Lab 2 Report

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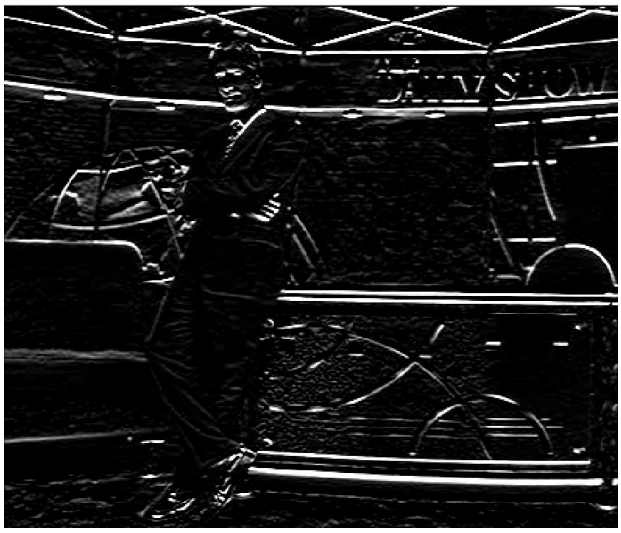
Assignment 1:

We successfully convert our input image to grayscale using rgb2gray() command.

Secondly, using size() command, we also managed to extract the information about the picture size which is 400 x 468). Thirdly, we also did the edge detection using the provided convolution kernel h1 and h2. h1 is for vertical edge and h2 is for horizontal edge. The way we did the edge detection is slightly different than the handout, but the principle is still the same. Instead of doing raw convolution, we used filter instead with imfilter() command for each M1 and M2. The image result is attached. Lastly, we also instructed to find the gradient magnitude, we did that by changing the format of MI and M2 from uint8 to double, square root operation, and find the sum of the magnitude (M3). An alternative way is to do convolution (2D). To find M1, we convolved the grayscale image with h1 and the find the absolute value of M1. We did the same procedure for M2 as well. In the code for Assignment 1, both solution are present. To find M3, we used the same procedure but we changed it to an 8 bit unsigned integer.

M1:

M2:+

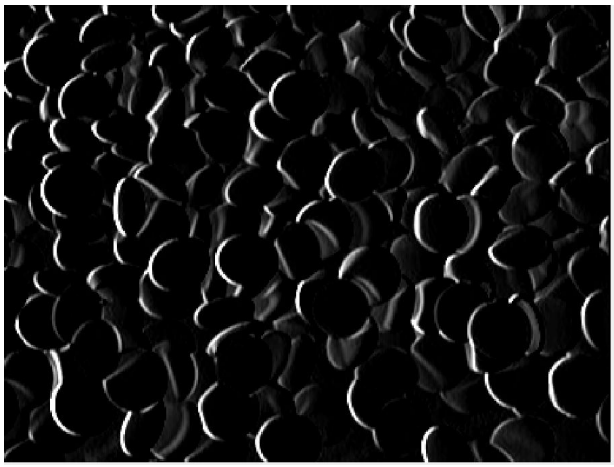


M3:

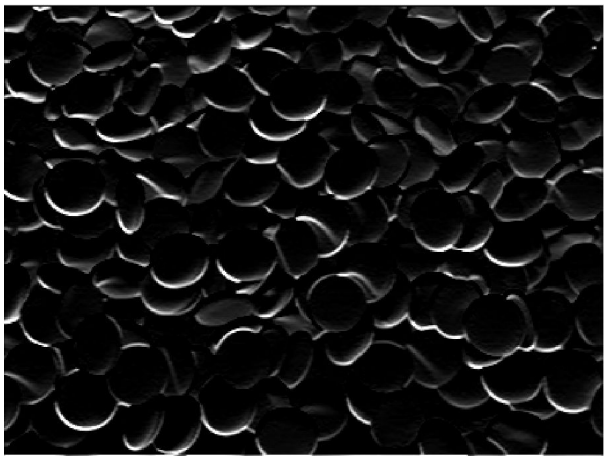
M3(as a result of M1 and M2 convolution):

Assignment 2:

The method used for this assignment exactly the same as assignment 1. the main difference is that the picture used is our own picture instead of given picture. We used the convolution method for this part.
M1:



M2:



M3:

Assignment 3:

In this assignment we applied scaling method to our picture. There are 2 part of this assignment. For the first part, we scaled the image down by 2 and 5 with simple scaling method. We keep the center pixel in each square of S^2 pixels when S is an odd number, and one of the 4 center pixels when S is even. We created a function called matrix which scaled our image with for-loop method.

