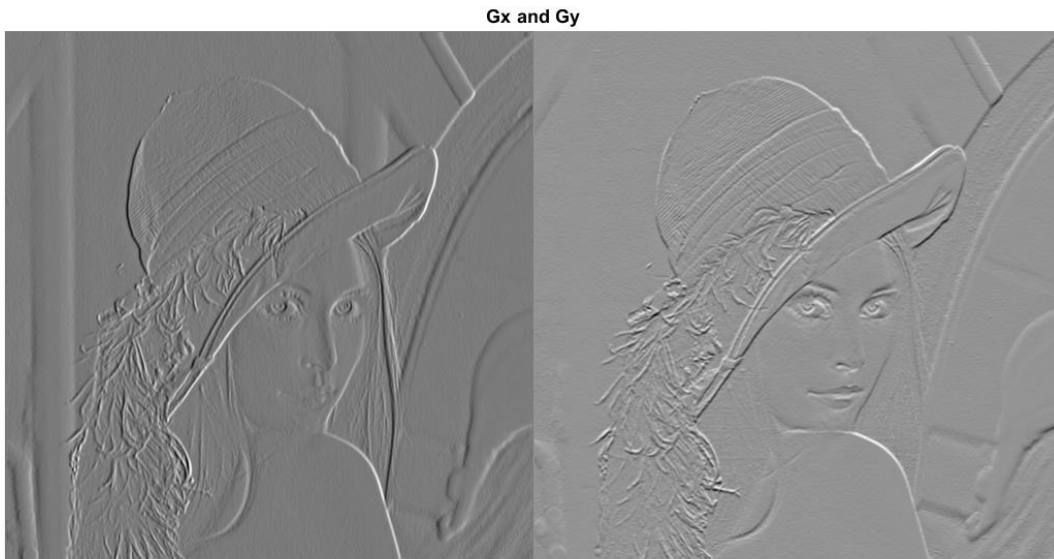


CMPE 565- Assignment 1

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- 1) In the first question, I used sobel kernels. Kernel_x components were $x1 = [1;2;1]$ and $x2 = [-1,0,1]$ and Kernel_y components were $y1 = [-1;0;1]$ and $y2 = [1,2,1]$. While doing convolution operation, each pixels of the image visited with for loop. At first, I used $x2$ and each 1×3 matrix in the image was processed with $x2$. After that, each 3×1 matrix was processed with $x1$. The same goes for Kernel_y and Gx and Gy images obtained as below.



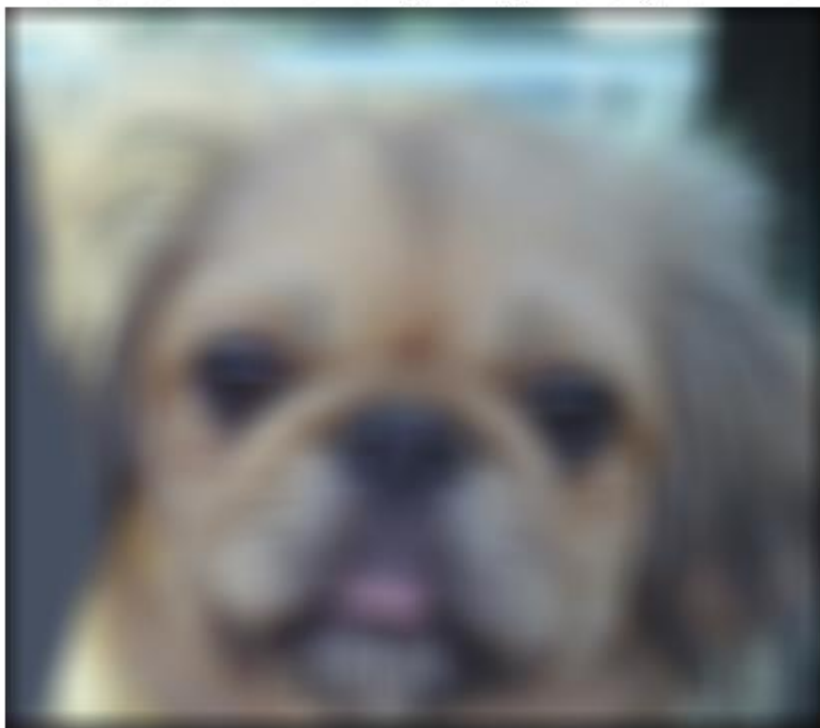
Finally I computed gradient magnitude from Gx and Gy .

