This is basically the code for full camera calibration and to calculate the 3D locations of points with respect to the floor plan. It has 3 important steps.

1. Intrinsic Calibration -- This part of the code reads about 20 different images of chessboard for every camera that needs to be calibrated and outputs Camera Matrix and the distortion coefficients.

2. Marker detection -- For the purpose of stereo calibration, we have used about 8 markers placed in a L - shape along vertical and horizontal planes. These markers are used as the Key Points for calculating the fundamental matrix in the next step. Hence, these markers need to be identified which is carried out in step 2. This step inputs images from each camera, undistorts it and finds the centers and corner points of the markers used. It then outputs an XML file for every image (1 image per camera).

3. Stereo Calibration -- In this step, we input the results of the step 1 and 2. Due to variations in the lighting conditions, there might be some non-markers identified as markers or some markers not being identified. The output screen and the images guide you through several steps which make sure all the markers are identified correctly. Here, we can add new points and delete any points we feel are not right. Then, we can change the matches between the images in case of errors. I have tried to automate the process as much as possible but does not work with all sets of images because there are lots of parameters that needs to be considered. Once, this is done, the program calculates the Fundamental Matrix, Essential Matrix, Projection Matrices of 1 camera 1 and camera 2 and the center of the second camera. Then, we perform triangulation of the marker points to obtain the 3D locations of the markers. Since, these are in camera co-ordinate system, I converted them into floor coordinate system by making a small assumption that there is no rotation with respect to z axis. The 3D locations are shown in the output screen while the camera parameters are stored in an XML file.

Something novel with my approach here is that I have used markers (3 squares inside each other) to calculate perform stereo calibration. This procedure got us results (3D points) with less than 10% error. Also, since it is very difficult to analyze the locations with respect to the camera co-ordinate system, I came up with a technique to convert it into the floor coordinate system with the help of simple and very little measurements.