Introduction to Remote Sensing Course Focus: Snow depth from Structure from Motion (SfM) Fall, 2019

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Outline

Alaska Pacific University (APU) Details

Introduction to Remote Sensing Class

Structure from Motion (SfM) Concept

APU Mapping System

Class Incorporation
  - Site visit to Blue Ice Aviation
  - Ground Control Points
  - Mapping Mission of APU Farm (twice)
Alaska Pacific University (APU)

Mission: APU provides a world-class, hands-on, culturally responsive educational experience in collaboration with our students, communities, and Tribal partners

Block/Session Format
- Fall (September), Winter (January), and Spring (May)
  - 4-week Block
- Fall/Spring
  - 12-week Session
Introduction to Remote Sensing Class (SC 363)

This course introduces students to the principles and techniques necessary for applying remote sensing to diverse issues within environmental science

Learning Objectives
1) understand the basics of how electromagnetic energy enables remote sensing and describe why different wavelength regions of the electromagnetic spectrum are useful for different types of remote sensing applications;
2) explain the concepts of spatial, spectral, radiometric and temporal resolution and how this impacts the selection of an appropriate data source(s) for analytical tasks;
3) describe spectral signatures and use this knowledge to explain how different wavelengths can successfully be used to differentiate between different land surface types;
4) explain and perform remote sensing methods (e.g. differencing ratios, classification)

Students complete a remote sensing projects from idea generation, data collection, image processing, and communicating results via a scientific poster using ArcGIS/R/MetaShape.

AK Space Grant funds allowed incorporation of our existing mapping system within class
Structure from Motion Concept

Remote sensing technique that uses multiple photographs of an object/surface to create a three-dimensional set of points corresponding to the surface of the feature (each with X, Y, Z coordinates) called a point cloud with associated RGB coloration.
APU Mapping System

Aviantrix Standard trigger box is required for laptop to fire the camera’s shutter (www.aerosci.info)

A Nikon D850 digital SLR camera (45.7 megapixels) and a Nikkor 24 mm lens (www.nikonusa.com) capture images

A discontinued Trimble dual-frequency 12 channel survey quality GPS (5700) and a Zephyr antennae uses an event marker to record position of each shutter opening
Class Incorporation

- Students visited Pilot Matt Keller with Blue Ice Aviation (Wasilla, AK)
- Ground Control Points (GCPs)
- Mapping Mission of APU Farm (twice)
- Imagery and GCPs were used as part of a lab
  - Used Agisoft Metashape software to create an orthomosaic image and Digital Elevation Model (DEM) of APU farm
  - Comparison of DEMs allowed for accuracy assessment of APU Mapping System
Former Alaska Space Grant Fellow Julia Ditto Checking out Camera/Trigger box set-up
Each mission was planned within Aviatrix FlightPlanner to determine flight altitude, pixel size, transect number and orientation and image capture locations.
Ground control points were collected with a Trimble Geo7 Series GPS with a Zephyr 3 antennae and postprocessed Trimble within Pathfinder Office (95% solutions < 5 cm)

Stable and distinct Ground control points consisted of paint marks and tar-filled cracks
Trimble 5700 GPS points were processed within Novatel GravNav (v. 8.7) using nearby CORS GPS base station (TBON)

Flight path and image collection points of APU Farm
Products

Farm 9/23: \( n = 145 \) images
Farm 9/26: \( n = 263 \) images

Orthomosaic image: 10 cm

DEM: 10 cm
Questions?

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