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Exercises in photogrammetry using PhoX

Module 3: Determination of image scale

Objectives:

- Determination and interpretation of the image scale number
- Definition and input of object coordinates (XYZ)
- Identifikation of control points
- Measurement of image coordinates in a digital image (with zoom function)
- Accuracy analysis

Task 1: Determination of image scale

Description:

Given a scanned aerial image of a metric aerial camera Zeiss RMK with standard lens of a region in the Bavarian Forest. The image scale shall be determined by the use of given control points.

Processing steps:

- Create a new project (*Project→New project*)
- Load the example image "4_321_k.bmp" (*Images→Load image*).
- Load the related camera file "rmkbayern.cam" (*Cameras→Camera list* Load) and assign it to the loaded image.
- Measure the fiducial marks for interior orientation (*Measure→Interior orientation*).
- Superimpose the image coordinate system (*Edit→Options/Graphics*).
- Create a new 3D object with *Objects→Object properties* or by double-clicking on *Objects* within the project tree.
- Import the given control points from "control point coordinates.xyz" with *Import→Object elements* or with *Objects→Object properties→Object coordinates* > *Import*. Be sure to use the correct metric unit.
- Enter the control point coordinates that are given in file "Control points overview.pdf" (*Objects→Object properties*/*Object coordinates*: Popup menu: *New*).
- Measure the image coordinates of the control points (*Measure→Image coordinates*) and calculate the average image scale. See "Control points overview.pdf" for the location of points.
- Save your data as a new project archive (*Project→Save project as* ... > *project archive*).

Test questions:

1. Calculated the mean image scale with three different distances
2. Mean flying height [m]
3. Maximum height difference in terrain

Task 2: Extended experiments

- Execute repeated measurements of the control points. Which repeating precision can be achieved in image space?
- Calculate all possible combinations of distances between control points and related image points. How large are the deviations in image scale and what is the reason?

- Calculate the relative image scale error by strict error propagation. What is the effect of scale error on measured distances or areas?