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Intro to Computer Vision

Laboratory 6 – Camera Calibration

Introduction

In this lab, we analyze the problem of camera calibration, to detect and isolate different distortions in an image capture. Geometric camera calibration, also referred to as camera re-sectioning, estimates the parameters of a lens and image sensor of an image or video camera. Our goal for this lab was to use these parameters to correct for lens distortion, measure the size of an object in world units, and determine the location of the camera in the scene. We used the Tsai's Camera Model and Calibration Equations to determine the real position not the camera in the world co-ordinate frame and to also calculate the focal distance and reduce the effects of radial distortion. Calibration relates the image point to the ray's direction.

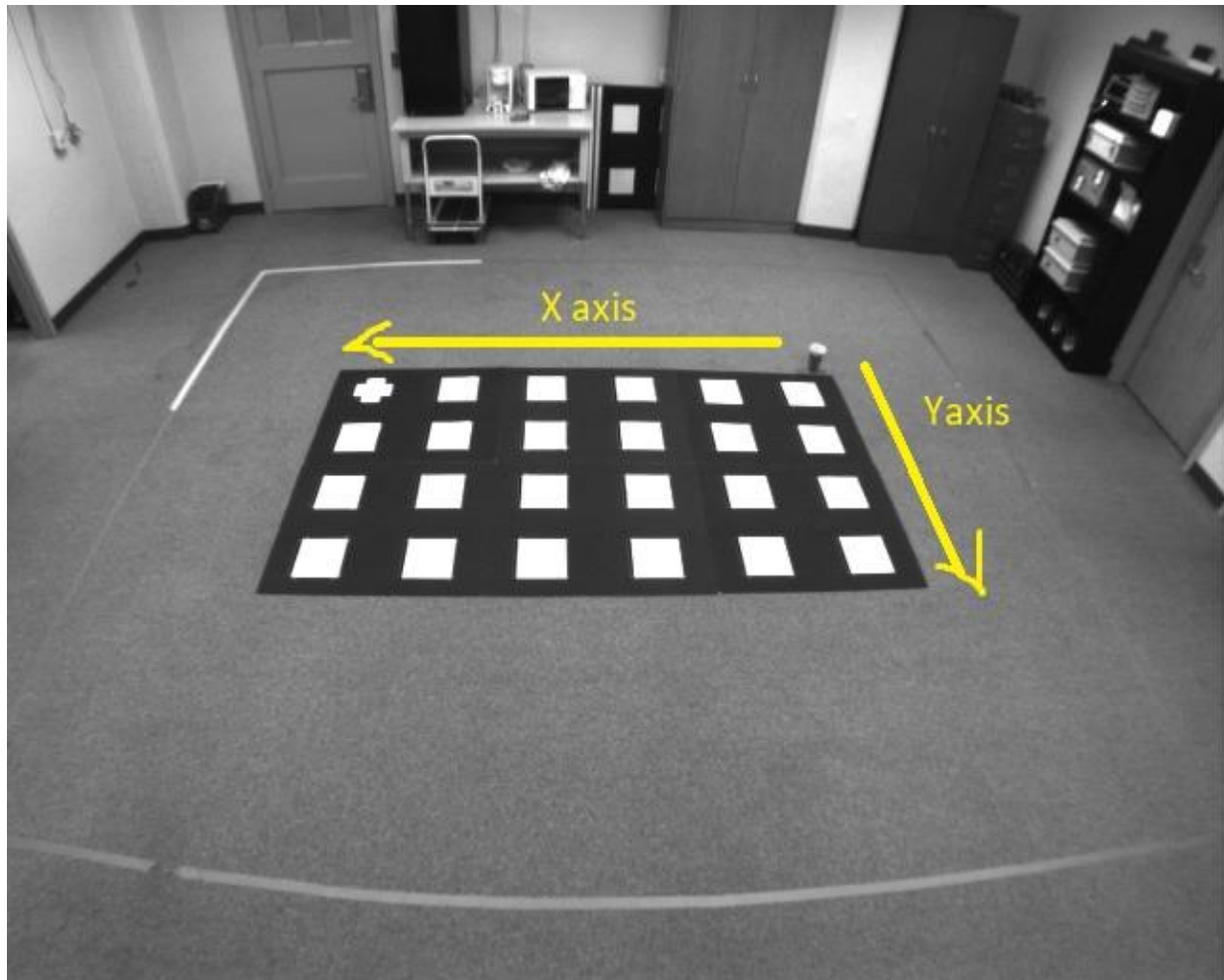
Implementation

In this assignment, we learned how to configure 6 cameras focusing on the same grid where we placed the grids by own. We also selected the correct x and y axis as mentioned in the class, please note that x coordinates distance was near around 508mm and y axis coordinates where around 406mm which was set by us. We also configured all the 6 cameras and got the desired results as explained in the class.

