Sample alignment camera calibration

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European Spallation Source

2018-11-15

ESS sample visualization calibration

- Objectives:
  - Image calibration using calibration target
  - Determine pixel size without prior knowledge of lens focal length or camera position relative to sample
  - Allow camera images to be used for sample position selection

Figure 1: Camera layout

ESS calibration target
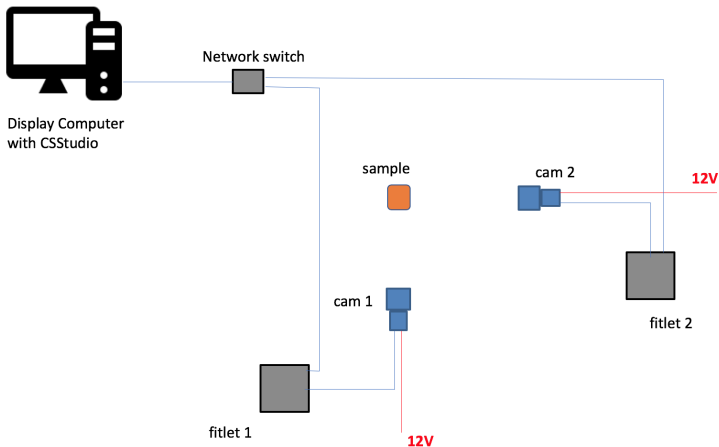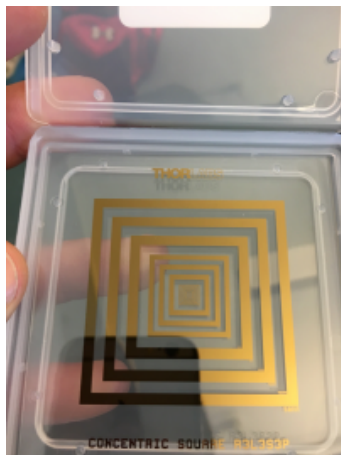

Figure 2: Calibration target

Raw image

Figure 3: Raw image

Image contour detection
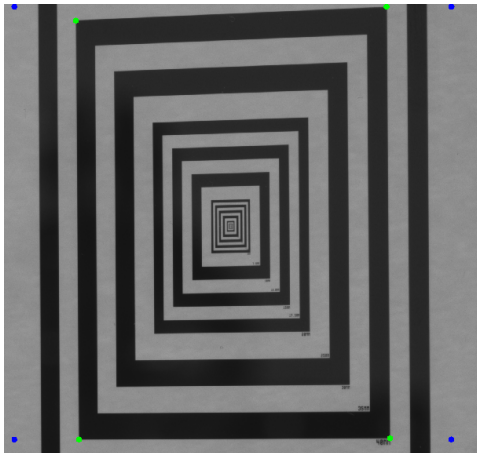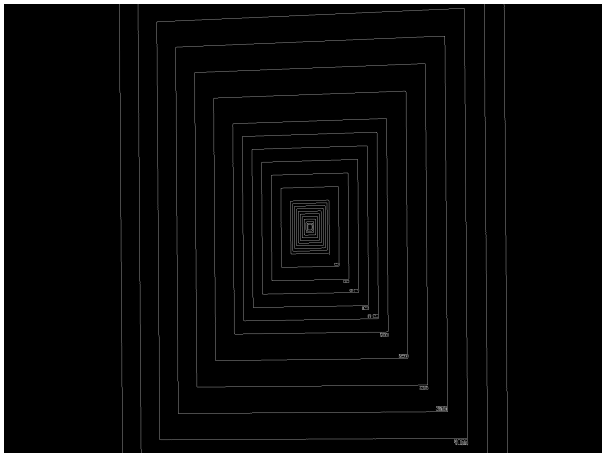
Figure 4: Image edge detection using OpenCV Canny algorithm
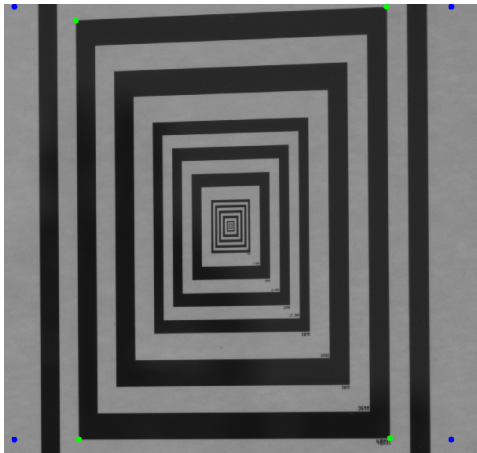
Corner identification

