

Authors: Boike, J., Veh, G., Stoof, G., Grüber, M., Langer, M., Muster, S.

Title: Visible orthomosaic of Samoylov Island, Siberia, summer 2008

Description:

High-resolution land cover mapping is needed in the heterogeneous arctic landscapes that change land surface parameters over a range of a few meters. Polygonal tundra on Samoylov Island features a network of dry polygonal rims interspersed with patches of wet tundra and polygon ponds.

In summer 2008, high-resolution aerial images were obtained by mounting a Nikon D200 (visible (VIS) range) on a helium-filled balloon. Acquisition dates were 01 Aug, 09 Aug, 15 Aug and 11 Sep 2008. The GPS log files of the camera show flight altitudes between 417 m and 1016 m.

In total, 232 images (Appendix A) were used for stereo photogrammetric processing using Agisoft Photoscan (V 1.0.4.1847). The decisive criteria for image selection were the absence of clouds and the image sharpness. Hence, no pictures from the northern/ northwestern part of the island met these criteria.

Raw image alignment in Agisoft Photoscan was based on the camera coordinates stored in the exif-file of each image. No measured Ground Control Points (GCPs) were available to enhance the image's georeference. In ArcGIS (V 10.2.2), an evenly distributed network of 91 "Virtual Ground Control Points (Appendix B) was pegged out across the whole island based on the Orthomosaic Samoylov from the year 2007 (Boike et al., 2012). These points represent clearly identifiable surface features like thaw pits which didn't change their position between the surveys. The GCP network is also used for georeferencing the simultaneously acquired NIR images (see attached file "Orthomosaic_Samoylov_NIR_2008" of this publication). 83 of these points (excluding Point 84-90) could be detected in the VIS images of 2008. The coordinates of these GCPs (WGS 1984, UTM Zone 52N) were imported into Photoscan and placed in each image. Thus, the previous raw camera alignment could be optimized with an overall reprojection error of 0.77 m.

A mesh was built from the sparse point cloud and exported as Geotiff with an planimetric resolution of 0.17 m. Color correction was enabled due to different lighting conditions between the acquisition dates.

See the developer's tutorial (Appendix C) to retrace the orthophoto processing chain in Agisoft Photoscan.

An overview of alignment and reconstruction parameters is given in Fig 1. See Appendix D for the reconstruction parameters of each GCP.

Property	Value
General	
Cameras	232
Aligned cameras	232
Markers	83
Point Cloud	
Points	1 541 528 of 1 846 026
Effective overlap	5.3541
Reprojection error	0.772642 (24.3255 max)
▾ Alignment parameters	
Accuracy	High
Image pair preselection	Ground Control
Maximum points per photo	80 000
Constrain features by mask	Yes
Matching time	53 minutes 55 seconds
Alignment time	18 minutes 10 seconds
Model	
Faces	300 974
Vertices	151 544
▾ Reconstruction parameters	
Surface type	Height field
Source data	Sparse
Interpolation	Enabled
Geometry type	Point cloud
Face count	308 300
Processing time	1 minutes 15 seconds

Figure 1: Alignment and reconstruction parameters of stereo photogrammetric image processing in Agisoft Photoscan for VIS orthomosaic 2008.

Slight differences compared to the Orthomosaic Samoylov 2007 (Boike et al., 2012) occurred especially at the edges of the VIS orthomosaic, whereas image alignment in the centre of Samoylov Island shows a very good agreement. Geomorphological units, i.e. the polygonal tundra, as well as major waterbodies are clearly detectable.

References:

Boike, J., Grüber, M., Langer, M, Piel, K, Scheritz, M. (2012): Orthomosaic of Samoylov Island, Lena Delta, Siberia. *Alfred Wegener Institute - Research Unit Potsdam*, doi:10.1594/PANGAEA.786073

Image meta data:

Image format: 3 bands (RGB)
 Data value range: 0–255
 No data value: 256
 Coordinate system: WGS 1984 UTM Zone 52N
 WKID: 32652 Authority: EPSG
 Resolution: 0.17 m
 Image extent: Top: 8033879.93575
 Left: 413769.486694
 Right: 416508.866694
 Bottom: 8031315.14575
 Pixel type & depth: 8 bit unsigned integer
 File size: 1,64 GB (uncompressed)

Keywords: *visible, VIS, aerial image, orthophoto, Agisoft Photoscan, Samoylov, 2008*

Appendix:

App. A: Images used for stereophotogrammetric processing in Agisoft Photoscan

App. B: Virtual Ground Control Points used for image alignment in Agisoft Photoscan

App. C: Tutorial (Beginner level): Orthophoto and DEM Generation with Agisoft PhotoScan Pro 1.1

App. D: Marker and image placement properties in Agisoft Photoscan