Quality Report

Generated with PIX4Dmapper version 4.7.5

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	share_5cam_v2
Processed	2022-12-14 00:01:18
Camera Model Name(s)	SHARE102SPRO265_DOWN_27.0_6000x4000 (RGB), SHARE102SPRO265_BACK_38.0_6000x4000 (RGB), SHARE102SPRO265_FRONT_38.0_6000x4000 (RGB), SHARE102SPRO265_LEFT_38.0_6000x4000 (RGB), SHARE102SPRO265_RIGHT_38.0_6000x4000 (RGB)
Rig name(s)	«SHARE102SPRO265_OBLIQUE_RIG»
Average Ground Sampling Distance (GSD)	1.95 cm / 0.77 in
Area Covered	0.296 km^2 / 29.5615 ha / 0.11 sq. mi. / 73.0859 acres
Time for Initial Processing (without report)	23m:12s

Quality Check

Images	median of 24921 keypoints per image	✓
Dataset	1420 out of 1490 images calibrated (95%), all images enabled	✓
Camera Optimization	0.57% relative difference between initial and optimized internal camera parameters	✓
Matching	median of 115.682 matches per calibrated image	⚠
Georeferencing	yes, 7 GCPs (7 3D), mean RMS error = 0.128 m	✗

Preview

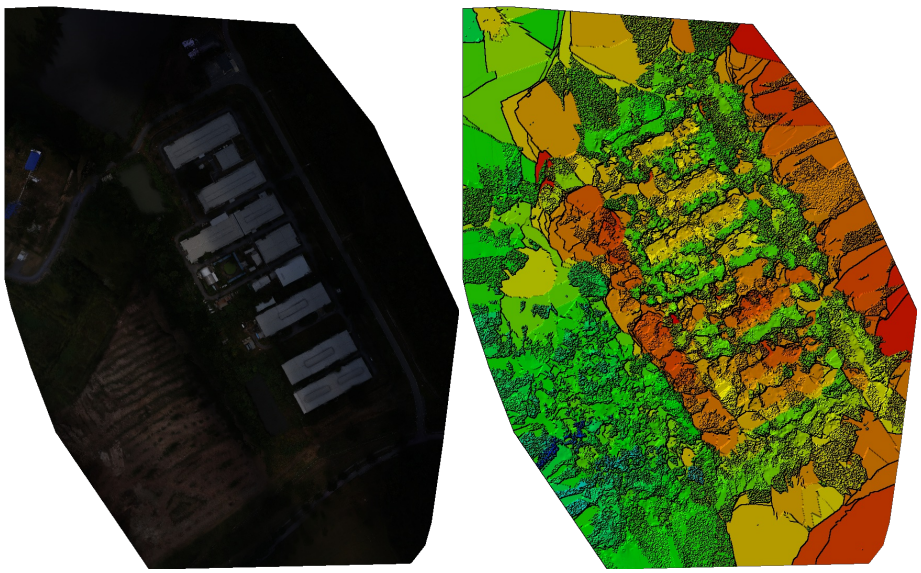


Figure 1: Orthomosaic and the corresponding sparse Digital Surface Model (DSM) before densification.

Calibration Details

Number of Calibrated Images	1420 out of 1490
Number of Geolocated Images	1490 out of 1490

