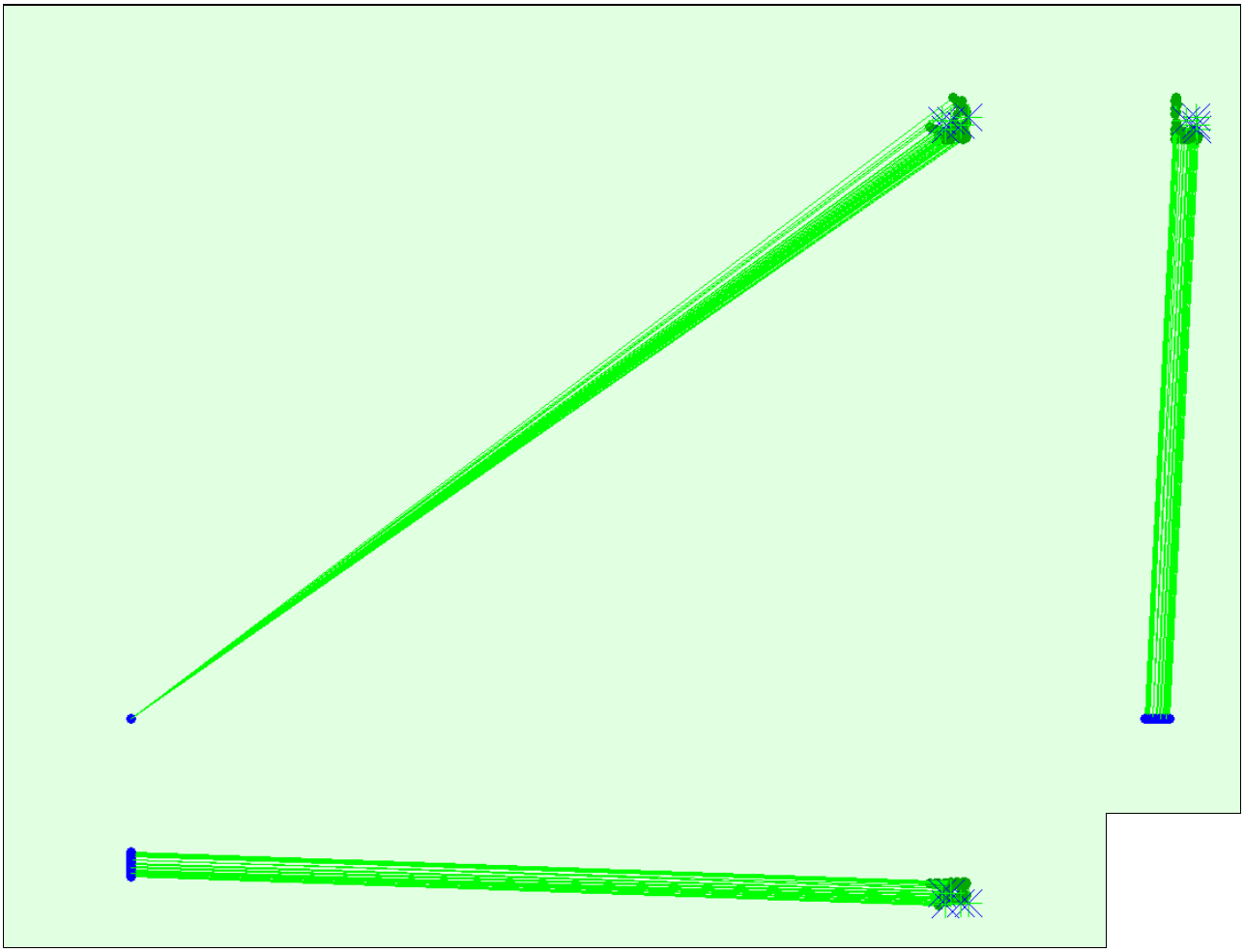


Figure 2: Top view of the initial image position. The green line follows the position of the images in time starting from the large blue dot.

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). 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	0.002	0.003	0.003	0.015	0.020	0.017
Sigma	0.000	0.001	0.001	0.011	0.007	0.011

Bundle Block Adjustment Details

Number of 2D Keypoint Observations for Bundle Block Adjustment	541106
Number of 3D Points for Bundle Block Adjustment	203662
Mean Reprojection Error [pixels]	0.305

