

ET3112 Assignment 2 on Spatial Filtering

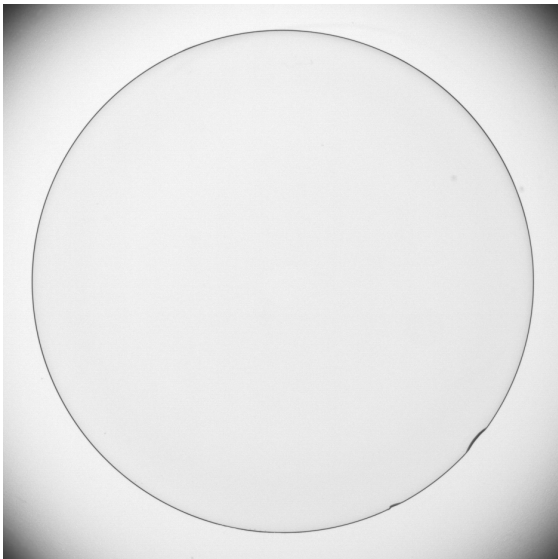
Ranga Rodrigo

February 23, 2023

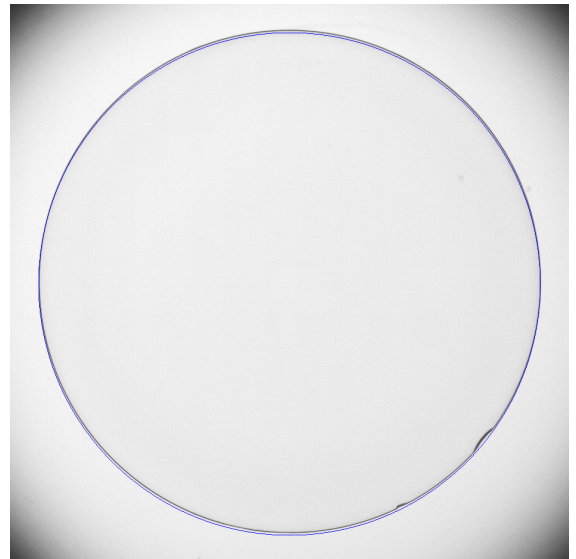
1. For the `contact_lens.tif` image f compute and display [30]

- (a) Vertical gradient f_x using the Sobel kernel,
- (b) Horizontal gradient f_y using the Sobel kernel, and
- (c) Gradient magnitude using the formula $|f_x| + |f_y|$ ¹.
- (d) Use a method on your own (without using contour detection or Hough circles) to find the center and the diameter of the contact lens and draw it as shown in Fig. 1.

Note that when computing the gradients, our resultant image must be represented using signed numbers, as the gradient can be negative.



(a) Contact lens.



(b) Image with a circle superimposed.

Figure 1: Contact lens and image with a circle superimposed.

2. Computer and display in 3-D the derivative of Gaussian kernel for the derivative in [20]

- (a) x -direction,
- (b) y -direction.

for the domain $[-3, -2.9, -2.8, \dots, 3] \times [-3, -2.9, -2.8, \dots, 3]$ with $\sigma = 1$.

3. Consider the `zebrahead.jpg` image f shown in Fig. 2. [20]

- (a) Compute the derivative of Gaussian kernels for $[-5, -4, -3, \dots, 5] \times [-5, -4, -3, \dots, 5]$ with $\sigma = 1$ and $\sigma = 3$.
- (b) Use these kernels to compute the derivatives of the grayscale version of the `zebrahead.jpg` image and display.
- (c) Comment on your results.

¹You may use the `convertScaleAbs` method.



Figure 2: Zebra image.

4. Fig. 3² shows a flower image with both the foreground and background in focus. [30]
- (a) Use grabCut in OpenCV to segment the image. Show the final segmentation mask, foreground image, and background image.
 - (b) Produce an enhanced image with a substantially blurred background. Display the original image alongside the enhanced image.
 - (c) Why is the background just beyond the edge of the flower quite dark in the enhanced image?
 - (d) Apply this to a portrait image of your choice to blur the background.



Figure 3: Image enhancing.

GitHub Profile

You must include the link to your GitHub (or some other SVN) profile, so that I can see that you have worked on this assignment over a reasonable duration. Therefore, make commits regularly. However, I will use only the pdf for grading to save time.

Submission

Upload a report (eight pages or less) named as your_index_a01.pdf. Include the index number and the name within the pdf as well. The report must include important parts of code, image results, and comparison of results. The interpretation of results and the discussion are important in the report. Extra-page penalty is 2 marks per page.

²<https://steemit.com/marguerite/ctrl-alt-nwo/marguerite-daisy>