A brief technical overview of Flexible Camera Calibration

12 images of the pattern file with different angles, rotations and tilts are taken, shown as below.

A picture containing indoor, table, wall, photo

Description automatically generated

Then grid corners are manually extracted:

A picture containing object, table, indoor

Description automatically generated

Begin the calibration:

A screenshot of a cell phone

Description automatically generated

A screenshot of a cell phone

Description automatically generated

According to the paper, the tool first runs the initialization based on the closed-form solution, then it provides optimization using maximum likelihood estimation. The errors are quite big at this stage.

A close up of a map

Description automatically generated

The extrinsic parameters of the camera-centered view:

A close up of text on a white background

Description automatically generated

I tried another round of recomputing corners and then re-calibrating. It can be observed that after recalibration, both uncertainty and errors significantly declined.

A close up of a piece of paper

Description automatically generated

The updated extrinsic paramters of the camera-centered view:

A close up of text on a white background

Description automatically generated

The calibration results after recomputing corners:

Calibration results after optimization (with uncertainties):

Focal Length: fc = [ 9306.23266 7476.69010 ] +/- [ 123.85279 80.13645 ]

Principal point: cc = [ 2015.50000 1511.50000 ] +/- [ 0.00000 0.00000 ]

Skew: alpha\_c = [ 0.00000 ] +/- [ 0.00000 ] => angle of pixel axes = 90.00000 +/- 0.00000 degrees

Distortion: kc = [ -2.44052 37.64722 -0.01853 -0.11023 0.00000 ] +/- [ 0.19041 6.62915 0.00169 0.00342 0.00000 ]

Pixel error: err = [ 1.65362 1.64747 ]