Carnegie Mellon University Africa

Applied Computer Vision

Assignment 3
Determining the Pose of a Cube

Deadline: 18:00 Thursday 16th November 2017

Problem Definition

Pose refers to the position and orientation of an object. The goal of this assignment is to develop an openCV vision application that can determine the pose of a cube[1] using the Hough transform.

You can assume that the cube is on a flat surface and the camera views the cube from above (i.e. the principle ray of the camera is orthogonal to the plane of the supporting surface).

The application should determine (see Fig. 1):

(a) the centroid of the top face of the cube (i.e. the face that is directed at the camera);
(b) the angle β of the cube with respect to the horizontal axis of the image where $0° < \beta \leq 90°$.

Figure 1: cube image.

The application should accept image input from image files. The image file names should be provided in an input file. The application should write the required data to an output file, i.e, the coordinates of the centroid and the angle β.

[1] These cubes are used by the Anki Cozmo robot.

Input
The filenames of the images of the scenes containing the cube.

Output
The output should begin with your Id on a separate line; you Id comprises the first letter of your first name and your last name in full (e.g. dvernon).

This should be followed by the input image filenames, the coordinates of the centroid, and the angle β, one filename and three numbers per line.

Sample Input

```
../data/assignment2A.png
../data/assignment2B.png
```

Sample Output

```
dvernon
../data/assignment2A.png: 388 233 90
../data/assignment2B.png: 384 213 56
```

Instructions
Submit the following in a zip file named with your Andrew Id to vernon@cmu.edu by the deadline shown above.

1. The source code: *.c, *.cpp, and *.h file(s)
2. The cmake file: CmakeLists.txt
3. The test input file: input.txt
4. The test output file: output.txt
5. The image files you used to test your program.

Do not include the Visual C++ solution files or the executable. Submit only the source code files, the Cmake file, and the input, output, and image files; do so in a single compressed (zipped) folder. Do not include subdirectories in the zipped folder.

In the interests of best practice, the source code should contain adequate internal documentation in the form of comments. Internal documentation should include the following.

- A summary of your algorithm.
- A summary of your test strategy.

Do not forget to include your name in the internal documentation. Place this documentation in the .h include file.

Marking Rubric
For each test image, 50% of the marks will be allocated for the coordinates of the centroid, 40% for the angle β, and 10% for the coverage of the test data set.