Assignment 4: Camera Calibration and Pose Estimation

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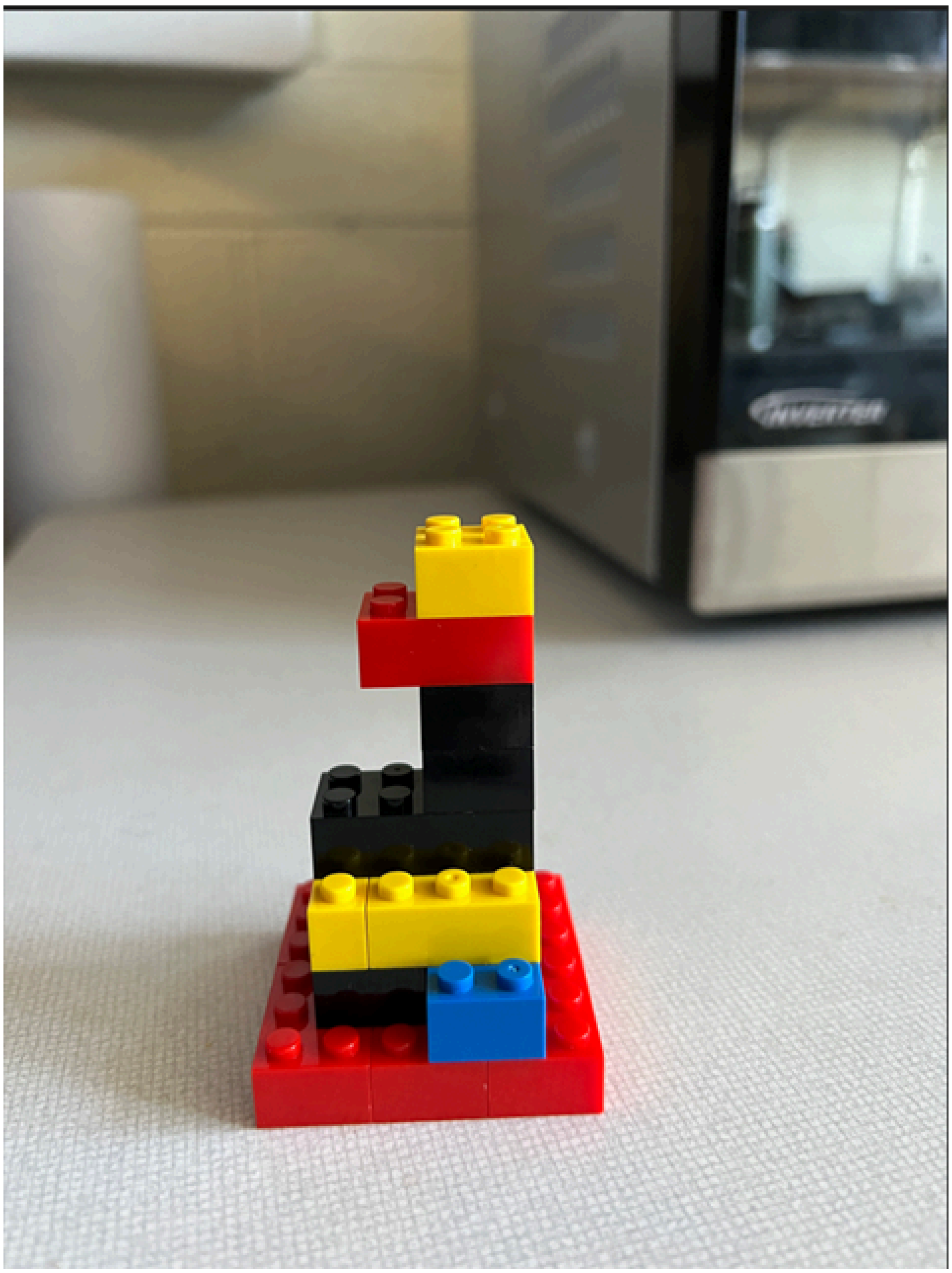
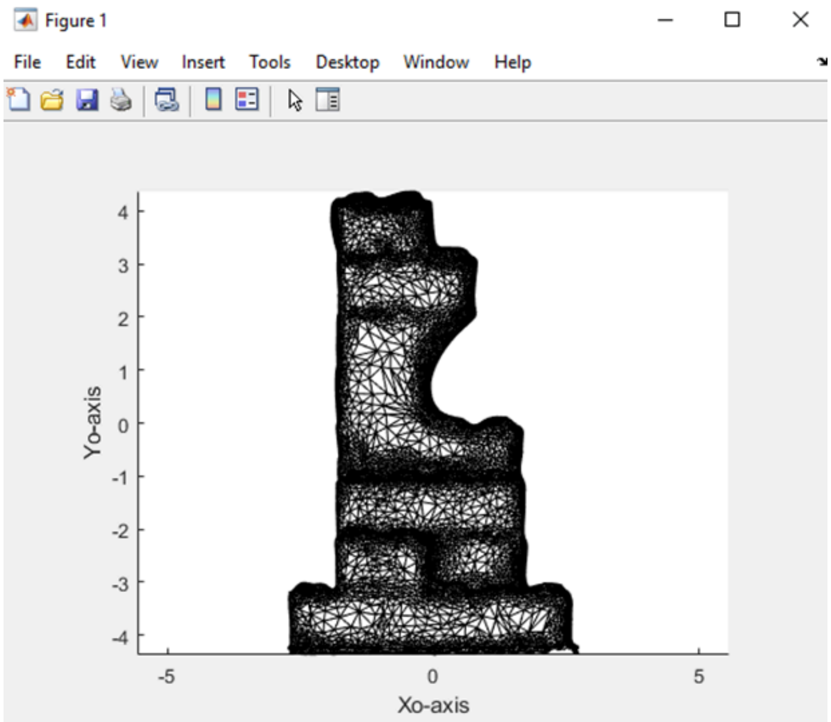
CS 473 Computer Vision