Below is the table showing our results based on our implementation:

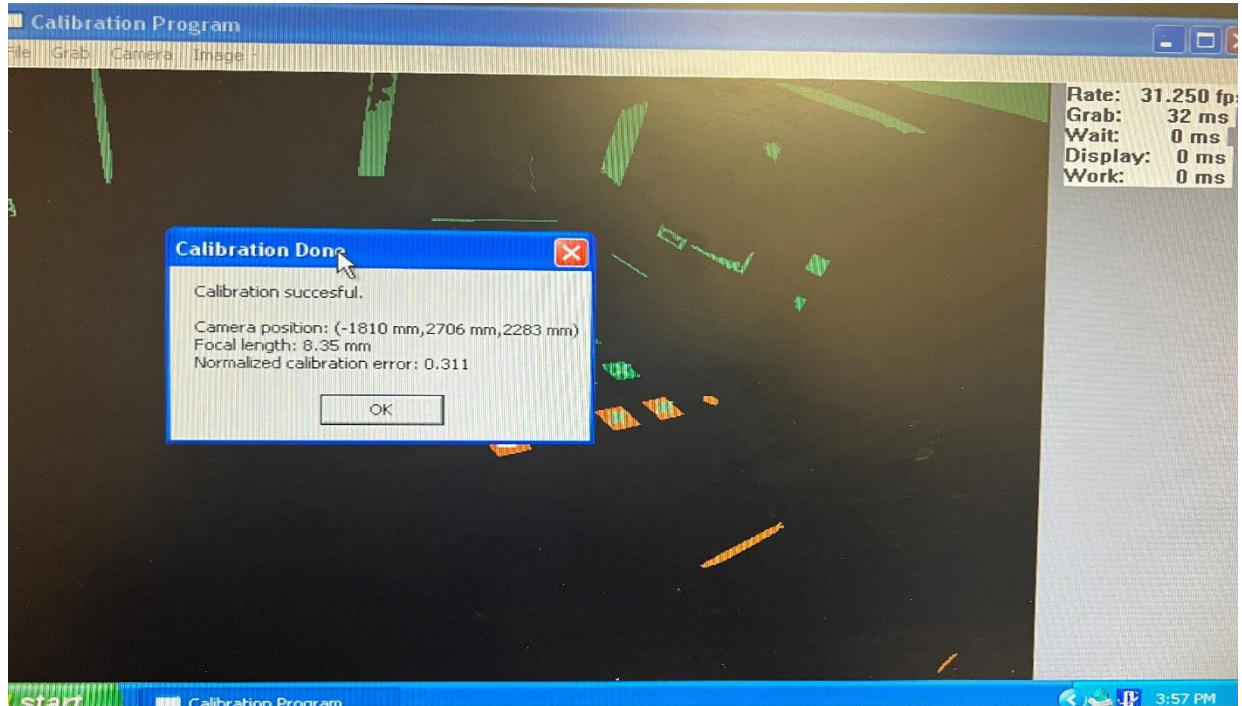
Camera No.	X(mm)	Y(mm)	Z(mm)
Camera 0	-1810 mm	2706 mm	2283 mm
Camera 1	1443 mm	3213 mm	2245 mm
Camera 2	4580 mm	3273 mm	2335 mm
Camera 3	4320 mm	-2136 mm	2230 mm
Camera 4	1262 mm	-2300 mm	2361 mm
Camera 5	-1928 mm	-2100 mm	2290 mm

X and Y axis selection:

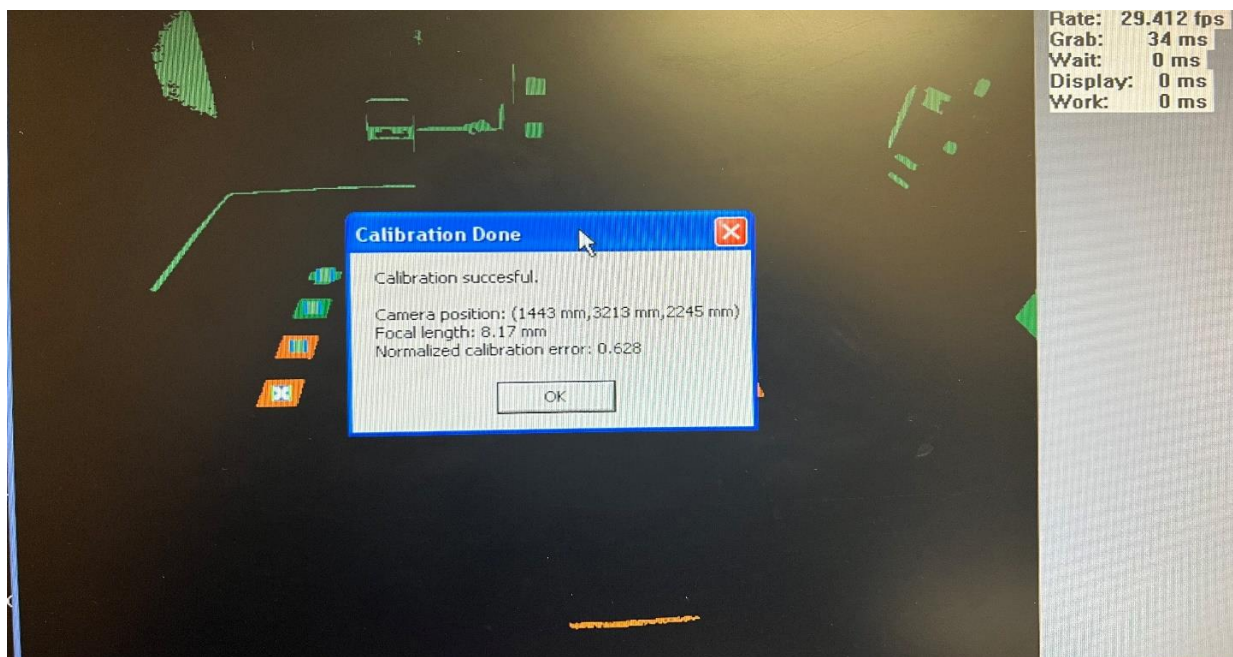


Results: (Please note that all the pictures were taken buy an iphone & not screenshots)

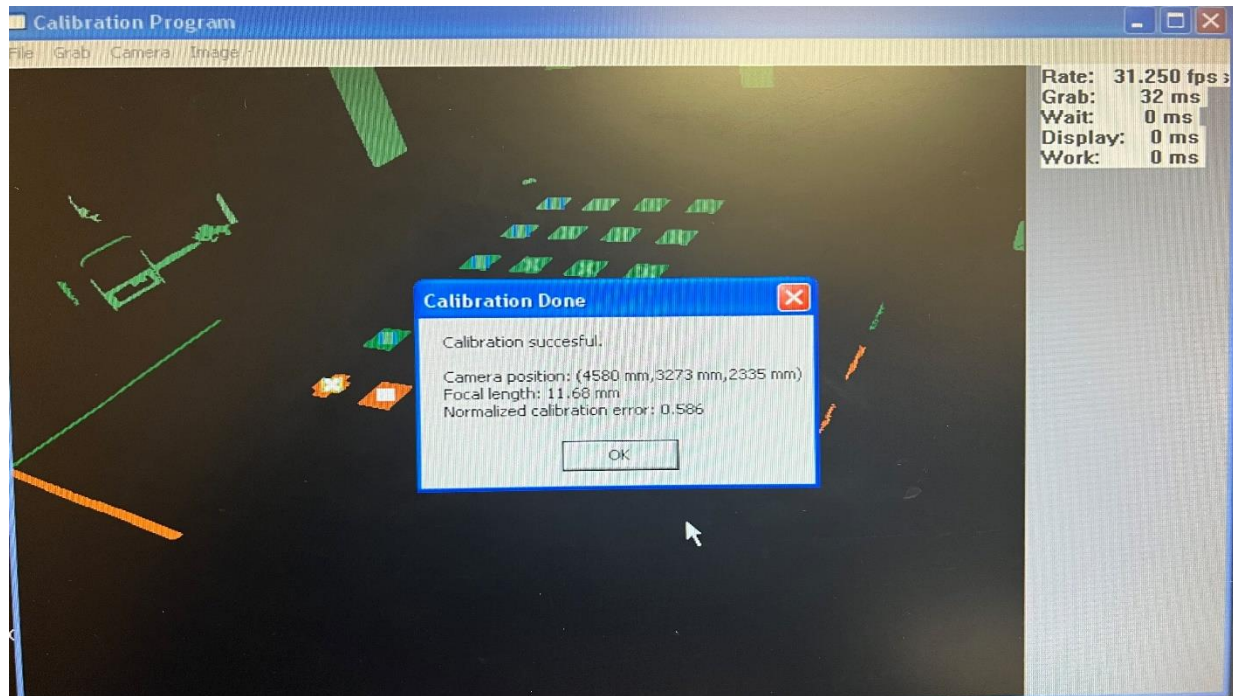
Camera 0: In this result, Camera 0 was set to threshold 210