Initial Image Positions

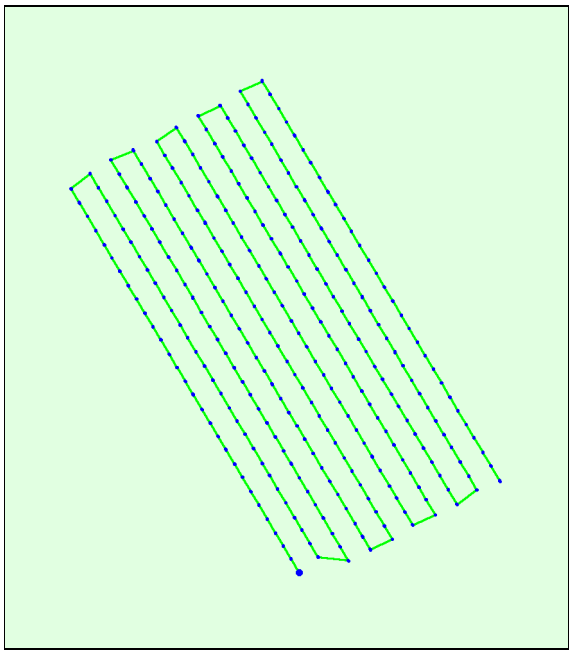
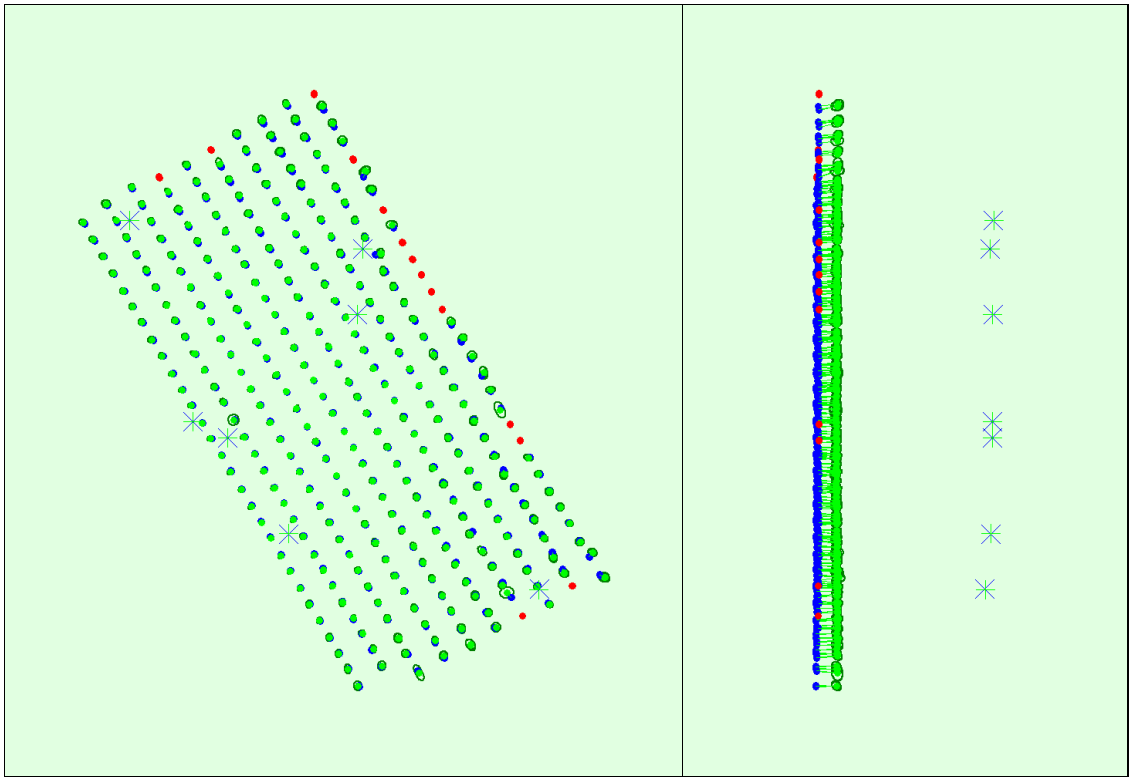
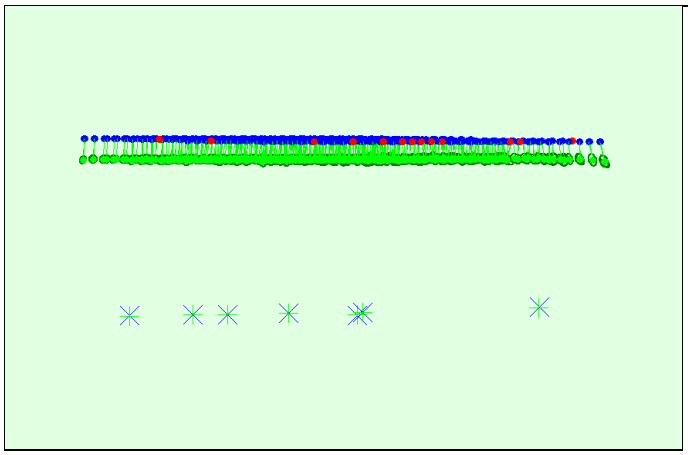


Figure 2: Top view of the initial image position. The green line follows the position of the images in time starting from the large blue dot.