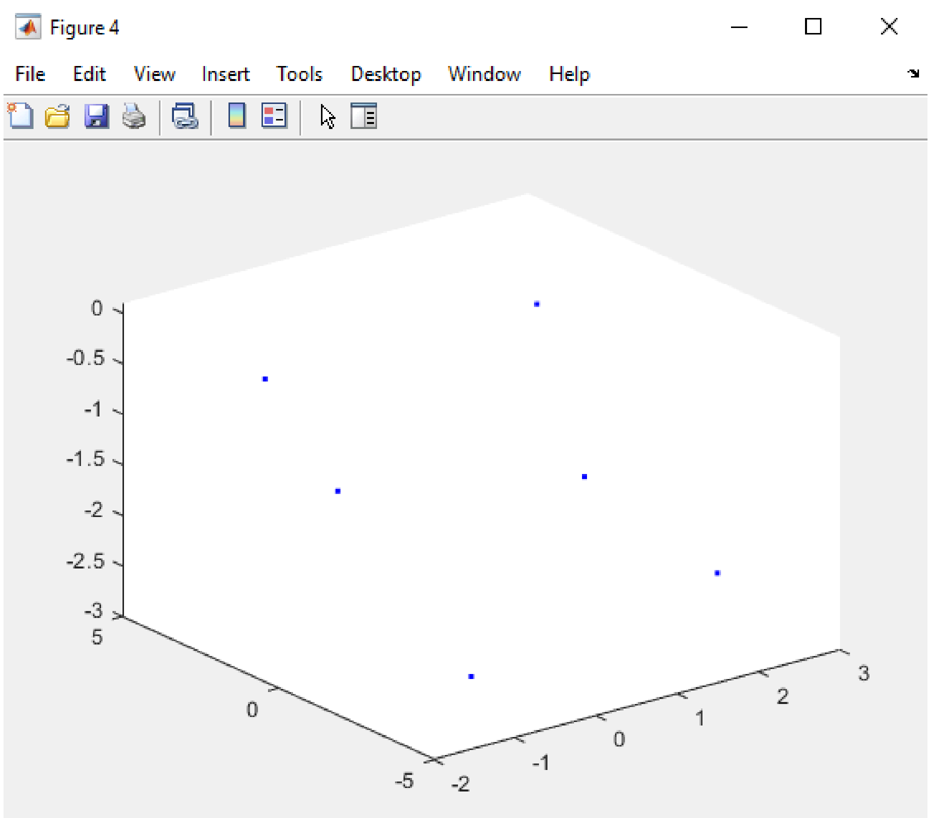
Base Photograph for model:

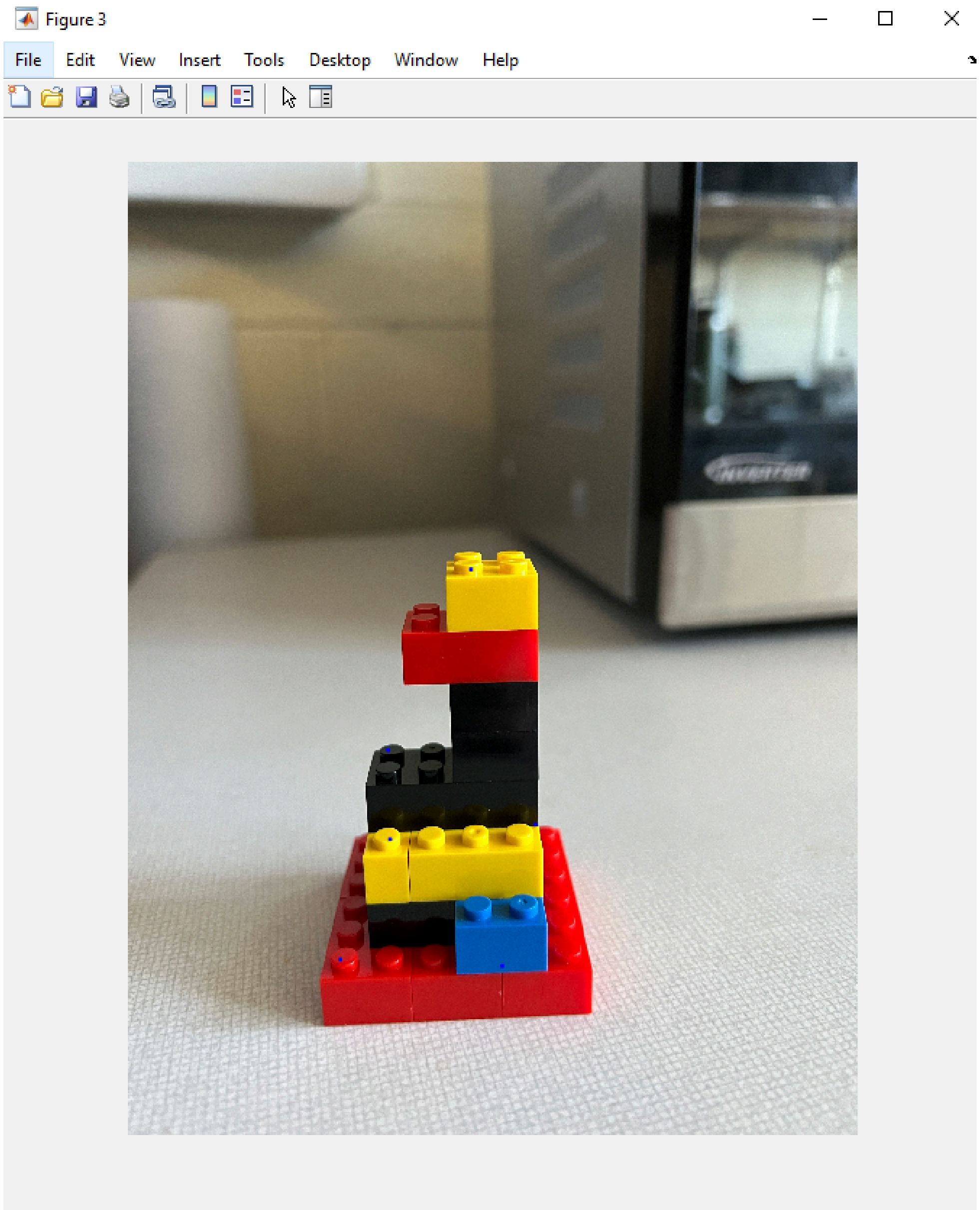


1 CAMERA CALIBRATION AND POSE ESTIMATION WITH AN ARBITRARY OBJECT

1.1 Mesh and Points







1.2 Camera Projection Matrix

M:

-247.16	-15.193	-12.814	1.35e+03
-70.122	-214.54	-117.51	2.46e+03
-0.0256	-0.0052	-0.0096	1

