ECE 6310 – INTRODUCTION TO COMPUTER VISION

Lab 6 – Camera Calibration

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Objective:

In this lab we were expected to calibrate the cameras at the Riggs Lab, after calibrating the cameras they should be able to track anything in the rectangular area using the occupancy map.

Implementation:

We began the calibration process by placing the target boards in the center portion of the rectangular area. After placing the target boards, we began the calibration process by opening the Calibration.exe program on the computer.

We determined the origin point in the world coordinate system and then determined which would be the x, y, and z axis. We answered all the questions asked during the calibration process like if the origin point is not detected automatically we need to tell the program where the origin point is from current highlighted point, whether the highlighted axis from the highlighted point is going negative or positive. Once we answered all the questions, after some backend calculation the world coordinates of the camera were given as the output and then we checked the values by estimating the camera positions in the world coordinates and if the values seemed correct we moved on to the next camera.

Once we calibrated all the cameras, we moved to drawing the polygon for the area where we wanted something to be tracked. We drew polygon over the taped box marked in room by hand for every camera and saved it.

Results:

	X – Coordinates(mm)	Y – Coordinates(mm)	Z – Coordinates(mm)	Focal Length(mm)
Camera 0	4040	-1363	2334	8.48
Camera 1	738	-1881	2219	8.03
Camera 2	-2304	-1940	2241	11.10
Camera 3	-2109	3259	2127	10.54
Camera 4	821	3448	2234	8.13
Camera 5	3886	3391	2189	8.06

Issues Faced:

- The camera feed was not stable it either kept constantly moving or giving disturbed feed, restarting the computer and reopening the program did not help, we had to shut down the camera and restart them after keeping them off for few seconds.
- There was some error in the calibration program where we noticed that wrong axis was getting highlighted where should have been highlighting different axis. This issue was also resolved by restarting the cameras.

