ECE 4310/6310 Introduction to Computer Vision

Lab #6 – camera calibration

In this project each student must calibrate the camera network in the Riggs 13/15/17 lab. You should use the "calibration.exe" program to perform the calibration, and the "occmap.exe" program to check that your calibration is correct. Contact one of the graduate students in Riggs 10 to gain access to the lab and the computer running the programs. Please be **careful** with the computer and calibration targets.

The calibration process will be demonstrated in class. It consists of the following steps. First, position 6 or 8 of the calibration targets in a grid. Decide which grid location will be the world coordinate (0,0). Decide which axes on the targets will be the X and Y axes emanating from the (0,0) coordinate. Note1: the world coordinate system should be right-handed with the Z axis upwards (towards the ceiling). Note2: the calibration.exe program by default assumes the distances between Y coordinates is 508 mm and the X coordinates is 406 mm; therefore you will save yourself a lot of retyping if you lay out the world grid with the Y axis spacing larger than the X axis spacing. Note3: if you ever move the grid you will have to restart the entire calibration process from scratch, so try to make sure it is well-centered and clear.

Second, run the calibration.exe program, select Grab->start, and verify that all 6 cameras are functioning and can see the grid (Camera->0 through Camera->5). If not, reposition the grid. For each camera, select Image->threshold and adjust the threshold until the grid targets are well segmented. Select Image->calibrate. The program will prompt you for the grid size then automatically find the grid. If the grid is not accurate, try changing the threshold. If that fails, you may need to reposition the grid. After the grid is found successfully, answer all the prompts to relate the world coordinate system to the image coordinate system. Note4: this will take some mental agility. After you have answered all the questions, the program will perform the calibration and report the X, Y, Z world coordinates of the camera. You are strongly advised to roughly check these against your envisioned world coordinate system to see if they agree with where the camera is located. Complete this process for all 6 cameras.

NOTE: The selection for every dialog box must be clicked, even if it the default highlighted already appears selected. This is a known program bug.

Third, rerun the calibration.exe program and for each camera, select Grab->start and then Grab->snapshot. Wait 1 second for the snapshot to complete. Select Image->polygons and draw a single polygon around the floor area of the tracking space that is visible in the camera. The tape on the floor should be followed when possible. The left mouse button adds new polygon points; the right mouse button deletes existing points. Polygon points can be grabbed and dragged to new locations. After finishing drawing the polygon, save it to a text file named floor#.txt where # is the camera number.

Lastly, check the entire calibration process by running the occmap.exe program. Select grab->start, then select misc->snap backgrounds. If everything is correct, then the bounding box of the tracking area will be roughly rectangular, and targets will be tracked correctly. Do not worry about centering the trackable area on the image window; that is beyond the scope of this lab.

Carefully return the calibration targets to their storage location. They tear easily, so **please be gentle**.

You must write a brief report that includes the calibration images in your report. Show all 6 images. In the manner of your choosing, identify the locations of your X and Y axes used for calibration (it is only necessary to show this once). Provide a list of table of the X, Y, Z camera positions. All this data can be found in the C:\Calibration folder and should be copied off the computer. You must expect that your calibration will get overwritten by the next person, so save the entire folder to your personal storage if you want to keep it.

Provide one or more screen captures showing successful tracking of one or more objects of your choice (i.e. people, chairs, etc.). Be sure that the tracking area bounded by the polygons you drew is clearly visible in the tracking demo screen capture.

The report due date is given at the web site. Reports will be collected in class.