

# Computer Vision HW10 Report

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# 1 Source Code

This part of the report will go through some important snippets of my source code. For source code file, please check out the `hw10.py` file in the directory submitted.

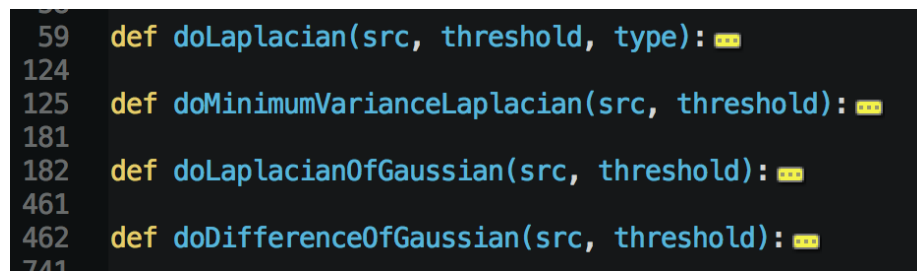
## 1.1 Principle Code Sneak Peek

First, we will take a look at the overall structure of my code. And furthermore we will have some brief explanation for the implementation of the operators with different masks.

### 1.1.1 Functions Overview

In this homework, we are asked to implement 5 different kinds of zero-crossing edge detection methods. And there are 4 functions that I've created for those methods.

The following snapshot includes the signature of those 4 functions.



```
59 def doLaplacian(src, threshold, type): ...
124
125 def doMinimumVarianceLaplacian(src, threshold): ...
181
182 def doLaplacianOfGaussian(src, threshold): ...
461
462 def doDifferenceOfGaussian(src, threshold): ...
741
```

Figure 1: Essential Functions Overview

All of the functions above take these parameters: `src` and `threshold`, which respectively stands for source image (input image) and the threshold for this method. And all the functions, if no error occurs, return a new image which is properly processed image.

The function `doLaplacian()`; takes an additional parameter: `type` due to the fact that we have 2 different masks for Laplacian method. And the `type` parameter should be either 1 or 2; otherwise, the function returns the source image `src` without any processing.

### 1.1.2 Masks to be used

There are 5 different masks (kernels), and they result in 5 different images in the end.

The masks that I have utilized in my code (in `hw10.py`) are shown in the following figure.

```

9
10 DIGITAL_LAPLACIAN_MASK_1 = [
11     0, 1, 0, 1, -4, 1, 0, 1, 0
12 ]
13
14 DIGITAL_LAPLACIAN_MASK_2 = [
15     1, 1, 1, 1, -8, 1, 1, 1, 1
16 ]
17
18 DIGITAL_LAPLACIAN_MINIMUM_VARIANCE_MASK = [
19     2, -1, 2, -1, -4, -1, 2, -1, 2
20 ]
21
22 LAPLACIAN_OF_GAUSSIAN_KERNEL = [
23     0, 0, 0, -1, -1, -2, -1, -1, 0, 0, 0,
24     0, 0, -2, -4, -8, -9, -8, -4, -2, 0, 0,
25     0, -2, -7, -15, -22, -23, -22, -15, -7, -2, 0,
26     -1, -4, -15, -24, -14, -1, -14, -24, -15, -4, -1,
27     -1, -8, -22, -14, 52, 103, 52, -14, -22, -8, -1,
28     -2, -9, -23, -1, 103, 178, 103, -1, -23, -9, -2,
29     -1, -8, -22, -14, 52, 103, 52, -14, -22, -8, -1,
30     -1, -4, -15, -24, -14, -1, -14, -24, -15, -4, -1,
31     0, -2, -7, -15, -22, -23, -22, -15, -7, -2, 0,
32     0, 0, -2, -4, -8, -9, -8, -4, -2, 0, 0,
33     0, 0, 0, -1, -1, -2, -1, -1, 0, 0, 0
34 ]
35
36 DIFFERENCE_OF_GAUSSIAN_MASK = [
37     -1, -3, -4, -6, -7, -8, -7, -6, -4, -3, -1,
38     -3, -5, -8, -11, -13, -13, -13, -11, -8, -5, -3,
39     -4, -8, -12, -16, -17, -17, -17, -16, -12, -8, -4,
40     -6, -11, -16, -16, 0, 15, 0, -16, -16, -11, -6,
41     -7, -13, -17, 0, 85, 160, 85, 0, -17, -13, -7,
42     -8, -13, -17, 15, 160, 283, 160, 15, -17, -13, -8,
43     -7, -13, -17, 0, 85, 160, 85, 0, -17, -13, -7,
44     -6, -11, -16, -16, 0, 15, 0, -16, -16, -11, -6,
45     -4, -8, -12, -16, -17, -17, -17, -16, -12, -8, -4,
46     -3, -5, -8, -11, -13, -13, -13, -11, -8, -5, -3,
47     -1, -3, -4, -6, -7, -8, -7, -6, -4, -3, -1
48 ]

```

Figure 2: Masks to be used in this homework

**DIGITAL\_LAPLACIAN\_MASK\_1** the mask for Laplacian type 1.

**DIGITAL\_LAPLACIAN\_MASK\_2** the mask for Laplacian type 2.

**DIGITAL\_LAPLACIAN\_MINIMUM\_VARIANCE\_MASK** the mask for Minimum Variance Laplacian.

**LAPLACIAN\_OF\_GAUSSIAN\_KERNEL** the kernel for Laplace of Gaussian.

**DIFFERENCE\_OF\_GAUSSIAN\_MASK** the mask for Difference of Gaussian.

**BBB mask** for BBB.

## 1.2 Parameters (Threshold)

Here is the list of thresholds I used for each of the resulted image.

**Laplacian Mask Type 1**  
my threshold = 15

**Laplacian Mask Type 2**  
my threshold = 15

**Minimum Variance Laplacian**  
my threshold = 20

**Laplace of Gaussian**  
my threshold = 3000

**Difference of Gaussian**  
my threshold = 1

## 2 Results

All the resulted images are properly saved and submitted along with this report document. You may go check them out if you'd like to.

## 2.1 Laplacian Mask Type 1



Figure 3: Laplacian type 1 with threshold=15

## 2.2 Laplacian Mask Type 2



Figure 4: Laplacian type 2 with threshold=15

### 2.3 Minimum Variance Laplacian



Figure 5: Minimum Variance Laplacian with threshold=20



## 2.4 Laplace of Gaussian



Figure 6: Laplace of Gaussian with threshold=3000

## 2.5 Difference of Gaussian



Figure 7: Difference of Gaussian with threshold=1