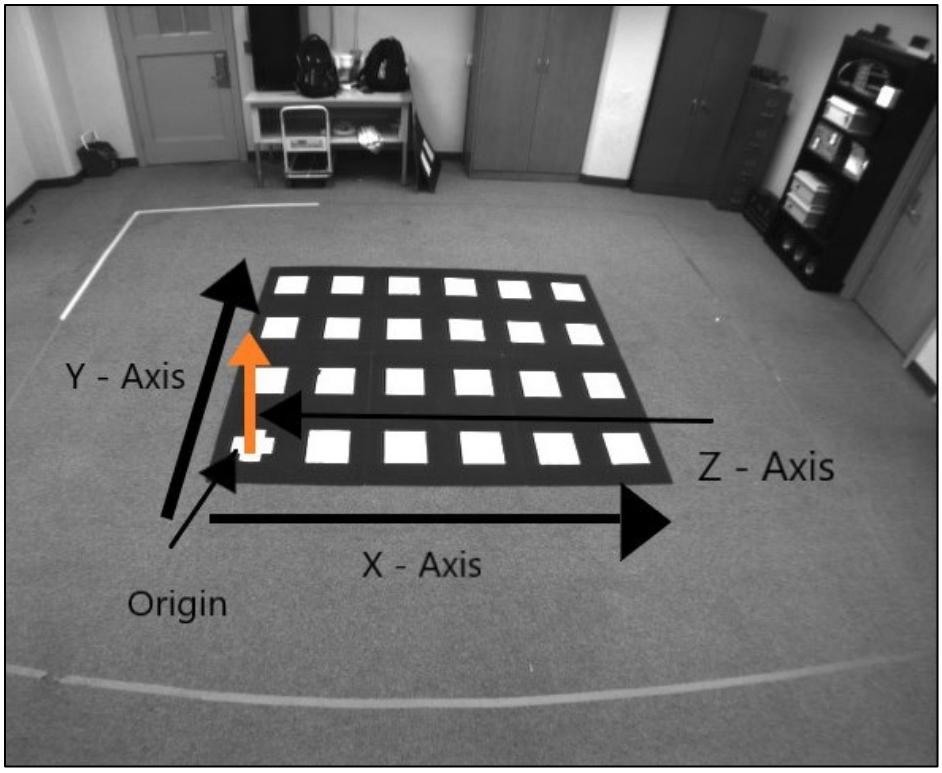

Figure 1 Cartesian coordinate system used for camera calibration

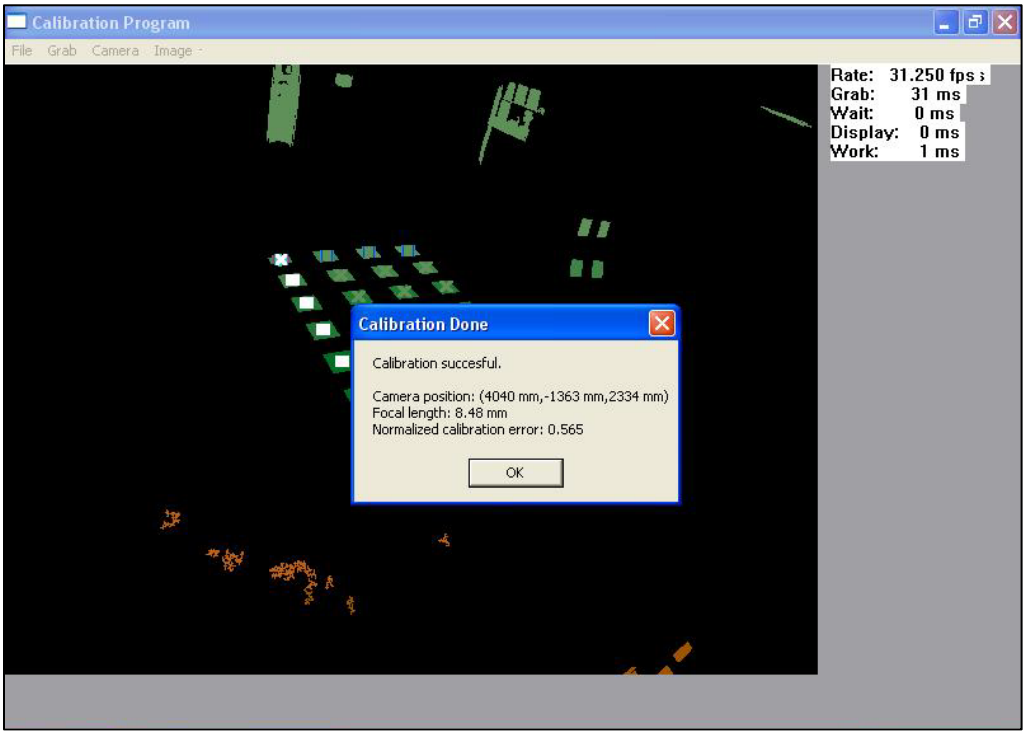

Figure 2 Calibration image for Camera 0

