TRINITY COLLEGE DUBLIN
THE UNIVERSITY OF DUBLIN

Faculty of Engineering, Mathematics and Science
School of Computer Science & Statistics

Augmented Reality (CS7034)

The goal of this exercise is to augment an object in your scene using a chessboard as a reference tracking system.

1. Install OpenCV on your computer, following the instructions for Windows or Linux respectively.
2. Print the chessboard provided for the exercise on blackboard and place it on a hard surface.
3. Start streaming from your webcam using OpenCV (See code example here).
4. Detect all internal chessboard corners using the findChessboardCorners() function from the calib3d module.
5. Refine corner locations using the cornerSubPix() function from the calib3d module.

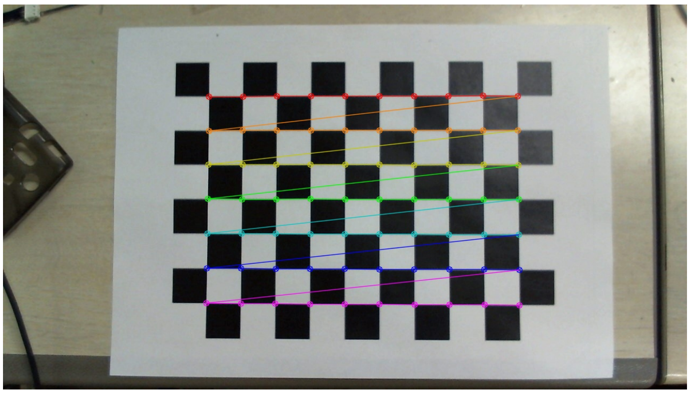

Figure 1: Chessboard inner corners detection

6. Visualize the chessboard corners using the drawChessboardCorners() function. You should visualise something similar to Fig. 1.
7. Calculate the intrinsic parameters, represented by the 3×3 calibration matrix K and the distortion coefficients of the camera respectively. You can use the OpenCV example code provided here.
8. Finding the camera pose (extrinsic parameters) with respect to the chessboard coordinate system, $2D \leftrightarrow 3D$ correspondences are required. Knowing the location of the chessboard corners in the image from step 4 and 5, the corresponding X, Y coordinates could be calculated based on the pattern size of the chessboard and Z could be set to 0. The solvePnP() function should be used for this purpose. An example could be found here.

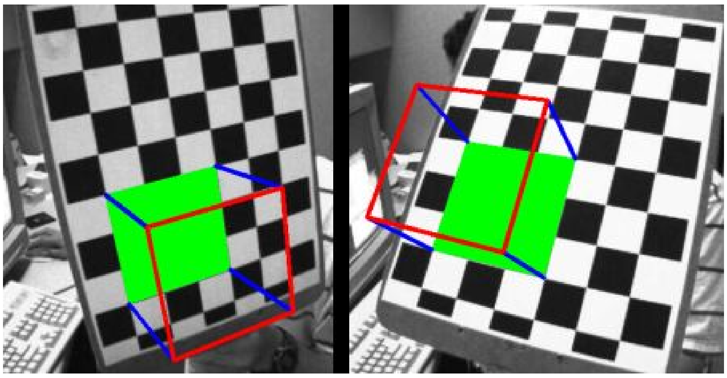

Figure 2: Rendering a cube

9. Draw object (e.g. cube) and render it (see Fig. 2). You can also use OpenGL if you would like to render more complicated figures. A Python example could be found here.