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 [m]	Y [m]	Z [m]	Omega [degree]	Phi [degree]	Kappa [degree]
Mean	0.025	0.027	0.035	0.014	0.011	0.010
Sigma	0.005	0.006	0.004	0.003	0.002	0.004

Overlap

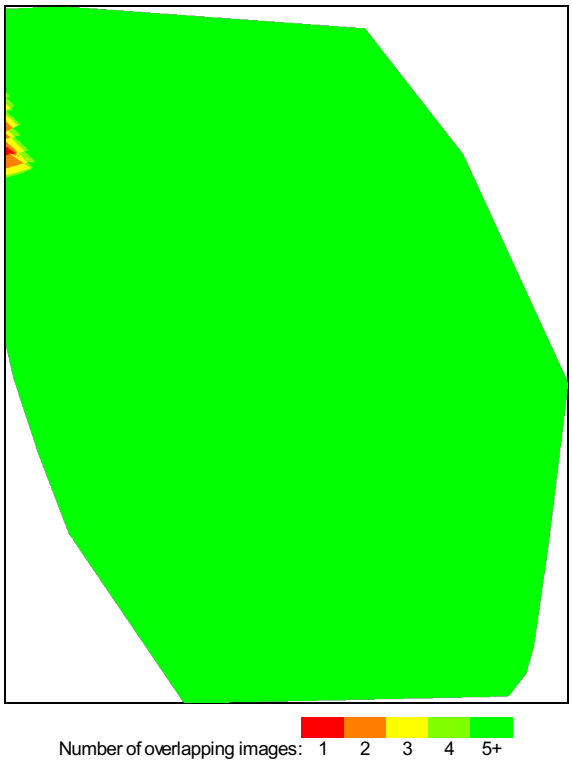


**Figure 4: Number of overlapping images computed for each pixel of the orthomosaic.
Red and yellow areas indicate low overlap for which poor results may be generated. Green areas indicate an overlap of over 5 images for every pixel. Good quality results will be generated as long as the number of keypoint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

Bundle Block Adjustment Details

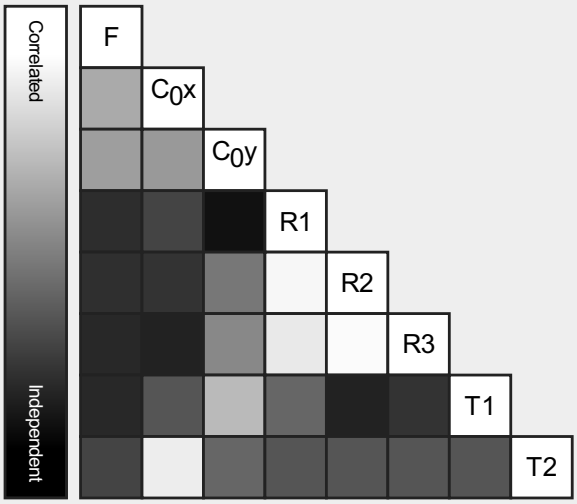
Number of 2D Keypoint Observations for Bundle Block Adjustment	245502
Number of 3D Points for Bundle Block Adjustment	107097
Mean Reprojection Error [pixels]	0.205

Internal Camera Parameters

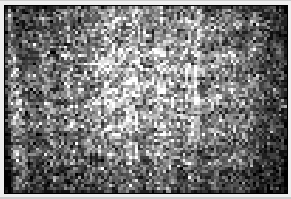
SHARE102SPRO265_DOWN_27.0_6000x4000 (RGB). Sensor Dimensions: 25.400 [mm] x 16.933 [mm]

EXIF ID: SHARE102SPRO265DOWN_35.6_6000x4000

	Focal Length	Principal Point x	Principal Point y	R1	R2	R3	T1	T2
Initial Values	6377.960 [pixel] 27.000 [mm]	3000.000 [pixel] 12.700 [mm]	2000.000 [pixel] 8.467 [mm]	0.000	0.000	0.000	0.000	0.000
Optimized Values	6379.049 [pixel] 27.005 [mm]	3001.227 [pixel] 12.705 [mm]	2003.128 [pixel] 8.480 [mm]	-0.044	0.103	-0.005	0.000	-0.000
Uncertainties (Sigma)	1.251 [pixel] 0.005 [mm]	0.791 [pixel] 0.003 [mm]	0.758 [pixel] 0.003 [mm]	0.001	0.007	0.017	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.