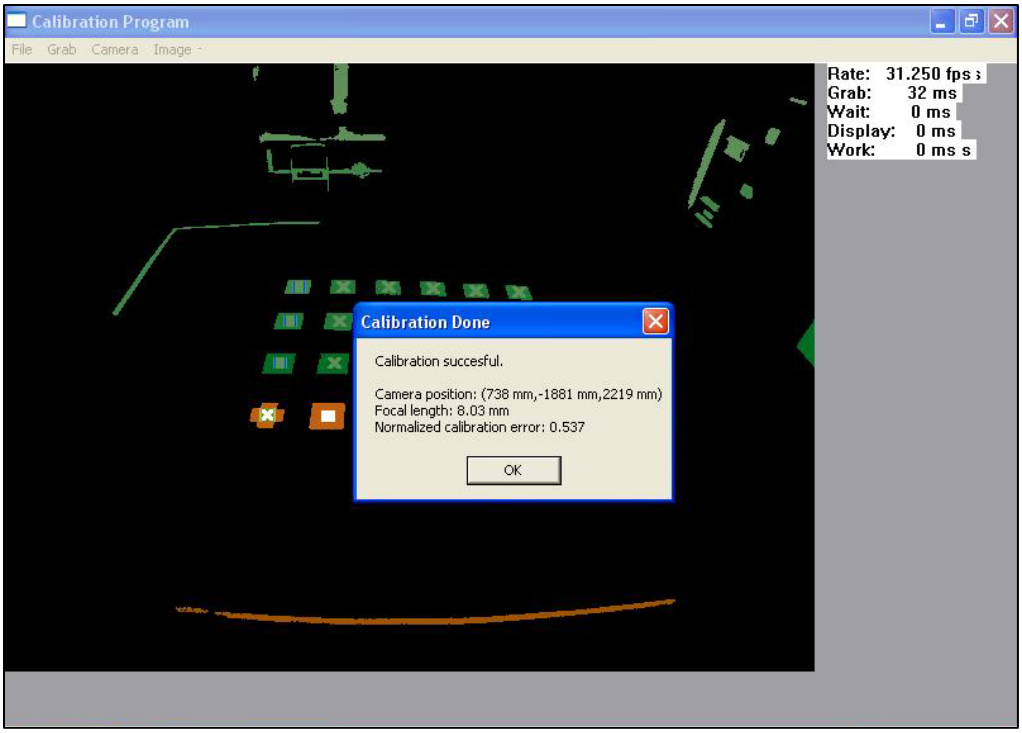

Figure 3 Calibration image for Camera 1

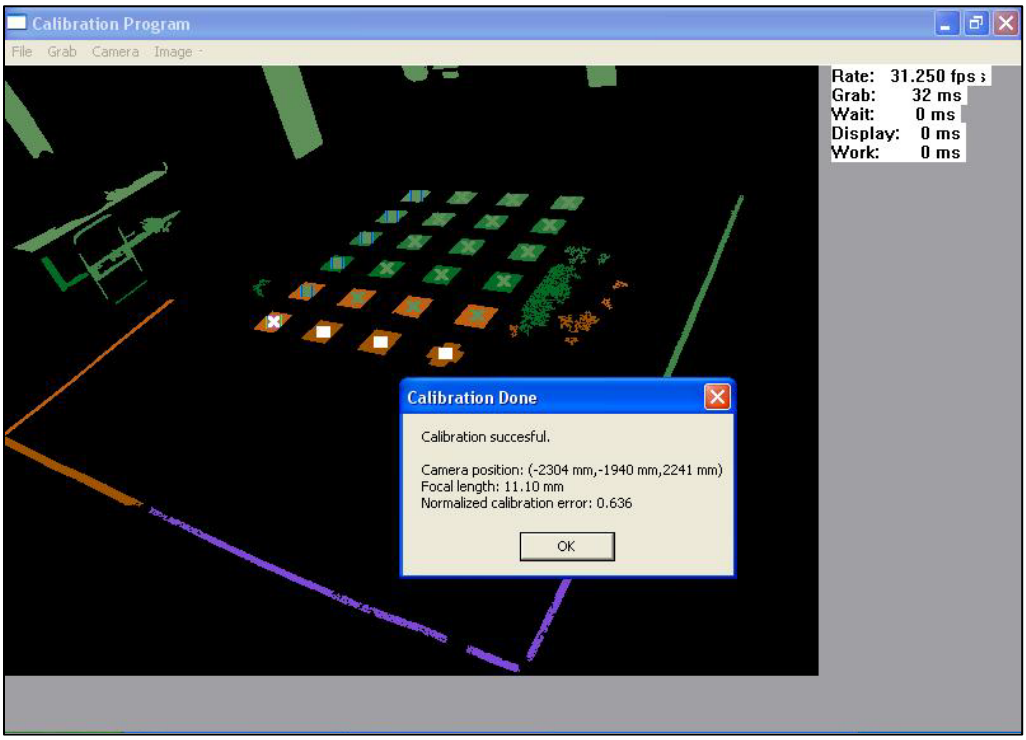

Figure 4 Calibration image for Camera 2

