

# Programming Assignment 4

CS 485

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## Camera Calibration

This assignment uses the *calibrateCamera* function in OpenCV which maps vectors of known world coordinates to vectors of known image coordinates. It computes various parameters such as the rotation vectors, translation vectors, distance coefficients, and the intrinsic parameters of the camera. OpenCV also provides a *projectPoints* that takes the estimated parameters in *calibrateCamera* to project the world coordinates provided as input to the estimated image coordinates. Below are the results of using *calibrateCamera* and *projectPoints* on the fifteen chessboard images.

Image Number	Average Projection Error (in pixels)
1	0.289775
2	0.274134
3	0.273236
4	0.249002
5	0.266986
6	0.291165
7	0.283195
8	0.28653
9	0.320945
10	0.294734
11	0.327822
12	0.314313
13	0.352102
14	0.277747
15	0.259884
All Images	0.290771

## Discussion of Results

The average projection error for all the images indicates that the parameters of the projection are correct up to around 0.3 pixels. For some images, the error is as low as 0.249002 pixels and as high as 0.352102 pixels with a standard deviation of 0.02672 pixels. Qualitatively, these results are very good because they are accurate to less than 1 pixel.

## Errors per Point per Image

Chart on the next page.

Image Number vs. Pixel Error

