

PASHCHIMANCHAL DRONE DATA PROCESSING

This report is on the basis of working procedure of drone data to make orthophoto of
WRC campus Pokhara using Agisoft MetashapePro software.

26 December 2021



Survey Data

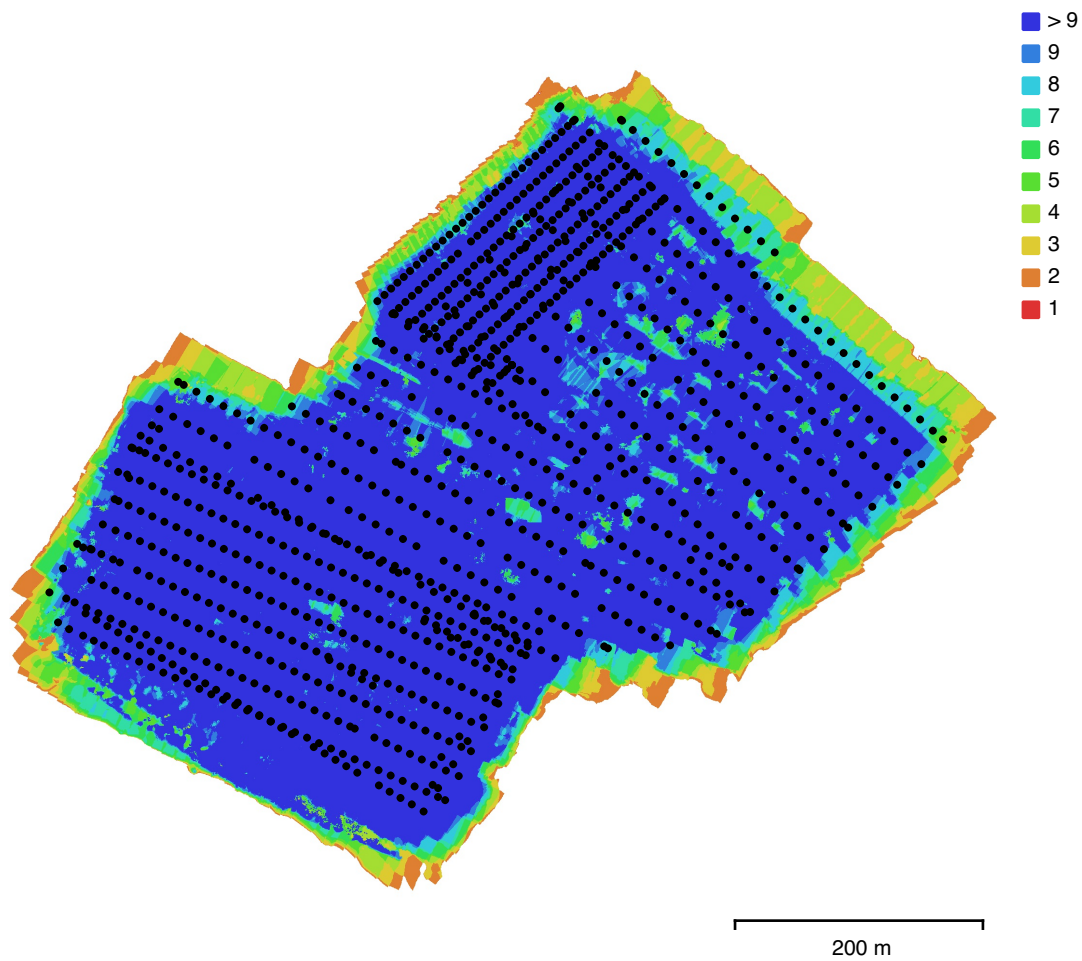


Fig. 1. Camera locations and image overlap.

Number of images:	1,041	Camera stations:	1,039
Flying altitude:	54 m	Tie points:	1,880,516
Ground resolution:	1.35 cm/pix	Projections:	5,421,516
Coverage area:	0.277 km ²	Reprojection error:	0.722 pix

Camera Model	Resolution	Focal Length	Pixel Size	Precalibrated
FC6310 (8.8mm)	5472 x 3648	8.8 mm	2.41 x 2.41 μ m	No

Table 1. Cameras.