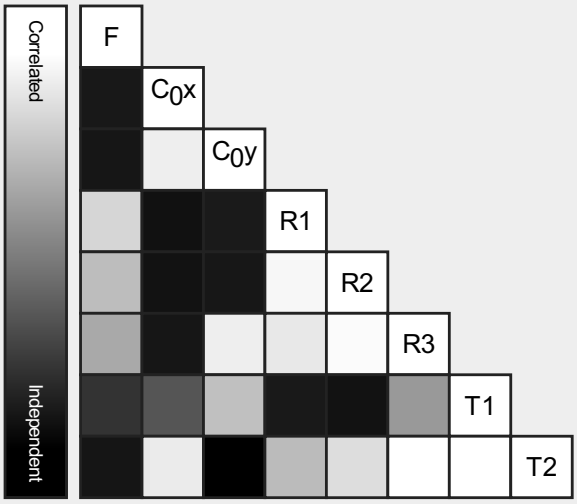
The number of Automatic Tie Points (ATPs) per pixel, averaged over all images of the camera model, is color coded between black and white. White indicates that, on average, more than 16 ATPs have been extracted at the pixel location. Black indicates that, on average, 0 ATPs have been extracted at the 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.

Internal Camera Parameters

SHARE102SPRO265_BACK_38.0_6000x4000 (RGB). Sensor Dimensions: 25.400 [mm] x 16.933 [mm]

EXIF ID: SHARE102SPRO265BACK_35.6_6000x4000

	Focal Length	Principal Point x	Principal Point y	R1	R2	R3	T1	T2
Initial Values	8976.390 [pixel] 38.000 [mm]	3000.000 [pixel] 12.700 [mm]	2000.000 [pixel] 8.467 [mm]	0.000	0.000	0.000	0.000	0.000
Optimized Values	9024.453 [pixel] 38.203 [mm]	2934.424 [pixel] 12.422 [mm]	2021.053 [pixel] 8.556 [mm]	-0.212	1.804	-1.399	0.001	-0.005
Uncertainties (Sigma)	2.086 [pixel] 0.009 [mm]	5.429 [pixel] 0.023 [mm]	5.069 [pixel] 0.021 [mm]	0.010	0.140	0.618	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.

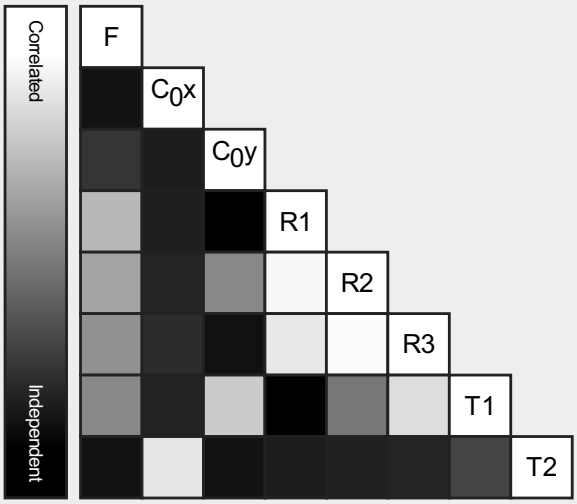
The number of Automatic Tie Points (ATPs) per pixel, averaged over all images of the camera model, is color coded between black and white. White indicates that, on average, more than 16 ATPs have been extracted at the pixel location. Black indicates that, on average, 0 ATPs have been extracted at the 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.

Internal Camera Parameters

SHARE102SPRO265_FRONT_38.0_6000x4000 (RGB). Sensor Dimensions: 25.400 [mm] x 16.933 [mm]

EXIF ID: SHARE102SPRO265FRONT_35.6_6000x4000

	Focal Length	Principal Point x	Principal Point y	R1	R2	R3	T1	T2
Initial Values	8976.390 [pixel] 38.000 [mm]	3000.000 [pixel] 12.700 [mm]	2000.000 [pixel] 8.467 [mm]	0.000	0.000	0.000	0.000	0.000
Optimized Values	9127.703 [pixel] 38.641 [mm]	3011.969 [pixel] 12.751 [mm]	2002.004 [pixel] 8.475 [mm]	-0.268	2.626	-1.279	-0.001	0.000
Uncertainties (Sigma)	2.173 [pixel] 0.009 [mm]	4.198 [pixel] 0.018 [mm]	3.734 [pixel] 0.016 [mm]	0.010	0.149	0.711	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.