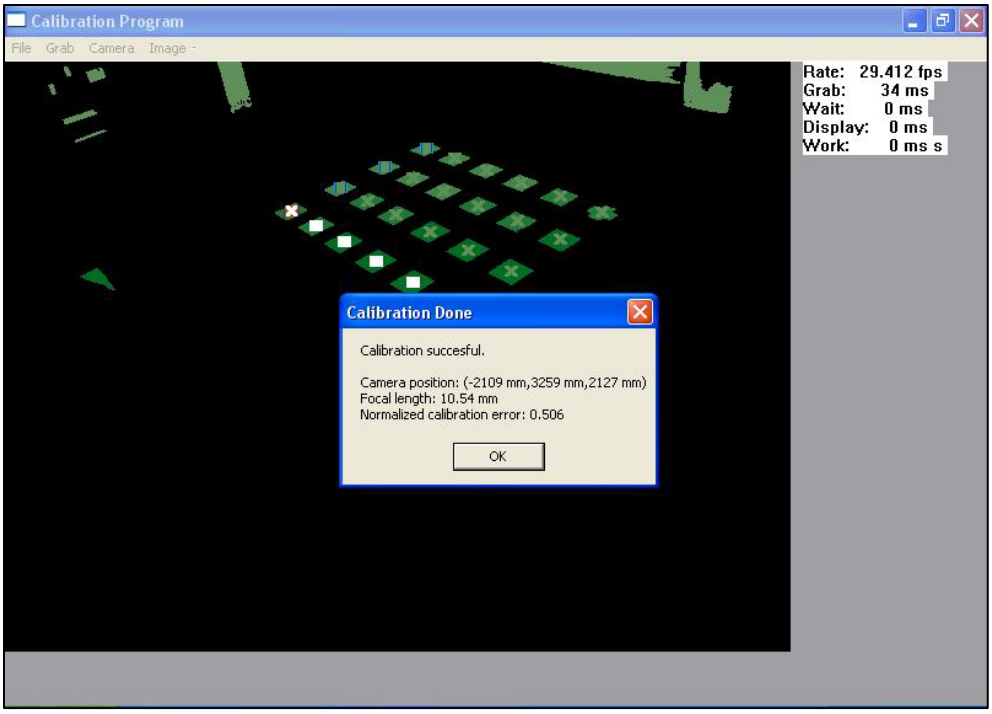

Figure 5 Calibration image for Camera 3

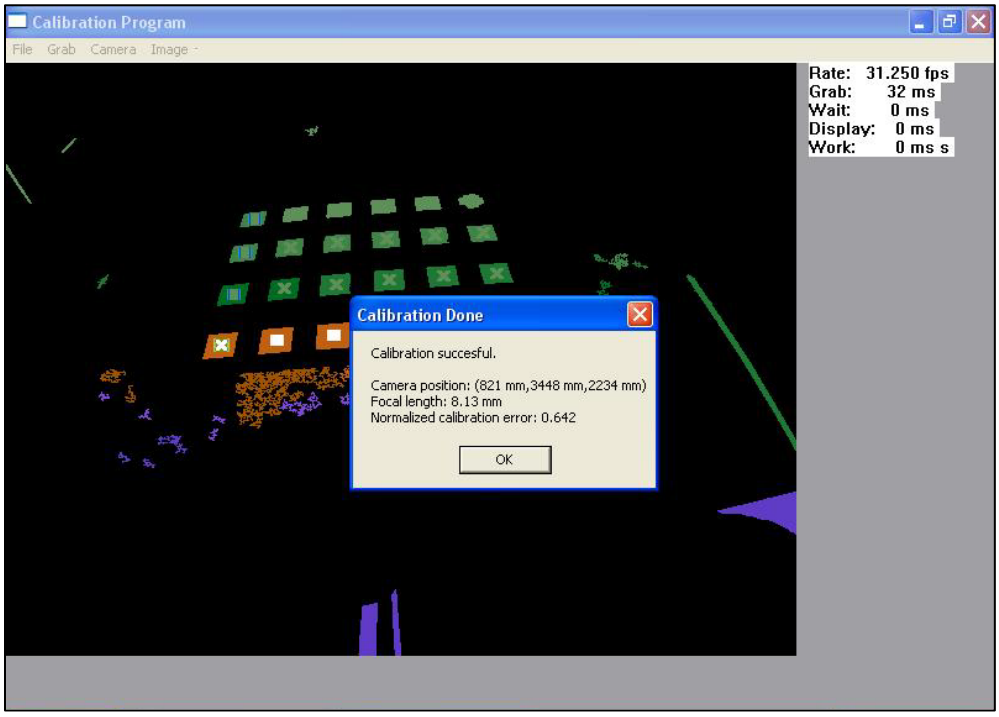

Figure 6 Calibration image for Camera 4