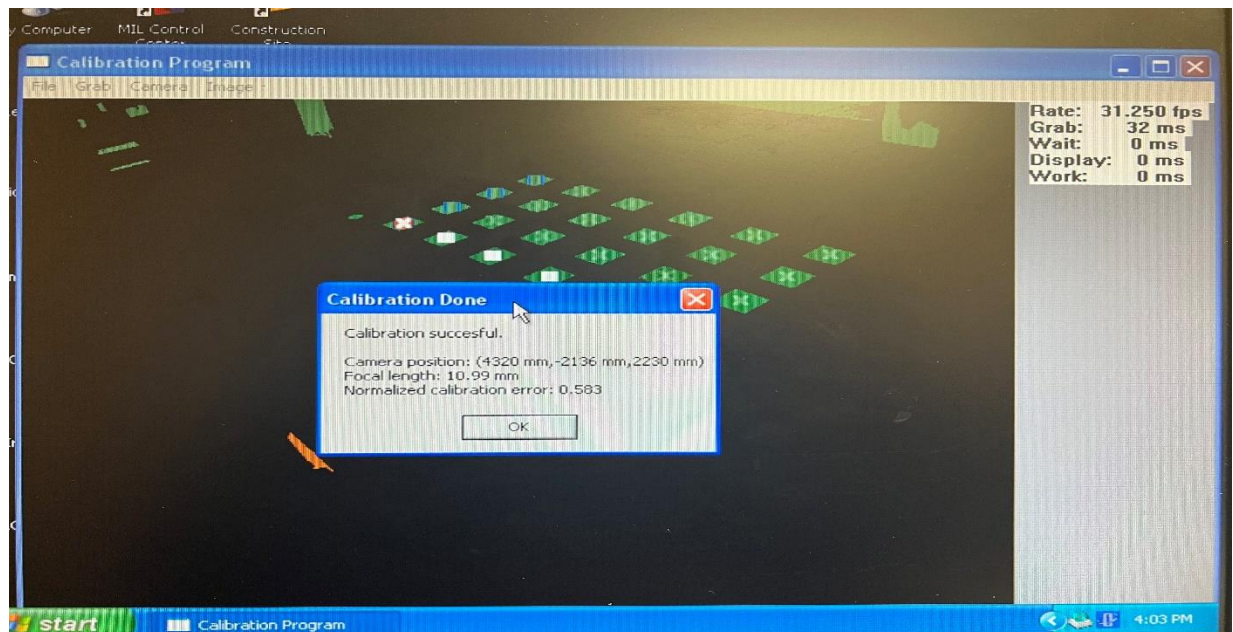
Camera 1: In this result, Camera 1 was set to threshold 160.



