

Single Frame Orthorectification and Block Triangulation

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Single Frame Orthorectification

- The process of orthorectifying one image at a time using space resection *.
- Must have 3 GCPs (Ground Control Points) for each photo
- Then you can compute the camera angle at the time the photo was captured with a DEM
- These images exhibit alignment errors because the error is not distributed over the block

Space Resection

- “The determination of an image's position and orientation parameters with respect to an object space coordinate system in which a certain amount of ground control points are reasonably distributed.” (Chen Yi)
- It describes the relationships among image coordinates, ground coordinates, the exposure station position and the angular orientation of the photograph.

Block Triangulation

- “Establishes a mathematical relationship between the images contained in a project, the camera or sensor model and the ground.” (Field Guide)
- Necessary input for orthorectification, DEM and stereo pair creation
- Finding GCPs photogrammetrically is preferred because it costs less

Block Triangulation Process

- Manually measure two points that are on both images (called tie points, see lab 2 for example)
- Determine ground coordinates using analog or analytical stereo plotters
- These measured points are then referred to as GCPs even though they might not physically be on the ground.

Analytical
Stereoplotter
(Wikipedia)



Bundle Block Adjustment

- Requires 60% overlap of the photos with tie points and vertical control points (perpendicular to the flight direction)
- It recreates the 3 rotation angles at the time the photo was taken
- Gives the exterior orientation parameters
- Determines ground coordinates of tie points
- Minimizes and distributes error over the block

Sources

- ERDAS Field Guide Volume 2
- Yi, Chen et al. "Performing Space Resection Using Total Least Squares." *International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences*. XXXVII.B3b (2008): 11-14. Print.
- Lillesand, T.M. et al. 2004. *Remote Sensing and Image Interpretation*, 5th edition. John Wiley & Sons.
- *Exterior Orientation Parameters* by Karsten Jacobsen, Institute for Photogrammetry and GeoInformation. Hannover, Germany.

Quiz Questions

1. If you have 10 photos you want to orthorectify using the Single Frame process, how many ground control points would you need?
2. What information is necessary, along with the GCPs, to correct geometric errors?
3. Why are photogrammetrically collected GCPs preferred over physical GCPs?
4. What are the exterior orientation parameters?

Questions?