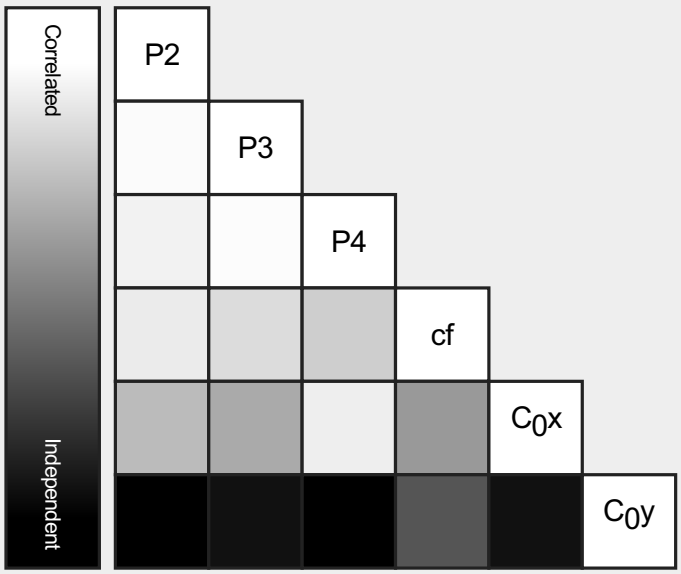
Internal Camera Parameters

Bebop2_1.8_4096x3320 (RGB). Sensor Dimensions: 5.734 [mm] x 4.648 [mm]

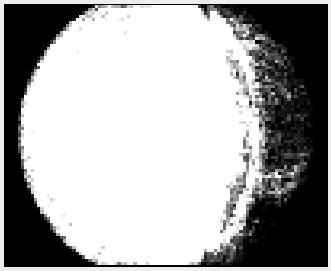
EXIF ID: Bebop2_1.8_4096x3320

	Poly[0]	Poly[1]	Poly[2]	Poly[3]	Poly[4]	c	d	e	f	Principal Point x	Principal Point y
Initial Values	0.000000	1.000000	-0.056111	0.035056	-0.095315	2203.93	0.00	0.00	2203.93	2048.00	1660.00
Optimized Values	0.000000	1.000000	-0.065801	0.053434	-0.105661	2199.15	0.00	0.00	2199.15	2054.77	1660.05

Uncertainties (Sigma)			0.000514	0.000916	0.000512	0.22	0.00	0.00	0.22	0.07	0.05



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	34227	10954
Min	30509	1638
Max	60930	18130
Mean	35692	10406

3D Points from 2D Keypoint Matches

	Number of 3D Points Observed
In 2 Images	142914
In 3 Images	32517
In 4 Images	12423
In 5 Images	6327
In 6 Images	3214
In 7 Images	2005
In 8 Images	1283
In 9 Images	892
In 10 Images	674
In 11 Images	455
In 12 Images	351
In 13 Images	226
In 14 Images	149
In 15 Images	89
In 16 Images	58
In 17 Images	38
In 18 Images	14
In 19 Images	22
In 20 Images	6