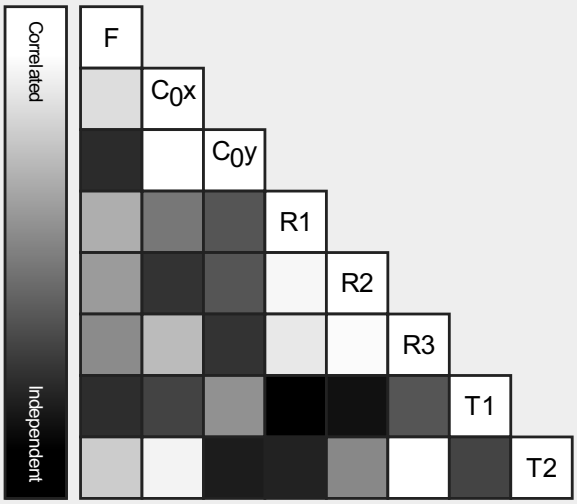
The number of Automatic Tie Points (ATPs) per pixel, averaged over all images of the camera model, is color coded between black and white. White indicates that, on average, more than 16 ATPs have been extracted at the pixel location. Black indicates that, on average, 0 ATPs have been extracted at the 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.

Internal Camera Parameters

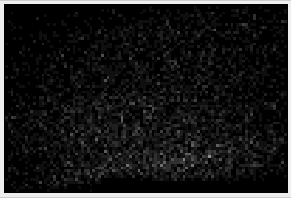
SHARE102SPRO265_LEFT_38.0_6000x4000 (RGB). Sensor Dimensions: 25.400 [mm] x 16.933 [mm]

EXIF ID: SHARE102SPRO265LEFT_35.6_6000x4000

	Focal Length	Principal Point x	Principal Point y	R1	R2	R3	T1	T2
Initial Values	8976.390 [pixel] 38.000 [mm]	3000.000 [pixel] 12.700 [mm]	2000.000 [pixel] 8.467 [mm]	0.000	0.000	0.000	0.000	0.000
Optimized Values	8964.619 [pixel] 37.950 [mm]	2923.694 [pixel] 12.377 [mm]	1980.667 [pixel] 8.385 [mm]	0.035	0.108	-1.673	0.000	-0.002
Uncertainties (Sigma)	1.836 [pixel] 0.008 [mm]	7.270 [pixel] 0.031 [mm]	4.866 [pixel] 0.021 [mm]	0.007	0.105	0.466	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.



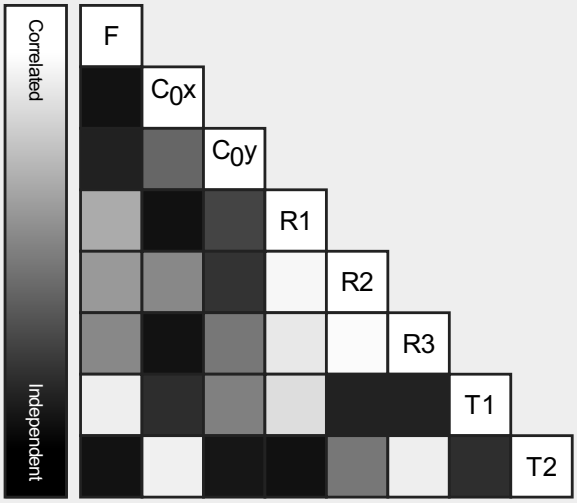
The number of Automatic Tie Points (ATPs) per pixel, averaged over all images of the camera model, is color coded between black and white. White indicates that, on average, more than 16 ATPs have been extracted at the pixel location. Black indicates that, on average, 0 ATPs have been extracted at the 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.