Camera Calibration

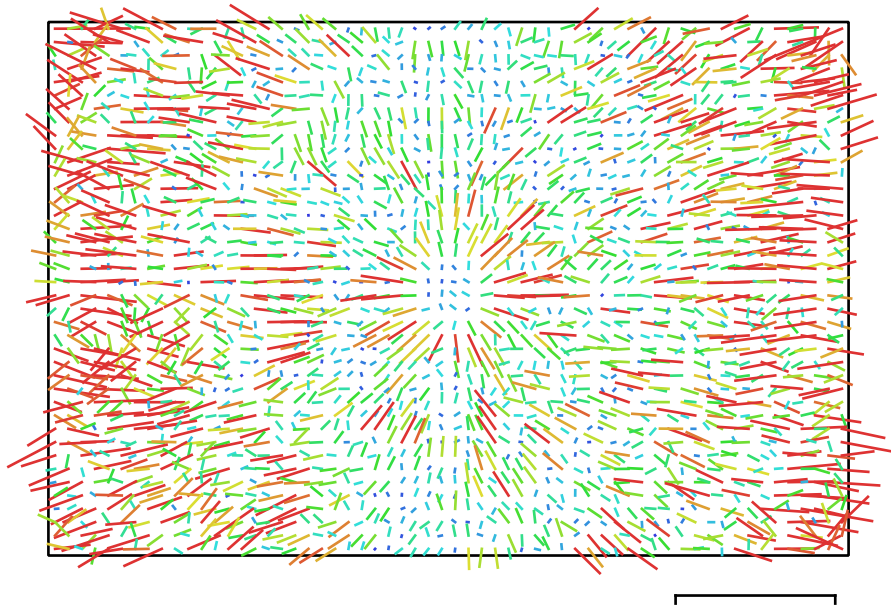


Fig. 2. Image residuals for FC6310 (8.8mm).

FC6310 (8.8mm)

1041 images

Type	Resolution	Focal Length	Pixel Size
Frame	5472 x 3648	8.8 mm	2.41 x 2.41 μm

	Value	Error	F	Cx	Cy	B1	B2	K1	K2	K3	K4	P1	P2
F	3651.78	0.27	1.00	-0.01	0.13	0.02	0.08	0.09	-0.18	0.24	-0.30	0.07	-0.07
Cx	2.62502	0.011		1.00	0.03	-0.04	-0.02	0.00	0.00	-0.00	0.00	0.64	0.02
Cy	16.4333	0.01			1.00	0.01	-0.02	0.02	-0.03	0.03	-0.04	0.04	0.66
B1	-0.330656	0.006				1.00	-0.03	0.02	-0.03	0.03	-0.02	-0.00	-0.02
B2	-0.423976	0.0059					1.00	0.00	-0.01	0.02	-0.02	0.01	-0.02
K1	0.0165459	2.4e-05						1.00	-0.96	0.91	-0.85	0.01	-0.01
K2	-0.0762058	0.00012							1.00	-0.98	0.95	-0.01	0.01
K3	0.133974	0.00023								1.00	-0.99	0.02	-0.02
K4	-0.0794089	0.00015									1.00	-0.02	0.02
P1	0.000906439	8.9e-07										1.00	0.02
P2	-0.000732616	8.2e-07											1.00

Table 2. Calibration coefficients and correlation matrix.

