Terrestrial Photogrammetry for Architects, Engineers, and Geoscientists

Syllabus

1. Overview

- Utility of photogrammetric analysis
- Example applications
- Special advantages, limitations

2. Essential Theory:

- Principles of single image formation
- Principles of stereometric image formation
- Camera characteristics
- Extraction of coordinate data
- Model accuracy: Range to object, image resolution, camera position

3. Single Camera Example:

- Exterior orientation from ground control
- Topographic assumptions
- Extraction of image space coordinates
- Unknown camera

4. Practice: Tabletop Model

- Initial model setup: import images, define camera
- Fiducial marks (for film images)
- Point selection and reference
- Initial 3D model formation
- Errors, refinement of point selection
- Additional points, more errors and model refinements
- Lines and surfaces
- Surface rendering
- Output: Coordinate files, CAD formats, orthorectified images.

Projects

4. Geotechnical Example 1: Rock outcrop (Boulder Canyon)

- Extraction of rock joint surface orientations
- Joint intersection calculations

5. Glaciological Example: **Glacier Mapping (Arapaho Glacier)**

- Typical issues in glaciological problems
- Ground control
- Optimizing resolution and range
- Extraction of topographic profiles

6. Architectural Example 1: Building Facade on CU campus

- Typical issues in architecture problems
- Curves, planar constraints
- Extraction of 3D measurement data from images
- Importation to CAD

7. Architectural Example 2: Historic structure

- Typical issues in historic documentation
- Extraction of orthorectified facades
- Using photogrammetry with HABS/HAER Documentation

8. Field Example: Project planning, execution and analysis

- Project design
- Optimizing resolution and range
- Ground control
- Defining objectives and choosing camera positions