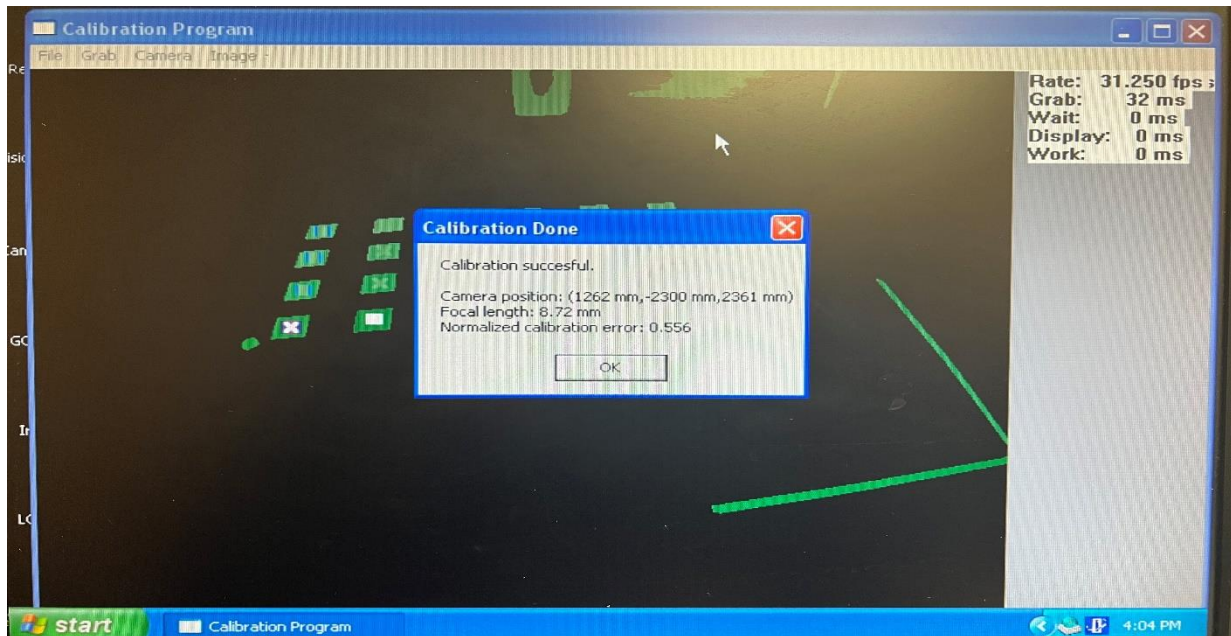
Camera 2: In this result, Camera 2 was set to threshold 170.



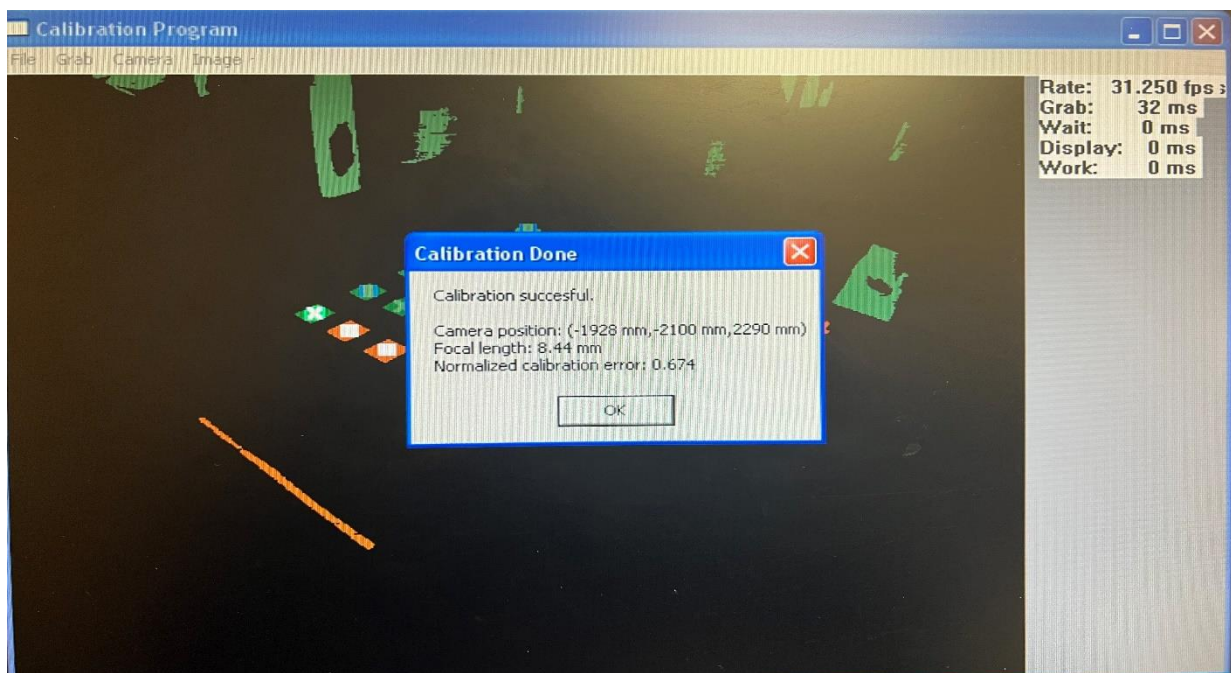
Camera 3: In this result, Camera 3 was set to threshold 150.