1.3 Estimated Intrinsic and Extrinsic Parameters

K

2.0928e+08	2.0928e+08	8.4368e+03
0	7.5154e+03	5.2139e+03
0	0	1

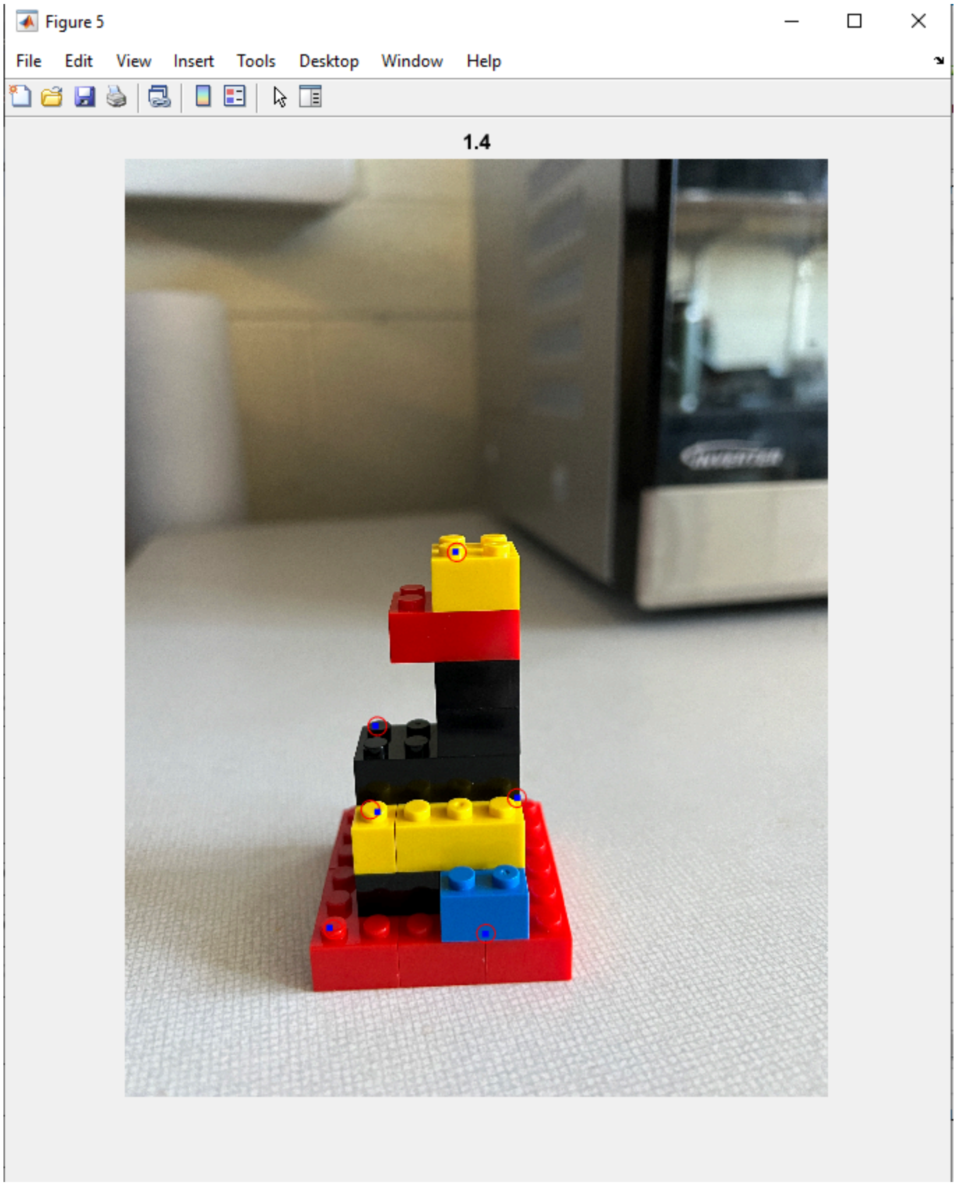
R

1.8593e+12	1.1429e+11	9.6397e+10
1.8594e+12	1.1435e+11	9.6429e+10
8.81e+7	4.4816e+7	2.5910e+7

t

-1.0155e+13
-1.0156e+13
-8.7110e+8

1.4 Verifying Intrinsic and Extrinsic Parameters



Sum Squared Difference:

1.3314e+03	130.8150

2 CAMERA CALIBRATION USING A PLANAR CHECKERBOARD

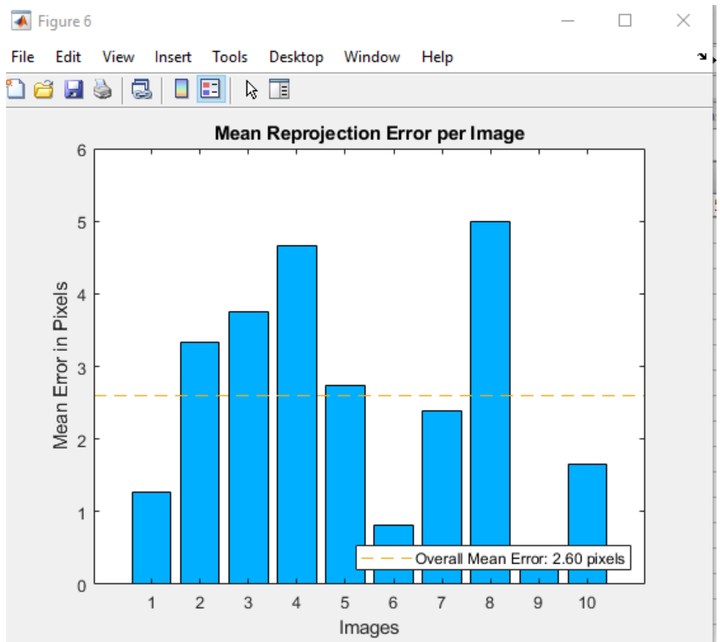
K checker

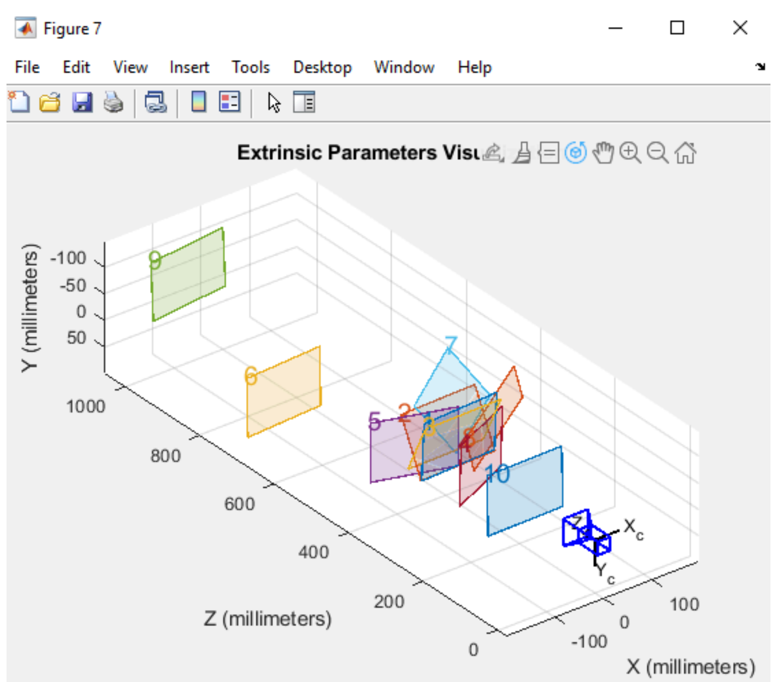
2.8473+e03	0	2.0104+e03
0	2.8473+e03	1.5445+e03

0	0	1

There is a significant difference between K and K checker. One particular difference stands out: the top middle element in K checker is 0. This difference could be due to the difference in difficulty between estimating the location of a complex lego structure and a few clearly defined planes of squares, especially considering that the checkerboard has a high contrast.

Results of Camera Calibration:





3 MOVING OBJECTS AROUND IN AN IMAGE

We took the original 3D model of the lego object in the form of a list of points and ran them through three translations composed of only rotations and translations. We then ran two different groups (one for each different K) through the transformations to account for the camera's intrinsic and extrinsic parameters, in order to place the model into an image. Unfortunately, this code did not work and we could not figure out why.