

# EECS 495 Biometrics Assignment2

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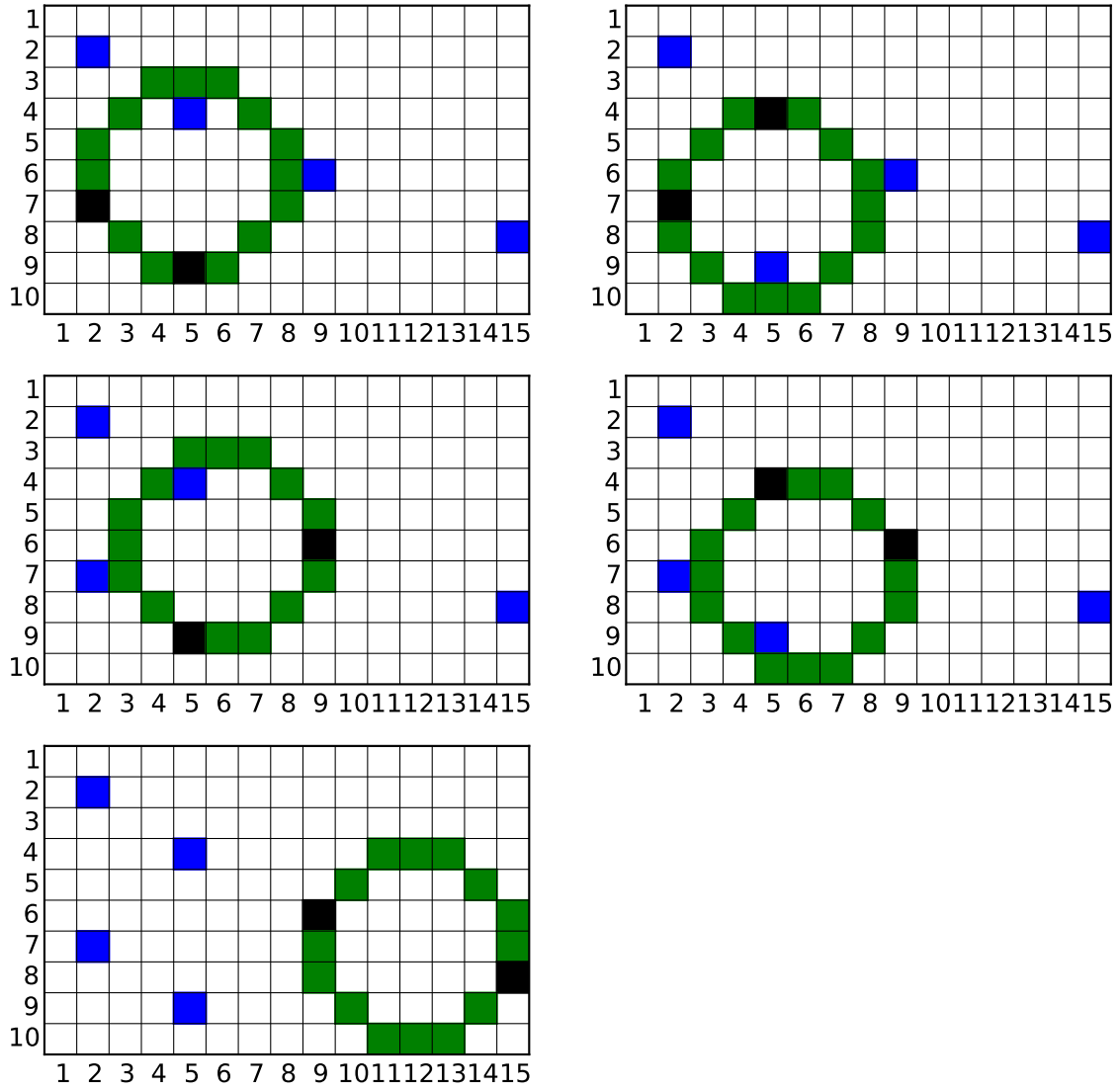
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## Problem 1

The hough space, red region indicates the parameter space:

1	0	0	0	1	2	1	0	0	0	0	0	0	0	0	0
2	0	0	1	0	1	0	1	0	0	0	0	0	0	0	0
3	0	1	0	0	1	0	0	2	1	1	0	0	0	0	0
4	1	2	1	1	0	0	1	1	0	0	1	0	0	0	0
5	1	2	1	1	0	1	0	1	0	0	0	1	0	1	1
6	0	0	1	1	2	2	1	0	0	0	0	1	1	0	0
7	0	0	1	1	2	2	1	0	0	0	0	2	0	0	0
8	0	1	0	0	1	0	1	1	0	0	1	1	0	0	0
9	0	1	0	1	0	0	0	2	1	1	0	1	0	0	0
10	1	2	1	0	0	0	0	1	0	0	0	0	1	0	0
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

The fitted circles: (green, black, and blue pixels corresponds to circle, pixels on the circle and pixels not on the circle, respectively)



## Problem 2

We basically followed Daugman's method.

First of all, to speed up the whole process, we resized the image to  $\frac{1}{4}$  of its original size. We then found the range of center of pupil by detecting the blackest region with a square sliding window. Next, we used integro-differential operator to fit two circles which corresponds to pupil and iris. Finally, we drew the fitted circle on the original image.

We used Python and OpenCV in this problem. The input and output path is specified by the variables *srcdir* and *dstdir* in line 98 and 99 of *fit\_circle\_orig.py*