Camera Locations

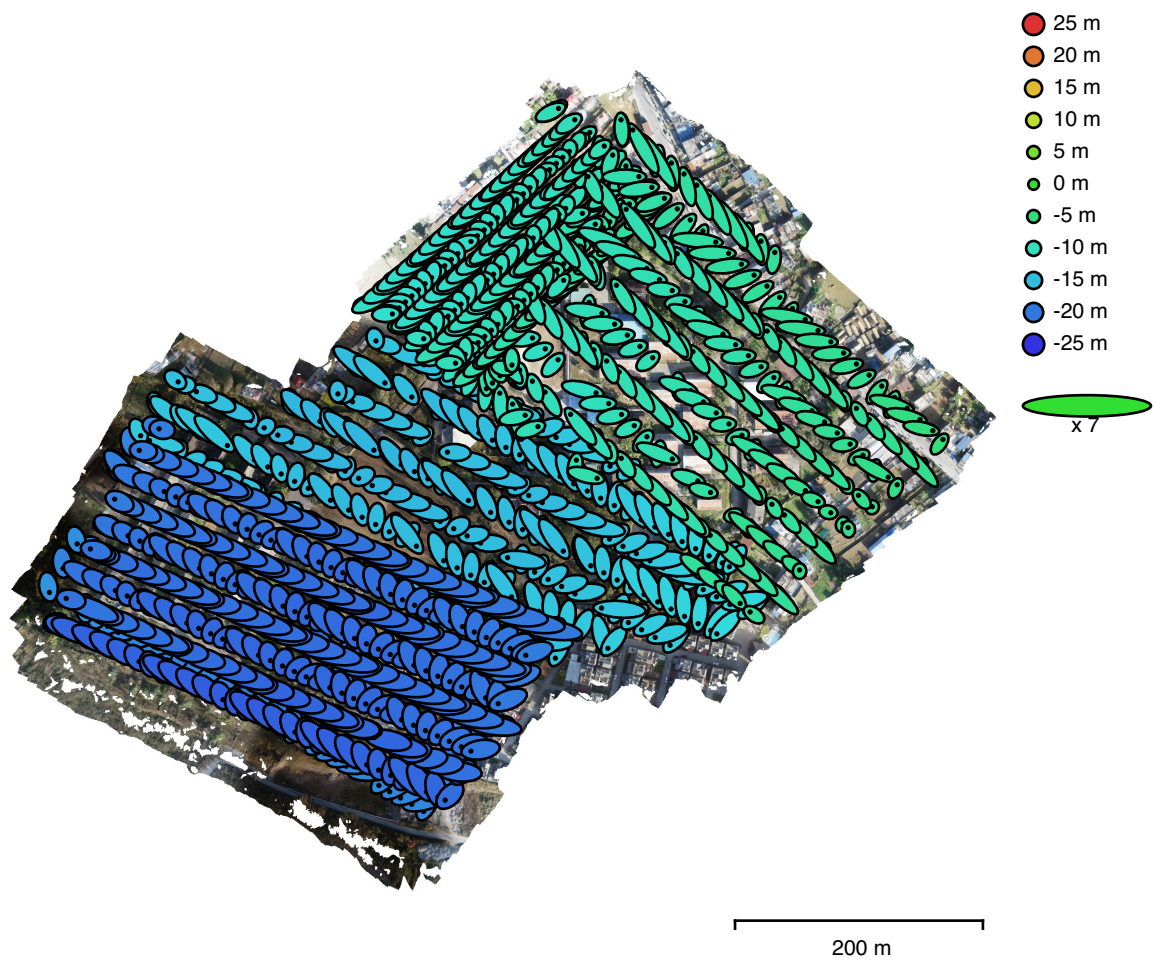


Fig. 3. Camera locations and error estimates.
Z error is represented by ellipse color. X,Y errors are represented by ellipse shape.
Estimated camera locations are marked with a black dot.

X error (m)	Y error (m)	Z error (m)	XY error (m)	Total error (m)
1.94981	1.39045	14.8745	2.39481	15.0661

Table 3. Average camera location error.
X - Longitude, Y - Latitude, Z - Altitude.

