Assignment 4 - Hough Transforms

This Assignment will be graded. So hand in your work on time.

In this homework assignment you will be asked to use the Hough transform a feature detection. Please watch this demo here. It gives a better explanation comparing to what you saw in the classes.

Hough Lines. Task 1:

a. Develop a program using OpenCV to detect lines in the image as shown in Figure 1. (image can be found on Canvas).

Consider to use filters to blur your image first. The result should look like the image as depicted in "*Figure 2. Output Image Hough Lines*". Please notice the red lines as a result of the Hough transform. See also example in OpenCV documentation on internet.

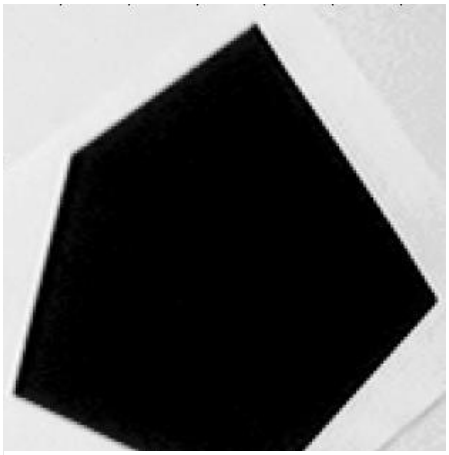

Figure 1 Image "Hough Picture".

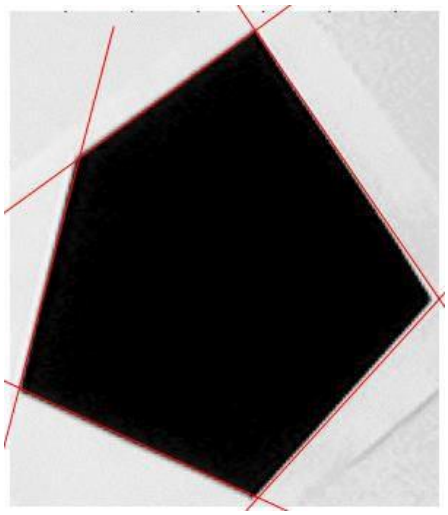

Figure 2 Output Image Hough Lines.

b. Hough transform (Hough Lines) is useful to detect parametric objects. In this task you'll be asked to calculate the intersections of the lines found in task a, also seen in *Figure 3* as an example. The pixel coordinates of A, B, C, D and E must be calculated.

Your results for the coordinates values A, B, C, D and E must be visible in the Output Image or beneath the Output Image. Please comment your results.

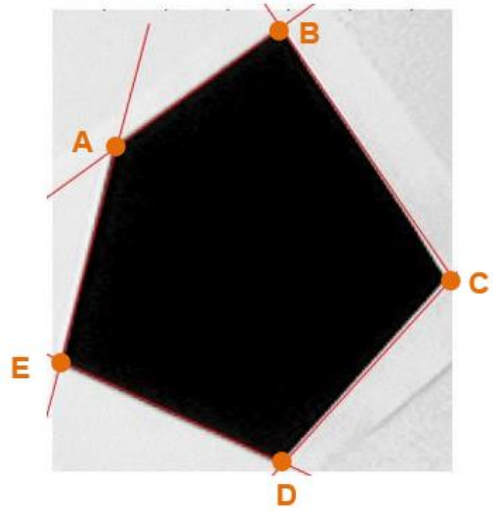

Figure 3. Output Image with Intersections

Hough Transform for Circles.

A circle in the x-y is given by the equation:

$(x-a)^2+(y-b)^2=c^2$ Where (a,b) are the x,y coordinates of the center of the circle.

We have a 3D parameter space. The Hough transforms for lines uses a 2D parameter space.

The simplified algorithm looks like:

```
All  A[a,b,c] = 0;
For every (x,y) where g(x,y) > T
     For all a and b
     c= sqrt((x-a)^2+(y-b)^2;
     A[a,b,c] =  A[a,b,c] + 1;     // Collecting a,b,c
```

Task 2:

a. Please read the tutorial carefully as shown here by clicking and create a program using Hough Transform for Circles on the images "EuroCoins.jpg" and "EuroCoins2.jpg". These images can be found on Canvas.

Figure 4 EuroCoins

Figure 5 EuroCoins2

You are free to discuss with other students, but take care you hand in your own original material. Don't forget to include your name, maximal 2 students per assignment.

This assignment must be handed in before Friday October …. 2016 on a **pdf** document with the sources, comments and the results.