Simple scale by 2:

Simple scale by 5:

The second part of assignment also pretty similar. However, instead of keeping the center pixel in each square of S^2 pixels, we must find the average of all pixel in the square. Therefore, for the second part, we just change the matrix function a little bit. Instead of using "w" for the image matrix, we find the average first by using mean() command and saved it to w2 variable and return the w2 format to uint8.
Advanced scale by 2:

Advanced scale by 5:

As you can see from the result, the image with average scaling has better quality since it less jagged.

Assignment 4

In this part of the assignment, we are asked to guess the following three equations.

(i) $X[N-n+1, m]$

(ii) $X[n, M-m+1]$

(iii) $X[N-n+1, M-m+1]$

where $1 \le n \le N,\ 1 \le m \le M$

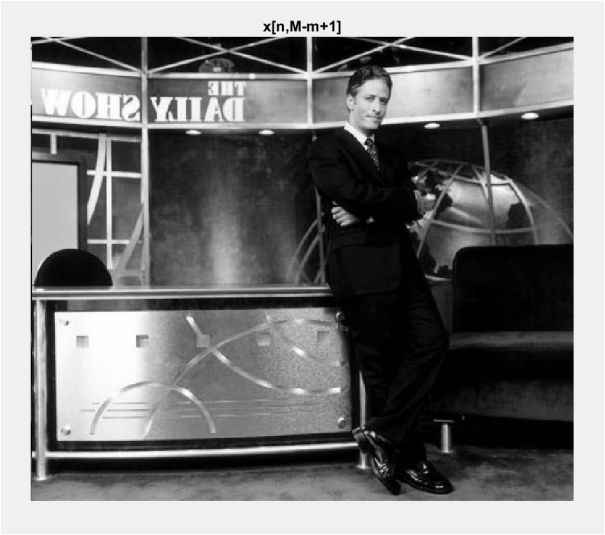
For the first one, We guessed that the picture will be flipped vertically and shifted by one(vertical shift).
For the second one, We guessed that the picture will be flipped horizontally and shifted by one(horizontally).

For the third one, we guessed that it will be a flipped both vertically and horizontally. It will also be shifted by one as well(both vertically and horizontally).

Our guess turned out to be pretty correct. For the first equation, we used the function flipud() to flip it vertically. To shift it by 1 vertically, I used circshift. The result would end up as a vertical flip of the picture with a grey line present at the top of the picture. This grey line was supposed to be at the bottom of the picture but since we used circshift, it moved towards the top of the picture.
For the second equation, we used the function fliplr() to flip it horizontally. To shift it by 1 horizontally, I used circshift. The result would end up as a horizontal flip of the picture with a grey line present at the left of the picture. This grey line was supposed to be at the right of the picture but since we used circshift, it moved towards the left of the picture. For the third equation, it was a mixture of the horizontal flip and the vertical flip. We also shift it by 1 vertically and horizontally. For this procedure, we flipped it horizontally and shift it by 1 (horizontal) and then flipped it vertically and shift it by 1(vertical). After that we flipped it vertically and shift it by 1(vertical). The result for the third equation was that it was flipped(vertical and horizontal) and shifted by 1. This results the third picture with a grey line on top and the left of the picture.
The resulting images is shown below:

First Equation

Second Equation



Third Equation

Assignment 5

The last part discussed in this report is the approach of enlarging the image. Using linear interpolation is a great technique to implement this task. MATLAB provides the function interp2() to make this a fairly simple procedure. We created a function that takes in a gray image and then used the function interp2() for the image. We also converted the image to a double. Then we displayed the image. The image result is shown below.

Expanding by Linear Interpolation