Ground Control Points

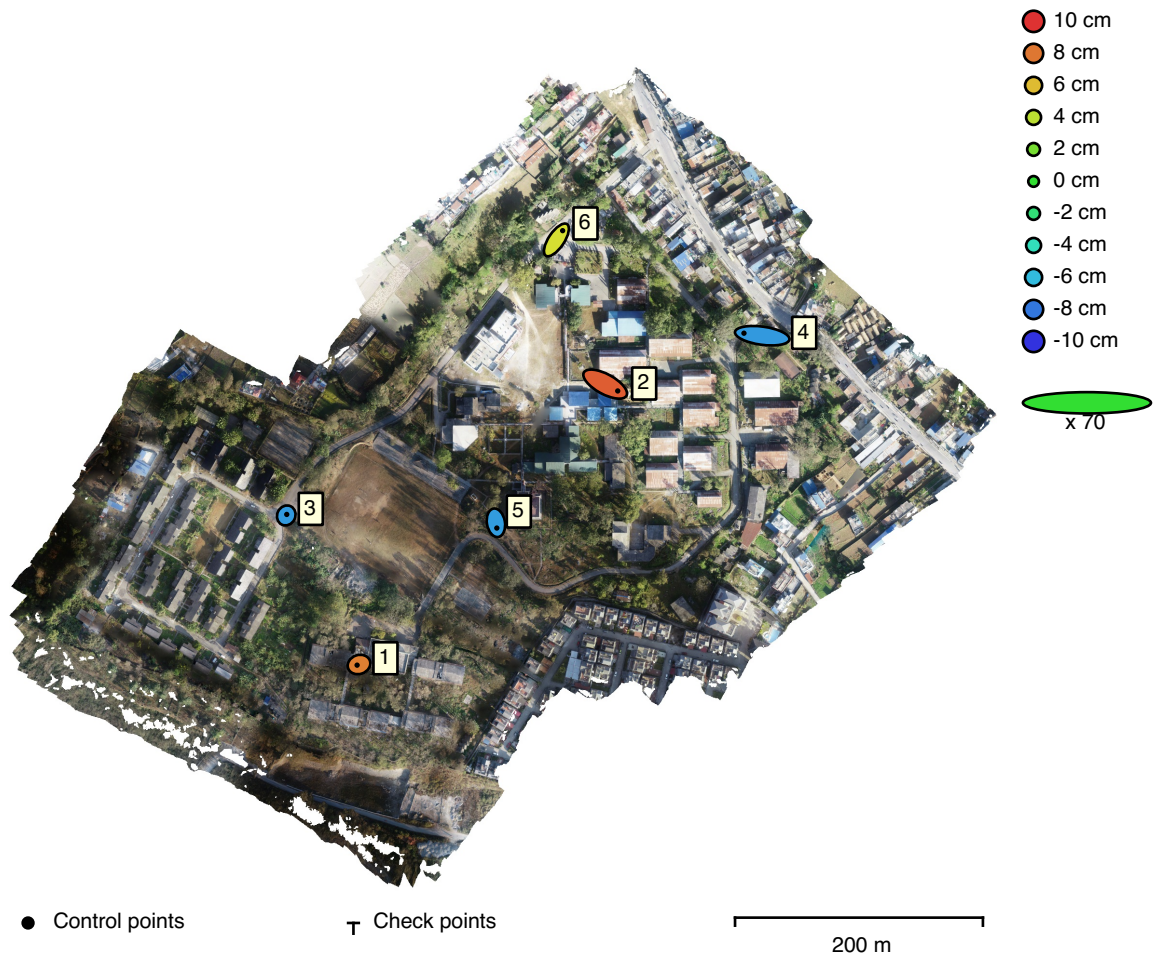


Fig. 4. GCP locations and error estimates.
 Z error is represented by ellipse color. X,Y errors are represented by ellipse shape.
 Estimated GCP locations are marked with a dot or crossing.

Count	X error (cm)	Y error (cm)	Z error (cm)	XY error (cm)	Total (cm)
6	21.7456	12.1863	7.13665	24.9274	25.9289

Table 4. Control points RMSE.
 X - Longitude, Y - Latitude, Z - Altitude.

