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Title: Near-infrared 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 (near infra-red (NIR) range) on a helium-filled balloon. Acquisition dates were 09 Aug, 15 Aug and 11 Sep 2008. Flight altitudes ranged from c. 400 m to c. 1000 m.

In total, 245 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 northwestern part of the island met these criteria.

Camera positions for raw image alignment were estimated by the software due to the lack of an internal GPS log. In addition, 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. This GCP network is also used for georeferencing the simultaneously acquired VIS images (see attached file "Orthomosaic_Samoylov_VIS_2008" of this publication). 82 of these points (excluding Point 2, 39, 56, 67, 69, 73, 74, 75 & 76) could be detected in the NIR 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 0.73 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	245
Aligned cameras	245
Markers	91
Point Cloud	
Points	1 484 732 of 1 964 889
Effective overlap	4.23397
Reprojection error	0.732232 (65.0781 max)
⊿ **Alignment parameters**	
Accuracy	High
Image pair preselection	Generic
Maximum points per photo	100 000
Constrain features by mask	No
Matching time	1 hours 17 minutes
Alignment time	22 minutes 2 seconds
Model	
Faces	289 147
Vertices	145 721
⊿ **Reconstruction parameters**	
Surface type	Height field
Source data	Sparse
Interpolation	Enabled
Geometry type	Point cloud
Face count	296 941
Processing time	21 seconds

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

Slight differences compared to the Orthomosaic Samoylov 2007 (Boike et al., 2012) occur especially at the edges of the near infra-red 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:	1 band
Data value range:	0–104
Coordinate system:	WGS 1984 UTM Zone 52N
	WKID: 32652 Authority: EPSG
Resolution:	0.17 m
Image extent:	Top: 8034269.26129
	Left: 413697.010157
	Right: 416570.180157
	Bottom: 8031317.72129
Pixel type &depth:	8 bit unsigned integer
File size:	580 MB (uncompressed)

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