Internal Camera Parameters

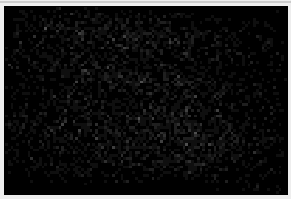
SHARE102SPRO265_RIGHT_38.0_6000x4000 (RGB). Sensor Dimensions: 25.400 [mm] x 16.933 [mm]

EXIF ID: SHARE102SPRO265RIGHT_35.6_6000x4000

	Focal Length	Principal Point x	Principal Point y	R1	R2	R3	T1	T2
Initial Values	8976.390 [pixel] 38.000 [mm]	3000.000 [pixel] 12.700 [mm]	2000.000 [pixel] 8.467 [mm]	0.000	0.000	0.000	0.000	0.000
Optimized Values	9021.023 [pixel] 38.189 [mm]	2928.681 [pixel] 12.398 [mm]	1999.183 [pixel] 8.463 [mm]	-0.139	0.879	-0.481	-0.000	-0.002
Uncertainties (Sigma)	1.836 [pixel] 0.008 [mm]	5.725 [pixel] 0.024 [mm]	4.520 [pixel] 0.019 [mm]	0.007	0.108	0.492	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.

Camera Rig «SHARE102SPRO265_OBLIQUE_RIG» Relatives. Images: 1490

	Transl X [m]	Transl Y [m]	Transl Z [m]	Rot X [degree]	Rot Y [degree]	Rot Z [degree]

SHARE102SPRO265_DOWN_27.0_6000x4000 (RGB)	Reference Camera					
SHARE102SPRO265_BACK_38.0_6000x4000 (RGB)						
Initial Values	0.000	0.047	-0.025	-45.000	0.000	0.000
Optimized values	0.000	0.047	-0.025	-45.183	-0.458	0.123
Uncertainties (sigma)				0.030	0.006	0.035
SHARE102SPRO265_FRONT_38.0_6000x4000 (RGB)						
Initial Values	0.000	-0.047	-0.025	45.000	0.000	-180.000
Optimized values	0.000	-0.047	-0.025	45.136	-0.076	-179.894
Uncertainties (sigma)				0.024	0.027	0.005
SHARE102SPRO265_LEFT_38.0_6000x4000 (RGB)						
Initial Values	0.047	0.000	-0.025	0.000	-45.000	90.000
Optimized values	0.047	0.000	-0.025	0.714	-44.903	90.561
Uncertainties (sigma)				0.034	0.030	0.057
SHARE102SPRO265_RIGHT_38.0_6000x4000 (RGB)						
Initial Values	-0.047	0.000	-0.025	0.000	45.000	-90.000
Optimized values	-0.047	0.000	-0.025	-0.635	45.026	-89.550
Uncertainties (sigma)				0.027	0.028	0.047

2D Keypoints Table

	Number of 2D Keypoints per Image	Number of Matched 2D Keypoints per Image
Median	24921	116
Min	20061	0
Max	33946	1883
Mean	25002	173

2D Keypoints Table for Camera SHARE102SPRO265_DOWN_27.0_6000x4000 (RGB)

	Number of 2D Keypoints per Image	Number of Matched 2D Keypoints per Image
Median	25078	298
Min	20061	45
Max	31833	1719
Mean	25371	360

2D Keypoints Table for Camera SHARE102SPRO265_BACK_38.0_6000x4000 (RGB)

	Number of 2D Keypoints per Image	Number of Matched 2D Keypoints per Image
Median	24603	75
Min	23729	0
Max	25239	676
Mean	24573	105

2D Keypoints Table for Camera SHARE102SPRO265_FRONT_38.0_6000x4000 (RGB)

	Number of 2D Keypoints per Image	Number of Matched 2D Keypoints per Image
Median	25145	40
Min	20120	0
Max	33946	452
Mean	25363	54

2D Keypoints Table for Camera SHARE102SPRO265_LEFT_38.0_6000x4000 (RGB)

	Number of 2D Keypoints per Image	Number of Matched 2D Keypoints per Image
Median	24899	99
Min	20470	0
Max	25798	1883
Mean	24848	213

2D Keypoints Table for Camera SHARE102SPRO265_RIGHT_38.0_6000x4000 (RGB)

	Number of 2D Keypoints per Image	Number of Matched 2D Keypoints per Image
Median	24874	78
Min	20806	0

