GSA 2019 Short Course: 510. High Resolution Topography and 3D Imaging II: Introduction to Structure from Motion (SfM) Photogrammetry

869 Chris Crosby September 21, 2019 Structure from Motion (SfM) Photogrammetry 8633

2019 Geological Society of America Annual Meeting Short Course, Phoenix, AZ

510. High Resolution Topography and 3D Imaging II: Introduction to Structure from Motion (SfM) Photogrammetry.

Sat., 21 Sept., 8 a.m.–5 p.m

Room 103AB, West Building, Phoenix Convention Center

Instructors: Ramon Arrowsmith & Tyler Scott, Arizona State Univ. & Christopher Crosby, UNAVCO

Supported by: UNAVCO & OpenTopography

Abstract: Structure from Motion (SfM), a photogrammetric technique that uses overlapping images to construct 3D surface models, is quickly emerging as a valuable research and education tool in geodesy, geomorphology, structural geology, and related disciplines. Images can be collected with a standard consumer-grade camera, making SfM a low-cost tool that compliments other 3D imaging technologies, such as terrestrial and airborne laser scanning (lidar). SfM can be collected from a handheld camera or an airborne platform such as an aircraft, tethered balloon, kite, or UAS (unmanned aerial system), enabling 3D imaging of features ranging in size from decimeters to several kilometers. This one-day course will provide faculty, students, and professionals with an introduction to SfM technology, data collection and processing, and examples of science and educational applications. A combination of lectures and hands-on demonstrations of SfM equipment and data processing will be used.

Software - please come with these software packages installed on your machine:

- Professional Edition of Agisoft Metashape (Commercial, multi-platform. We will use the free demo mode in this short course.)

- CloudCompare (multi-platform, open source software. Recommend the Latest stable

release (2.10.2 Zephyrus))

- LIME: Visualisation and Interpretation Software (Windows only. Free for academic use.)

MORNING SESSION

8:00 AM Welcome & Course Introduction

8:30 AM Intro to SfM & scientific motivations – high-resolution topography and 3D imaging

- Science Motivations & Intro Remarks
- Introduction to SfM Photogrammetry
- Coordinate systems primer

9:30 AM Break

9:45 AM Faraglione, Vulcano Island, Sicily, Italy demo

- Faraglione SfM tutorial
- Faraglione 30 image sample dataset (.zip)
- Faraglione SfM products (.zip)
- Faraglione metadata - dataset source: 10.5069/G9WD3XPD
- Video tutorial (designed for this sample dataset)

10:45 AM Overview of SfM data acquisition concepts

LUNCH

12:00 PM Lunch on your own. While out, take some pictures for afternoon session, start moving images off your phone.

AFTERNOON SESSION

1:00 PM Hands-on demonstration of SfM workflow: Participants photograph objects near short course venue, transfer images to computer, process data to simple 3D models using AgiSoft PhotoScan software.

Show and tell of the models

2:15 PM Mafala Bolo, Ethiopia georeferencing exercise

- Mafala Bolo georeferencing tutorial
- Mafala Bolo sample dataset

3:30 PM LIME demo

- SfM models & LIME mapping tutorial
- Faraglione demo dataset for LIME
- Buckley et al 2019 LIME Geosphere

As time allows:

- Lee Adoyta, Ledi Geraru, Afar Ethiopia CloudCompare differencing tutorial
- LA_Inspire_thin.laz

- LA6_Mavic.laz

5:00 PM Adjourn

Other Resources:

- UNAVCO Explained in 3 Minutes video
- UNAVCO Structure from Motion manuals:
  - Structure from Motion guide - practical considerations, cameras, collection platforms, software, field methods.
  - Structure from Motion AgiSoft processing guide
- **Curriculum Resources:**
  - Analyzing High Resolution Topography with TLS and SfM (SERC-hosted resources and curriculum for field education with TLS and SfM)
  - UNAVCO Geodesy Field Education resources (links to UNAVCO support resources for field education, including TLS and SfM)

Online URL:
https://kb.unavco.org/article/gsa-2019-short-course-510-high-resolution-topography-and-3d-imaging-ii-introduction-to-structure-from-motion-sfm-photogrammetry-869.html