Label	X error (cm)	Y error (cm)	Z error (cm)	Total (cm)	Image (pix)
1	-4.40263	-1.51562	7.77083	9.05903	1.723 (17)
2	28.9215	-15.7178	8.74494	34.0584	4.534 (12)
3	1.13333	2.31088	-6.9966	7.455	2.881 (19)
4	-42.068	5.78272	-7.00171	43.0369	5.512 (12)
5	2.06478	-12.1798	-6.92633	14.1628	2.646 (12)
6	14.3568	21.3203	4.77286	26.1429	10.465 (18)
Total	21.7456	12.1863	7.13665	25.9289	5.652

Table 5. Control points.
X - Longitude, Y - Latitude, Z - Altitude.

Digital Elevation Model

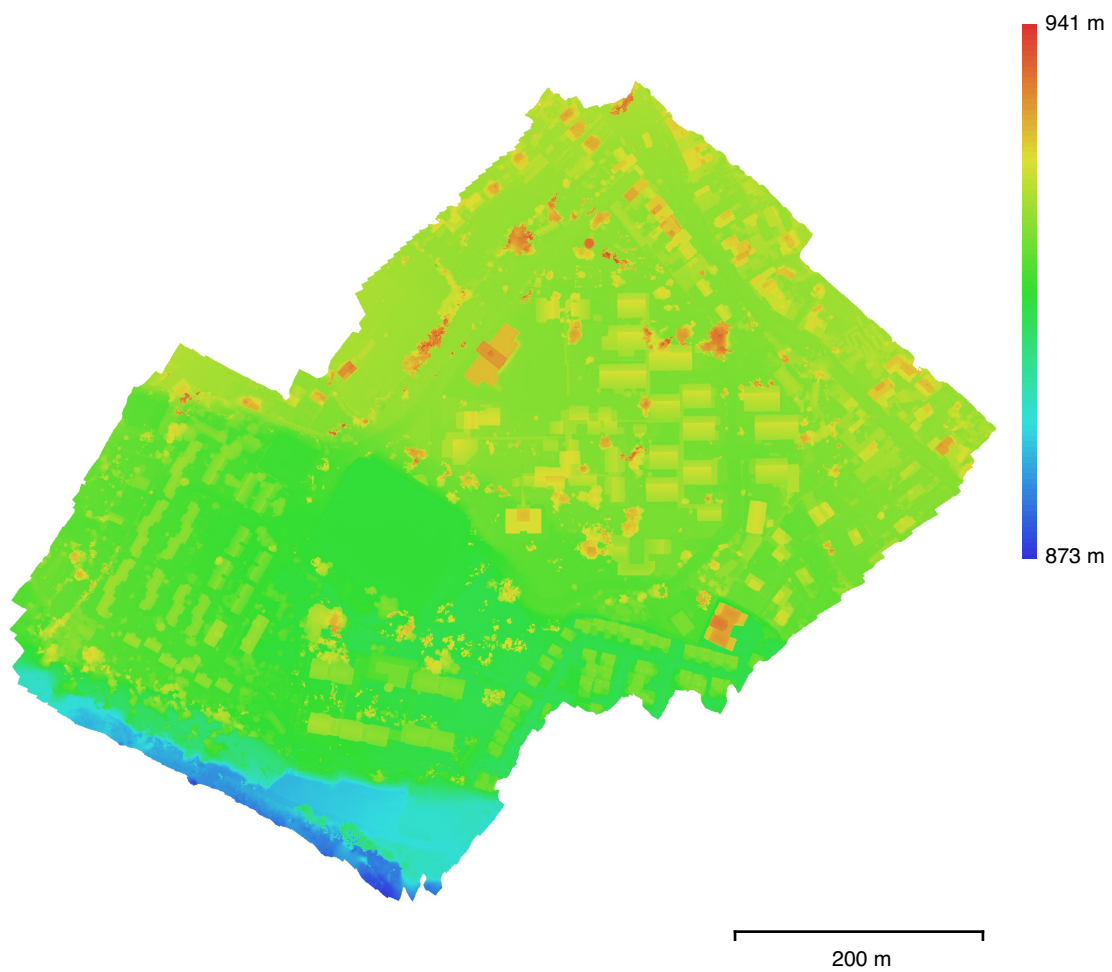


Fig. 5. Reconstructed digital elevation model.