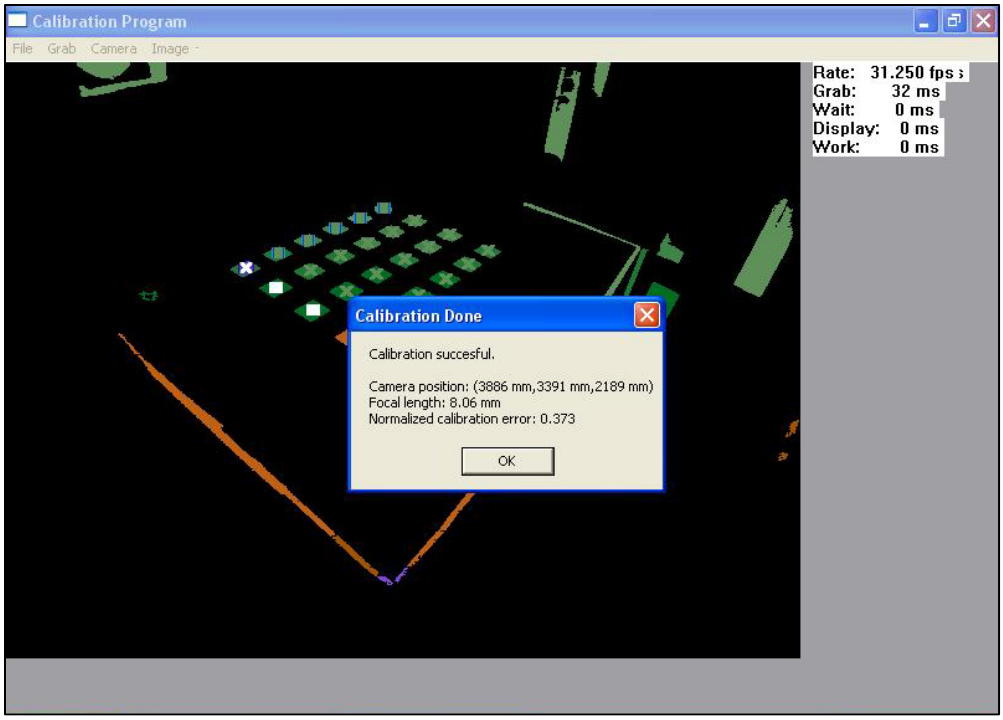

Figure 7 Calibration image for Camera 5

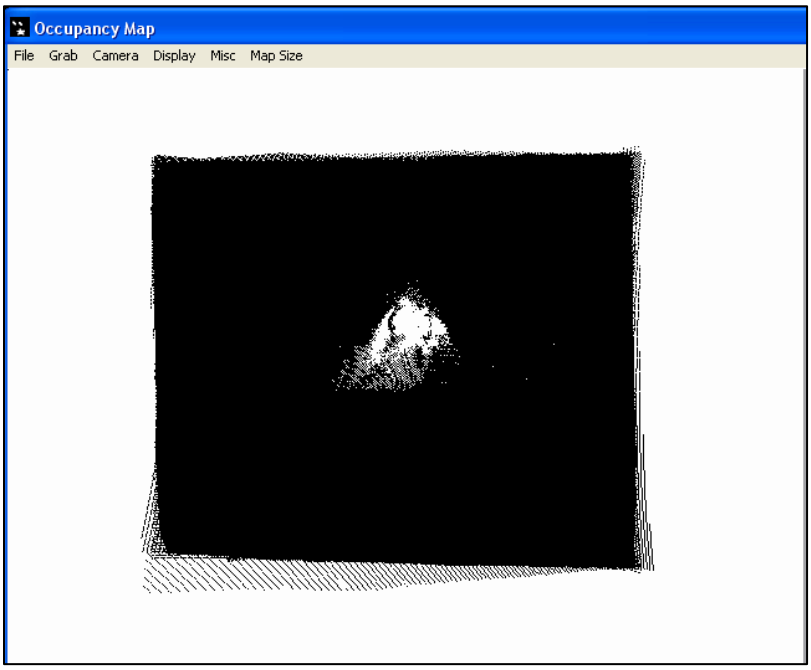

Figure 8 Occupancy map with one object

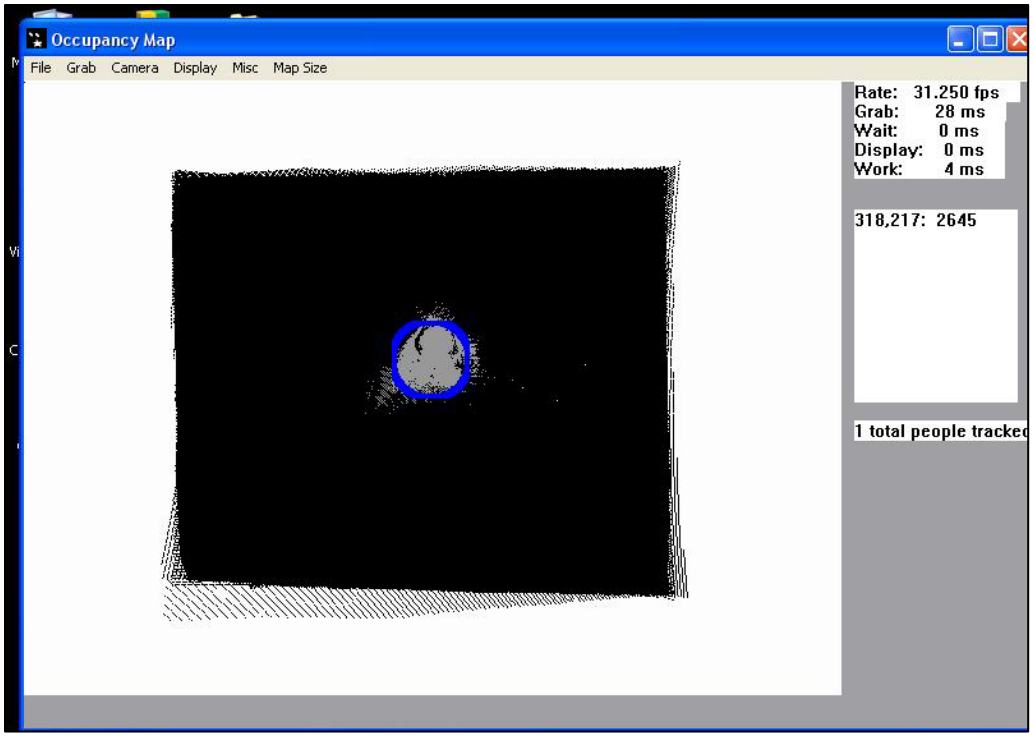

Figure 9 Tracking with one object

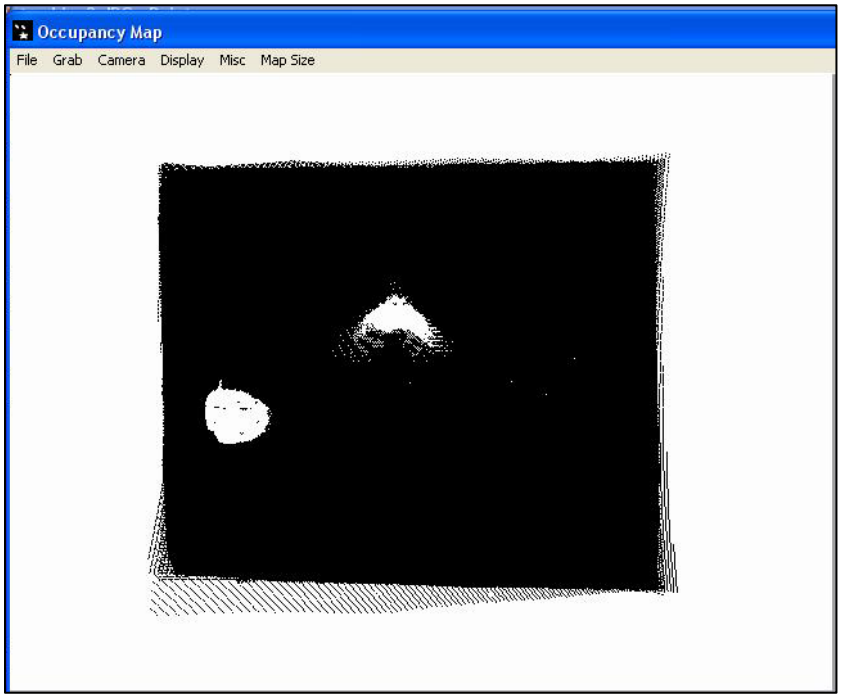

Figure 10 Occupancy map with two objects

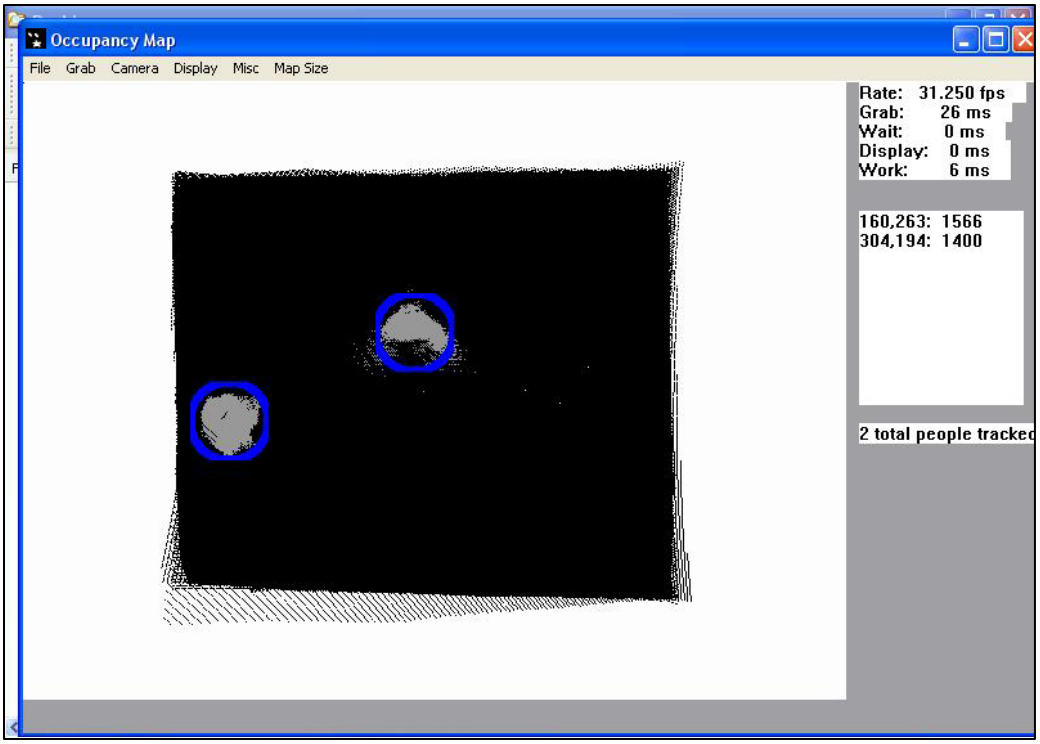

Figure 11 Tracking with two objects

Figure 12 Occupancy map with 3 different objects

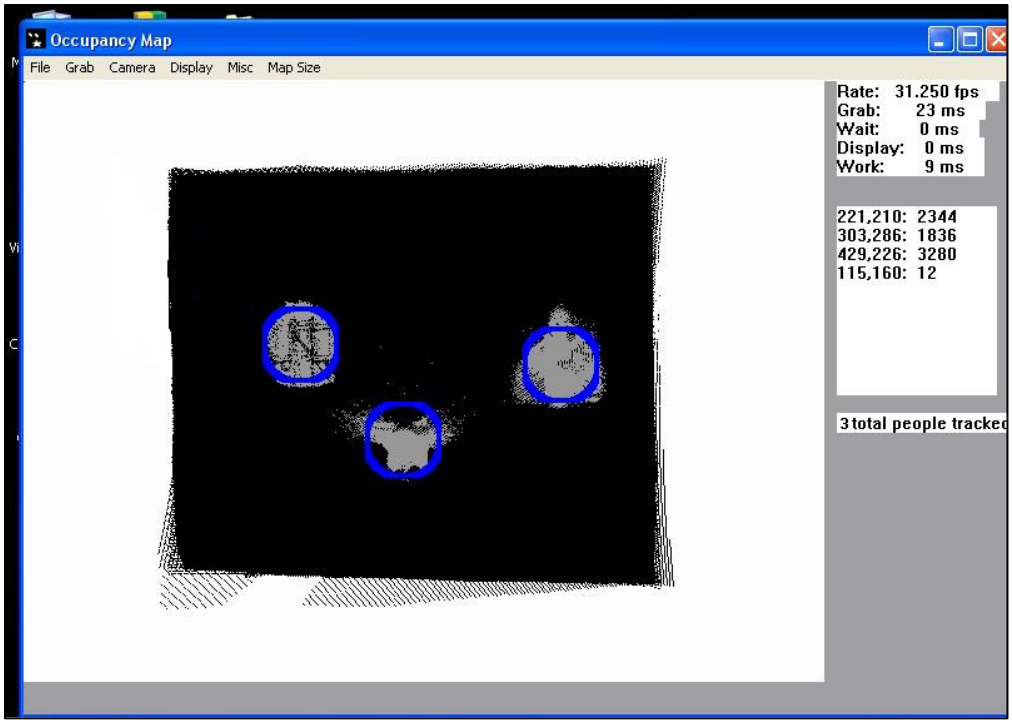

Figure 13 Tracking with 3 different objects