Max	30326	1464
Mean	24853	132

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

	SHARE102SPRO265... (RGB)	SHARE102SPRO265... (RGB)	SHARE102SPRO265... (RGB)	SHARE102SPRO265... (RGB)	SHARE102S (RGB)
SHARE102SPRO265_DOWN_27.0_6000x4000 (RGB)	8 / 22 / 988	1 / 1 / 3	1 / 1 / 11	1 / 1 / 2	1 / 1 / 3
SHARE102SPRO265_BACK_38.0_6000x4000 (RGB)		3 / 13 / 459	1 / 1 / 7	1 / 1 / 1	1 / 1 / 1
SHARE102SPRO265_FRONT_38.0_6000x4000 (RGB)			2 / 10 / 225	1 / 1 / 2	1 / 1 / 1
SHARE102SPRO265_LEFT_38.0_6000x4000 (RGB)				4 / 24 / 919	1 / 2 / 42
SHARE102SPRO265_RIGHT_38.0_6000x4000 (RGB)					4 / 17 / 1068

3D Points from 2D Keypoint Matches

	Number of 3D Points Observed
In 2 Images	93415
In 3 Images	7907
In 4 Images	2503
In 5 Images	1105
In 6 Images	616
In 7 Images	416
In 8 Images	290
In 9 Images	184
In 10 Images	143
In 11 Images	119
In 12 Images	94
In 13 Images	65
In 14 Images	43
In 15 Images	38
In 16 Images	36
In 17 Images	31
In 18 Images	33
In 19 Images	13
In 20 Images	15
In 21 Images	11
In 22 Images	5
In 23 Images	7
In 24 Images	1
In 25 Images	6
In 26 Images	1

2D Keypoint Matches

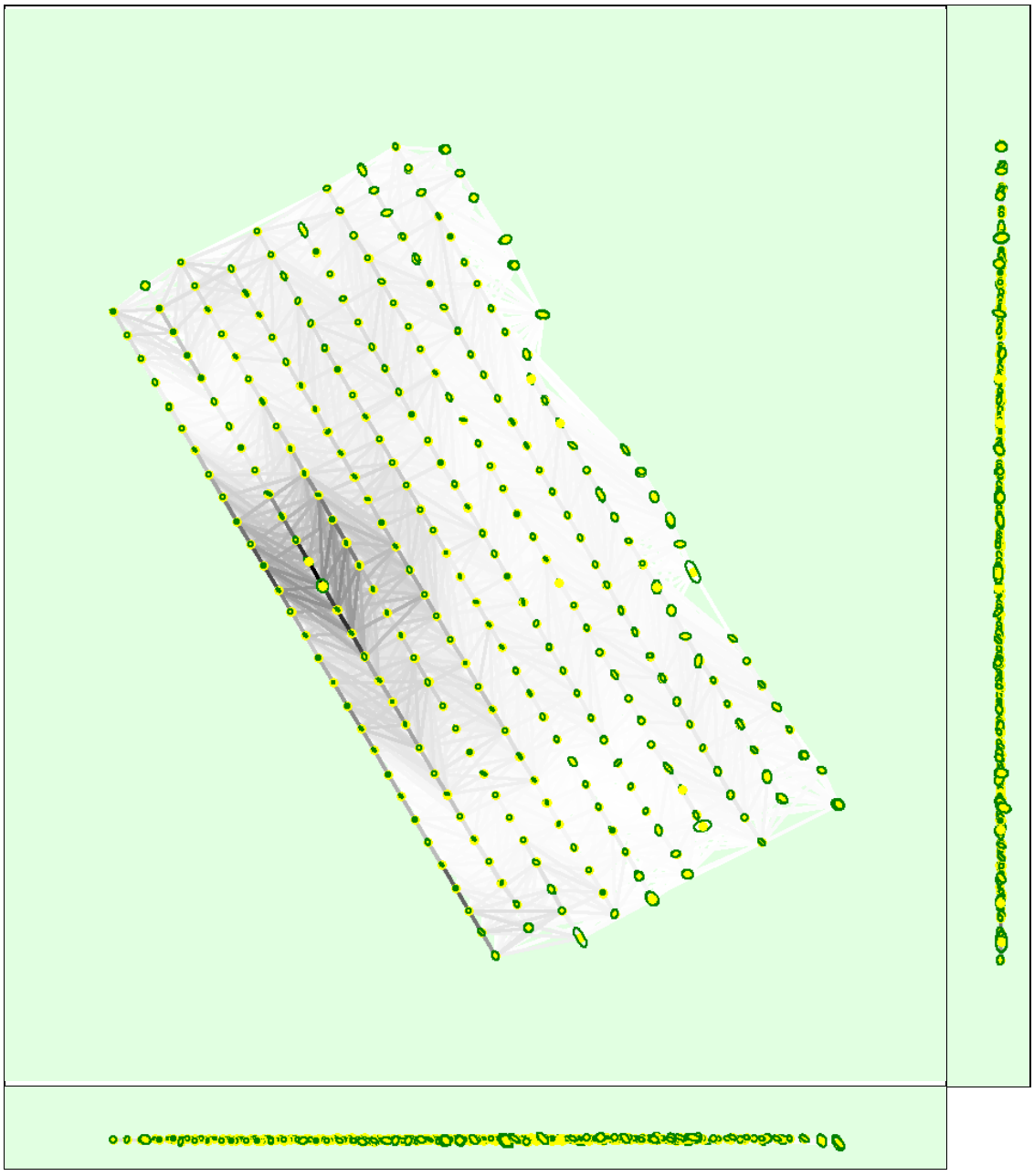


Figure 5: Computed image positions with links between matched images. The darkness of the links indicates the number of matched 2D keypoints between the images. Bright links indicate weak links and require manual tie points or more images. Dark green ellipses indicate the relative camera position uncertainty 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	0.016	0.018	0.014	0.013	0.009	0.009
Sigma	0.006	0.006	0.006	0.003	0.003	0.004

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
LCP-19 (3D)	0.020/ 0.050	-0.091	-0.100	-0.029	0.426	6 / 6
LCP-24 (3D)	0.020/ 0.050	-0.082	0.009	-0.100	0.264	6 / 6

LCP-25 (3D)	0.020/ 0.050	0.042	-0.041	-0.334	0.365	6 / 6
GCP-02 (3D)	0.020/ 0.050	0.085	0.017	0.381	0.283	6 / 6
GCP-05 (3D)	0.020/ 0.050	0.075	-0.033	0.014	0.607	6 / 6
GCP-07 (3D)	0.020/ 0.050	-0.095	-0.021	-0.199	0.244	6 / 6
GCP-10 (3D)	0.020/ 0.050	0.065	0.169	0.252	0.267	6 / 6
Mean [m]		-0.000214	-0.000128	-0.002094		
Sigma [m]		0.078292	0.077603	0.230331		
RMS Error [m]		0.078293	0.077603	0.230341		

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 [%]
-	-4.44	0.14	0.07	0.00
-4.44	-3.55	0.56	0.35	0.00
-3.55	-2.67	0.35	0.92	0.00
-2.67	-1.78	1.41	3.17	2.39
-1.78	-0.89	5.77	12.68	27.75
-0.89	0.00	30.77	30.56	21.69
0.00	0.89	58.24	35.56	28.59
0.89	1.78	2.39	13.38	19.58
1.78	2.67	0.00	2.04	0.00
2.67	3.55	0.35	1.06	0.00
3.55	4.44	0.00	0.21	0.00
4.44	-	0.00	0.00	0.00
Mean [m]		0.311685	-0.216941	14.960606
Sigma [m]		0.703140	1.042100	1.004425
RMS Error [m]		0.769125	1.064442	14.994286

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]	0.313078	-0.214730	15.068245

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]	90.07	68.59	100.00
[-2.00, 2.00]	97.75	93.38	100.00
[-3.00, 3.00]	98.66	97.75	100.00
Mean of Geolocation Accuracy [m]	0.943545	0.943545	2.828977
Sigma of Geolocation Accuracy [m]	0.008375	0.008375	0.095975

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

Geolocation Orientational Variance	RMS [degree]
Omega	1.689
Phi	0.714
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: Intel(R) Core(TM) i9-10900F CPU @ 2.80GHz RAM: 64GB GPU: NVIDIA GeForce RTX 2070 SUPER (Driver: 30.0.15.1277)
Operating System	Windows 10 Pro, 64-bit

Coordinate Systems

Image Coordinate System	WGS 84
Ground Control Point (GCP) Coordinate System	WGS 84 / UTM zone 47N (2D)
Output Coordinate System	WGS 84 / UTM zone 47N (2D)

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
Rig «SHARE102SPRO265_OBLIQUE_RIG» processing	optimize relative rotation