



Exercises in photogrammetry using PhoX

Module 2: Digital camera and distortion parameters

Objectives:


- Definition and use of photogrammetric camera data
- Differences between analog and digital cameras
- Effect of radial-symmetric distortion
- Effect of additional parameters
- Properties of a colour image

Task 1: Image of a digital camera

Description:

The given digital image has been taken by a digital camera Fuji S1pro with 6 Mpixel sensor and 14mm lens. The camera was calibrated by a test field procedure.

Processing steps:

- Create a new project (*Project*→*New project*)
- Load the example image "iapg_hof.jpg" (*Images*→*Load image*)
- Load the associated camera file "fuji.cam" and assign it to the loaded image (*Cameras*→*Camera list*). Check the camera parameters with respect to the used digital camera Fuji FinePix S1Pro.
- Superimpose the image coordinate system (*Edit*→*Options/Graphics*).
- Open the coordinate display with *Window*→*Mouse coordinates* and activate the mode *continuously*.
- Move the cursor over the image and observe pixel and image coordinates and the correction values dx' , dy' .
- Select the line cursor mode  and observe the colour values along the cursor line. Alternatively, open the diagram window (*Window/Diagram window*) and analyse the colour values.
- Save your data as a new project (*Project*→*Save project as ...*).

Test questions:

1. Pixel size of the digital image in mm
2. Technical data of the camera
3. What is the meaning of the principal point H' ?
4. Reasons and definition of radial-symmetric distortion
5. Maximum correction values of imaging errors
6. Which numerical interval is covered by the colour values?
7. How are RGB colour values generated for a pixel?

Task 2: Extended experiments

- Start the function *Graphics*→*Distortion curves* and analyse the resulting figures when different distortion effects are switched on or off (modify *Vector scaling* if necessary). What is the meaning of the second zero-crossing of the distortion curve?
- Calculate the histograms of the single colour channels and their mean values with *Images*→*Properties/Image/Histogram*: Calculate.

- What is the meaning of the displayed values of pixel transformation under *Images→Properties/Transformations/Parameters*?