Resolution: 5.4 cm/pix
Point density: 343 points/m²

Processing Parameters

General

Cameras	1041
Aligned cameras	1039
Markers	6
Coordinate system	WGS 84 (EPSG::4326)
Rotation angles	Yaw, Pitch, Roll

Point Cloud

Points	1,880,516 of 1,994,705
RMS reprojection error	0.147009 (0.722484 pix)
Max reprojection error	1.58251 (46.2095 pix)
Mean key point size	4.12065 pix
Point colors	3 bands, uint8
Key points	3.26 GB
Average tie point multiplicity	3.01328

Alignment parameters

Accuracy	High
Generic preselection	No
Reference preselection	Source
Key point limit	40,000
Tie point limit	10,000
Guided image matching	No
Adaptive camera model fitting	Yes
Matching time	1 hours 51 minutes
Matching memory usage	498.65 MB
Alignment time	11 minutes 9 seconds
Alignment memory usage	1.05 GB

Optimization parameters

Parameters	f, b1, b2, cx, cy, k1-k4, p1, p2
Adaptive camera model fitting	No
Optimization time	22 seconds
Software version	1.6.6.11715
File size	163.55 MB

Depth Maps

Count	1039
-------	------

Depth maps generation parameters

Quality	Medium
Filtering mode	Moderate
Processing time	46 minutes 7 seconds
Memory usage	252.79 MB
Software version	1.6.6.11715
File size	1.47 GB

Dense Point Cloud

Points	148,338,997
Point colors	3 bands, uint8

Depth maps generation parameters

Quality	Medium
Filtering mode	Moderate
Processing time	46 minutes 7 seconds
Memory usage	252.79 MB

Dense cloud generation parameters

Processing time	44 minutes 54 seconds
-----------------	-----------------------

Memory usage	3.55 GB
Software version	1.6.6.11715
File size	1.89 GB
Model	
Faces	9,800,768
Vertices	4,907,340
Vertex colors	3 bands, uint8
Texture	4,096 x 4,096, 4 bands, uint8
Depth maps generation parameters	
Quality	Medium
Filtering mode	Moderate
Processing time	46 minutes 7 seconds
Memory usage	252.79 MB
Reconstruction parameters	
Surface type	Height field
Source data	Dense cloud
Interpolation	Enabled
Strict volumetric masks	No
Processing time	4 minutes 25 seconds
Memory usage	1.48 GB
Texturing parameters	
Mapping mode	Adaptive orthophoto
Blending mode	Mosaic
Texture size	4,096
Enable hole filling	Yes
Enable ghosting filter	Yes
UV mapping time	2 minutes 40 seconds
UV mapping memory usage	1.04 GB
Blending time	17 minutes 2 seconds
Blending memory usage	840.72 MB
Software version	1.6.6.11715
File size	443.14 MB
DEM	
Size	19,152 x 17,745
Coordinate system	WGS 84 (EPSG::4326)
Reconstruction parameters	
Source data	Dense cloud
Interpolation	Enabled
Processing time	1 minutes 16 seconds
Memory usage	194.18 MB
Software version	1.6.6.11715
File size	333.11 MB
Orthomosaic	
Size	58,999 x 49,076
Coordinate system	WGS 84 (EPSG::4326)
Colors	3 bands, uint8
Reconstruction parameters	
Blending mode	Mosaic
Surface	DEM
Enable hole filling	Yes
Processing time	45 minutes 37 seconds
Memory usage	987.67 MB
Software version	1.6.6.11715
File size	20.44 GB
System	
Software name	Agisoft Metashape Professional

Software version	1.6.6 build 11715
OS	Mac OS 64 bit
RAM	8.00 GB
CPU	VirtualApple @ 2.50GHz
GPU(s)	Apple M1