Steps in a Photogrammetry Survey
With emphasis on using Washington and Lee Geology Dept. Instruments and Software

The advent of modern photogrammetry software allows one to make highly detailed base maps and 3D models from digital photos.

Field Acquisition

1. Collect 100-200 hundred photos at different angles of the survey area and adjacent area. In general this needs to be done at orientations close to normal to the dominant plane of interest. So if it is a vertical face of an outcrop then you would use a digital SLR handheld camera. If the plane of interest is the surface of the earth across which one is going to collect geophysical data then it needs to be done from above. The easiest way to acquire such photo is with unmanned aerial vehicles (UAV).

2. Note, it is vital that the photos are geocoded; that is that they have known gps locations in the headers of the images, or that you associate with an external data file.

3. Use an existing coarse base map, such as downloaded online from GlobalMapper or GoogleEarth to outline the area of interest.

4. Devise a plan for acquisition, including some estimate of the number, distance, resolution and quality of photos needed. If using a UAV then you should use DJIFlightPlanner and set these in the program.

5. Collect the photos with ideally some symbols or shapes laid on the ground to use with georeferencing (see separate sheet on georeferencing and ground control points).

6. Process the photos as discussed below, and if need be collect additional photos and merge with existing data. Note, it is generally not necessary to have the symbols or shapes laid out again.

Processing of photos

1. Download the photos from the SD card. Some of the monitors have these, some do not.

2. Load the photos into MetaShape (formally known as PhotoScan) a photogrammetry software package. It is installed on all computers in the Geology computer lab as well as the workstation lab in the IQ Center.

3. Process the photos in MetaShape. The program is very easy to use, but model runs can take hours to run, so you need to find a machine that is free and let it run.

4. Basically the steps involved are: Align Photos, Build Dense Cloud, Build Mesh, Georeference, Make DEM in that order. Optionally one can do a Textured Model and Orthoimage. You can also run smoothing on the resulting mesh, and potentially point classification, filtering, and particular editing of the point cloud to get rid of undesirable points. Dave Pfaff, the IQ Center director, or I can show you how to do it if you have questions, but you should read the manual first.

5. Process the data including georeferencing. Note, if the photos are geocoded then you will already be close in terms of georeferencing, but if you do not have an extremely good gps location for the phots, then you need to georeferenced using ground control points (GCP). These can be obtained with a differential GPS and/or with other surveying. The key steps in MetaShape for georeferencing are that you need to identify the GCP in the model, and then import the lon lat locations with the same names. MetaShape will then adjust the model it fit these known points. You have to do this before building a DEM or Orthoimage.

6. Export the DEM and Orthoimage from MetaShape and load them into GlobalMapper for use as a base map.