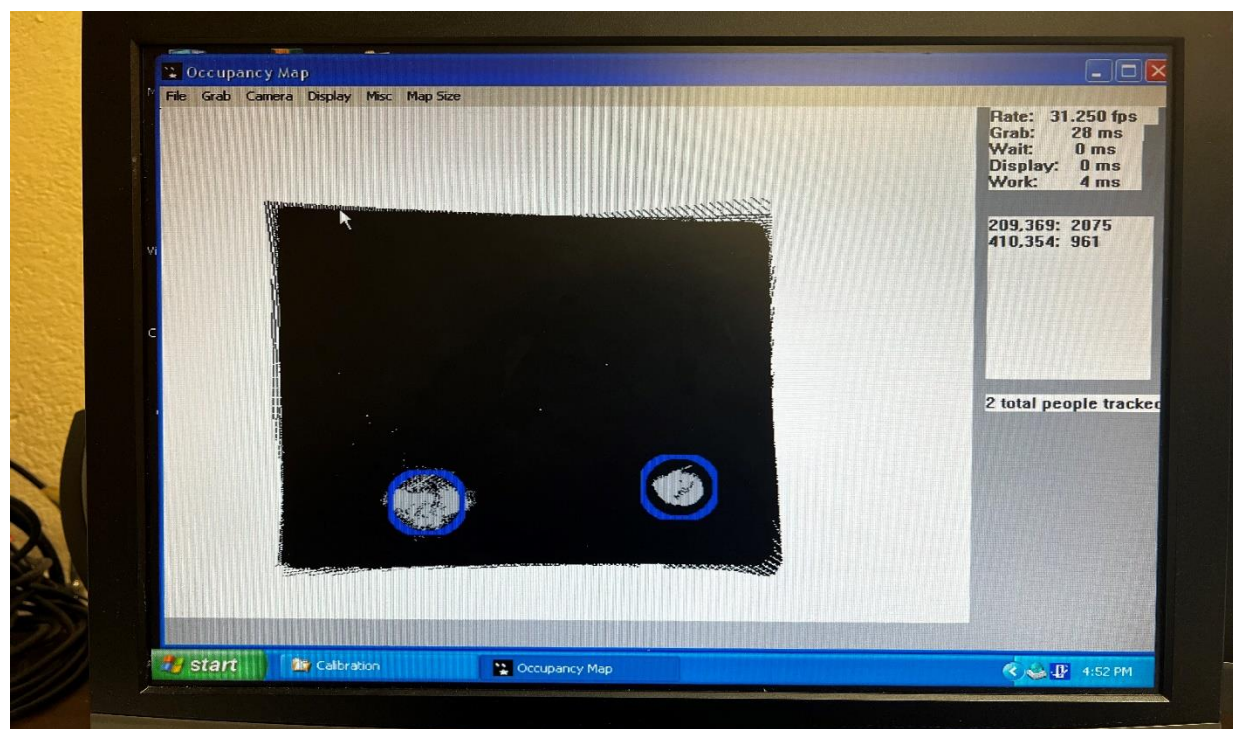
Camera 4: In this result, Camera 4 was set to threshold 200.



Camera 5: In this result, Camera 5 was set to threshold 200.



Tracking of a bag and a person & Occupancy Map:



Object reference pictures:

