

Gebze Institute of Technology
Department of Computer Engineering
BIL 665 / BIL 463
(Introduction to) Computer Vision
Fall 2016
HW3
Dec 26th 2016

In this homework, we will make real world distance measurements between two circles in the camera view of a stereo setup.

1. For producing stereo pairs, we will use a mirror setup as done by our publication at <http://vision.gyte.edu.tr/publications/2014/camera%20ready.pdf> Figure 1-b RGB camera might be considered as our camera. The view from the mirror will be our second camera, this way we will not use two cameras but will have 2 different views of the same scene. One of the views will be the real view, the other is mirror view.
2. Use openCV calibration procedures to calibrate each camera (real and mirror). You should calibrate the real and the mirror view at the same time without moving the camera or the mirror. You may use a procedure such as <http://www.youtube.com/watch?v=9-PWe4vTipo>.
3. Use the points that you collected from calibration phase to calculate the fundamental matrix F .
4. Locate the circle center points at each image (real and mirror). Use the epipolar lines to establish a better correspondence between the center points.
5. Use the center point correspondences to find the 3D points of each circle center. You have the camera projection matrices and correspondences, which should be enough to find the 3D positions. Display the 3D circle center positions and the distances between them in real millimeter units.

For the demo you will follow these steps

1. Download the HW from moodle and compile the program.
2. Run the program from the executable file
3. Calibrate the cameras
4. Detect circles and mark each center with a different color mark.
5. Draw the epipolar lines for each circle center of the left camera on the other image with a different color.
6. On a different graphical window, display continuously the 3D circle positions and the difference between them. We will do experiments to measure the distance between two detected circles.
7. You should have a mode that turns on and off the employment of the epipolar geometry to establish point correspondence.

You may use any OpenCV functions to establish any steps of the above procedure. However, you should not use any code from anywhere.