OVERVIEW

Each camera has own intrinsic parameters and extrinsic parameters. Intrinsic parameters don't depend on the scene viewed. So, when we once estimate it, we can re-use. Extrinsic parameters describe its orientation in the world.

We know that the equation:

$$M = K\,(R \mid t)$$

Where,

- M represents projection matrix(3x4),
- K represents intrinsic parameters matrix(3x3),
- R represents rotation matrix (3x3),
- T represents transition (3x1)

METHOD

Camera calibration is the process of estimating these parameters. Procedure:

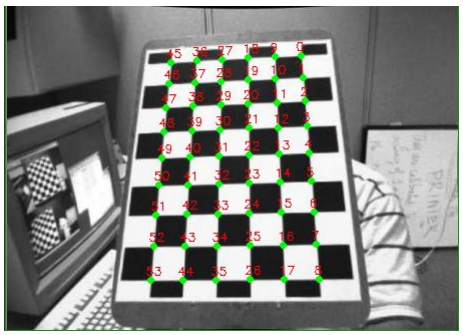
- Select chessboard with 6x9 internal points as a calibration pattern
- Take 20 pictures of the target at different orientations and distances for each camera
  - calibration_comp contains pictures taken by computer webcam
  - calibration_logi contains pictures taken by external webcam

find_intrinsic_params function in my code, uses the opencv calibrateCamera functions to get camera matrix and distortion coefficients and returns them. These camera matrix is the intrinsic parameters represented by K.

When we get the corners in the calibration patterns:

- the point in the index 0 is the left top corner,
- the point in the index 8 is the left bottom corner,
- the point in the index 45 is the right top corner and
- the point in the index 53 is the right bottom corner,

So, these 4 points were used for get the projection matrix.



get_projection function in my code, uses the opencv solvePnP function to get rotation vector and transition vector. This function uses the image coordinates and the real world coordinates of the selected 4 points. Then return the projection matrix according to equation.

find_positions function in my code, uses these equations and estimate the real location:

$$P1 = M1xP$$

$$P2 = M2xP$$