Figure 5: Corner identification using OpenCV Canny algorithm
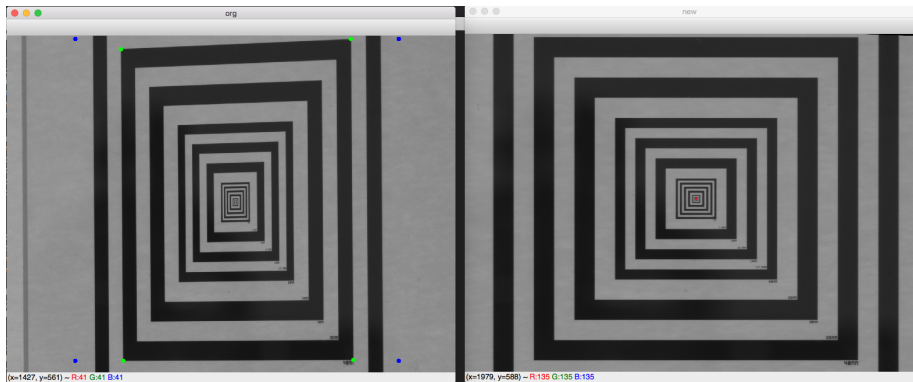
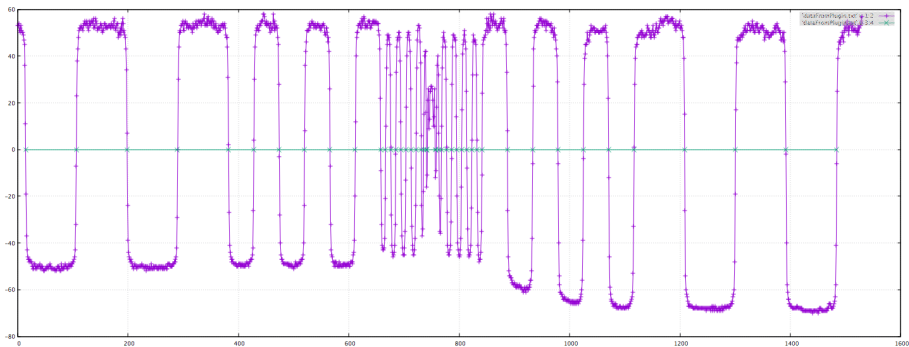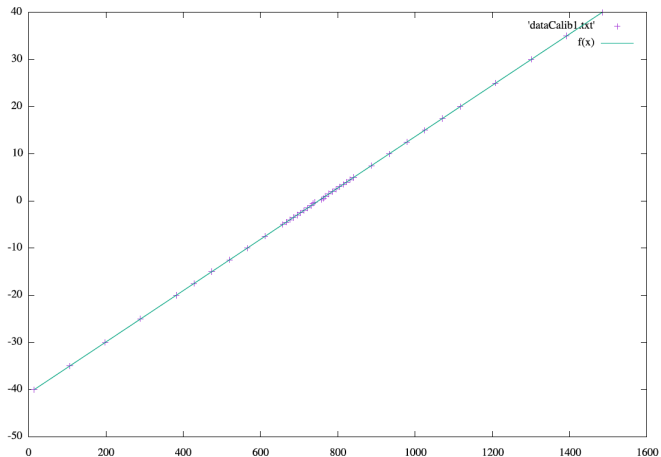Figure 6: Image before and after correction using rotation matrix

Figure 7: Center line intensity plot

Pixel size calculation

Future activities

- Complete CS-Studio application development
- Complete testing with users
- Publish code in areaDetector repository

Acknowledgements

- Tomasz Brys (ESS)
- Anders Petterson (ESS)
- Malcolm Guthrie (ESS)

Code

- Code available at:
  https://github.com/waynelewis/ADPluginCalib
- Still in active development, and will migrate to an official location

Thank you

Backup slides

Image alignment correction

- Corrects for camera being imperfectly aligned with target
- Uses contour detection algorithm
- OpenCV Canny algorithm
- Find corners of largest continous contour
- Calculate corner positions of undistorted square
- Calculate transformation matrix to convert distorted quadrilateral to rectangle
- Identify center line of rectangle based on corrected image

Image pixel size calculation

- Calculate image intensity on slices through middle of image in X and Y
- Image center based on corrected corner locations
- Find edges using zero-crossing algorithm
- Discard smaller values than 2.5 mm (some assumptions are made here)
- Plot pixel location against actual size increments (prior knowledge of calibration target dimensions is required)