In 21 Images	2
In 22 Images	2
In 23 Images	1

2D Keypoint Matches

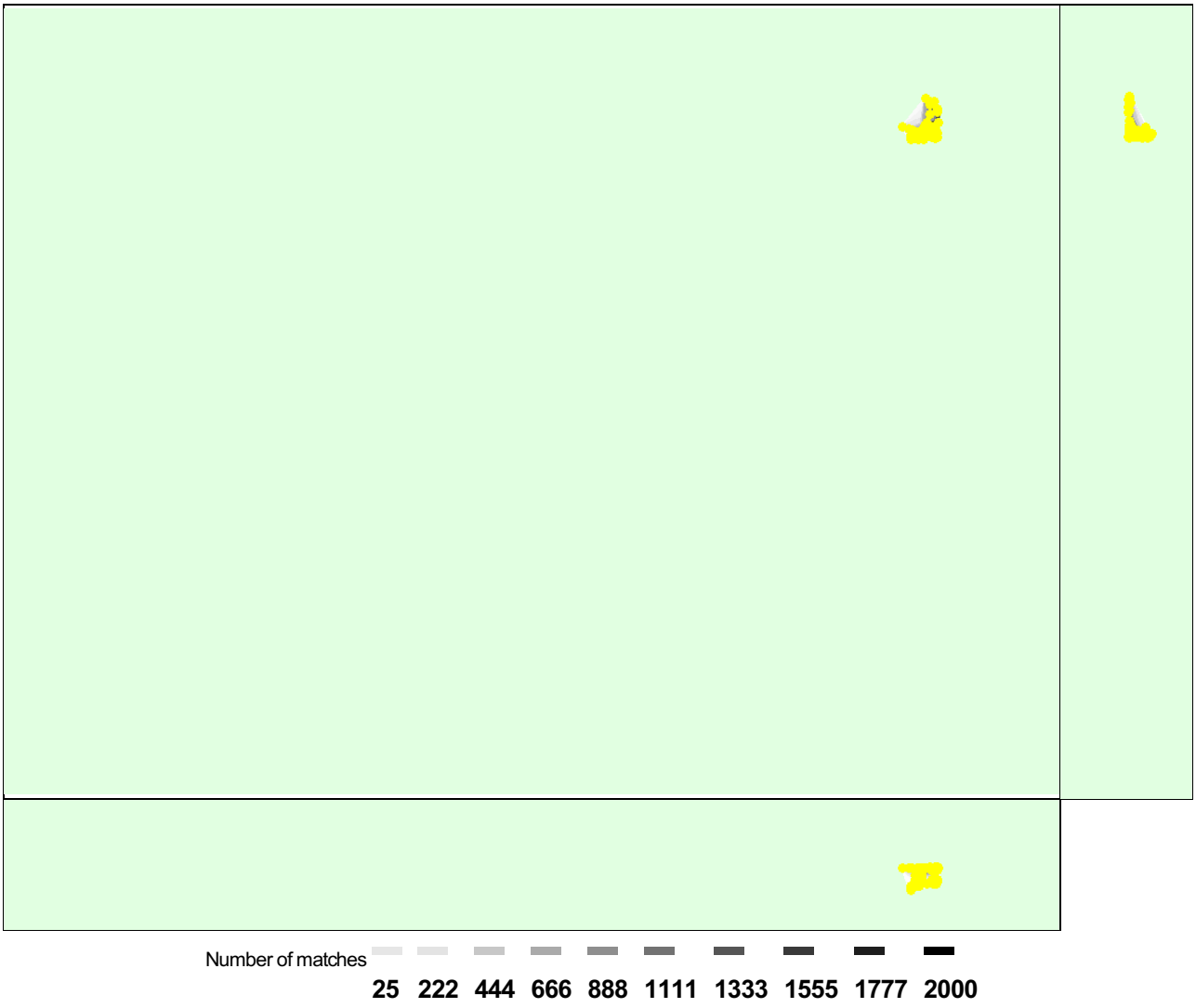


Figure 5: Computed image positions with links between matched images. The darkness of the links indicates the number of matched 2D keypoints between the images. Bright links indicate weak links and require manual tie points or more images.

Geolocation Details

Ground Control Points

GCP Name	Accuracy XY/Z [m]	Error X [m]	Error Y [m]	Error Z [m]	Projection Error [pixel]	Verified/Marked
d1 (3D)	0.020/ 0.020	-0.007	-0.007	0.007	2.413	17 / 17
d4 (3D)	0.020/ 0.020	0.018	0.016	-0.007	1.000	7 / 7
129 (3D)	0.020/ 0.020	0.013	-0.002	-0.013	1.822	17 / 17
101 (3D)	0.020/ 0.020	-0.011	0.017	-0.005	2.640	21 / 21
124 (3D)	0.020/ 0.020	-0.005	-0.007	0.006	2.007	13 / 13
Mean [m]		0.001467	0.003673	-0.002520		
Sigma [m]		0.011661	0.010926	0.007491		
RMS Error [m]		0.011753	0.011526	0.007903		

0 out of 1 check points have been labeled as inaccurate.

Check Point Name	Accuracy XY/Z [m]	Error X [m]	Error Y [m]	Error Z [m]	Projection Error [pixel]	Verified/Marked

8001		0.1187	0.0868	-0.0490	0.3656	5 / 5

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 [m]	Max Error [m]	Geolocation Error X [%]	Geolocation Error Y [%]	Geolocation Error Z [%]
-	-15.00	100.00	100.00	0.00
-15.00	-12.00	0.00	0.00	0.00
-12.00	-9.00	0.00	0.00	0.00
-9.00	-6.00	0.00	0.00	0.00
-6.00	-3.00	0.00	0.00	0.00
-3.00	0.00	0.00	0.00	0.00
0.00	3.00	0.00	0.00	0.00
3.00	6.00	0.00	0.00	0.00
6.00	9.00	0.00	0.00	0.00
9.00	12.00	0.00	0.00	0.00
12.00	15.00	0.00	0.00	0.00
15.00	-	0.00	0.00	100.00
Mean [m]		-585.747706	-421.243846	20.107067
Sigma [m]		6.878011	8.301367	0.739546
RMS Error [m]		585.788086	421.325634	20.120663

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 [m]	-0.000000	-0.000000	0.000000

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]	0.00	0.00	0.00
[-2.00, 2.00]	0.00	0.00	46.15
[-3.00, 3.00]	0.00	0.00	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.

Initial Processing Details

System Information

Hardware	CPU: Intel(R) Core(TM) i7-4770 CPU @ 3.40GHz RAM: 16GB GPU: Intel(R) HD Graphics 4600 (Driver: 20.19.15.4835)
Operating System	Windows 10 Enterprise, 64-bit

Coordinate Systems

Image Coordinate System	Arbitrary (m)
Ground Control Point (GCP) Coordinate System	Arbitrary (m)
Output Coordinate System	Arbitrary (m)

Processing Options

Detected Template	3D Models
Keypoints Image Scale	Full, Image Scale: 1
Advanced: Matching Image Pairs	Free Flight or Terrestrial
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, yes
Advanced: Automatic Sky Masking:	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	03m:59s
Time for Point Cloud Classification	NA
Time for 3D Textured Mesh Generation	01m:55s

Results

Number of Generated Tiles	1
Number of 3D Densified Points	1367536
Average Density (per m^3)	523.5