Hough Circle Transform

Goal

In this chapter,

- We will learn to use Hough Transform to find circles in an image.
- We will see these functions: **cv.HoughCircles()**

Theory

A circle is represented mathematically as $(x - x_{center})^2 + (y - y_{center})^2 = r^2$ where (x_{center}, y_{center}) is the center of the circle, and r is the radius of the circle. From equation, we can see we have 3 parameters, so we need a 3D accumulator for hough transform, which would be highly ineffective. So OpenCV uses more trickier method, **Hough Gradient Method** which uses the gradient information of edges.

The function we use here is **cv.HoughCircles()**. It has plenty of arguments which are well explained in the documentation. So we directly go to the code.

```
import numpy as np
import cv2 as cv

img = cv.imread('opencv-logo-white.png',0)
img = cv.medianBlur(img,5)
cimg = cv.cvtColor(img,cv.COLOR_GRAY2BGR)

circles = cv.HoughCircles(img,cv.HOUGH_GRADIENT,1,20,
                          param1=50,param2=30,minRadius=0,maxRadius=0)

circles = np.uint16(np.around(circles))
for i in circles[0,:]:
    # draw the outer circle
    cv.circle(cimg,(i[0],i[1]),i[2],(0,255,0),2)
    # draw the center of the circle
    cv.circle(cimg,(i[0],i[1]),2,(0,0,255),3)

cv.imshow('detected circles',cimg)
cv.waitKey(0)
cv.destroyAllWindows()
```

Result is shown below:

image

Additional Resources

Exercises