Gradient Magnitude



- 2) I used gaussian blur for the low frequency of first image. For the gaussian filter, i take the hsize = [20 20] and sigma = 40. For obtaining the high pass image which is the second image, blurred image is subtracted from original image and the same hsize and sigma value were used to blur second image. After that I added low frequency of the first image and high frequency of second image each other.

lowpass with hsize = [20 20] and sigma = 40



highpass with hsize = [20 20] and sigma = 40

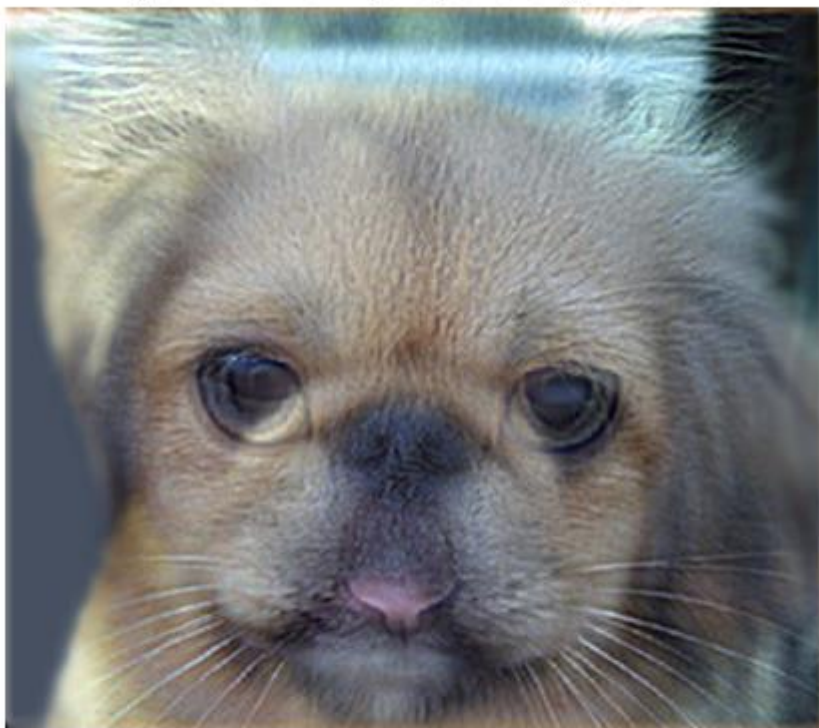


Hybrid hsize = [20 20] and sigma = 40



Hsize = [20 20] and sigma = 40 were optimal. When I tried to change hsize to [9 9] and no change in sigma, the cat was not visible, and it seems like it is only a dog image.

Hybrid hsize = [9 9] and sigma = 40



And when hsize were [40 40] and sigma were 40, hybrid image was like a cat, the dog was not seen properly.

Hybrid hsize = [40 40] and sigma = 40



- 3) I used `impyramid` function for reducing and expanding instead of `imresize`. For the gaussian and laplacian pyramids, I preferred to use 6 layers. Layers of gaussian pyramid is stored in cell array. The `gaussPyramid` function takes parameters of an image and return cell array with 6 elements and its first element is original image itself. Second layer is reduced form of first element which is the original image. Then the third layer is reduced form of second layer. The same goes for others until sixth element is done. The gaussian pyramid layers are as below from 512x512 to

16x16.





In `laplPyramid` function, I used gaussian pyramid array as a parameter, since $L_i = G_i - \text{expand}(G_{i+1})$. For expanding operation, I used `impyramid` function. The last and smallest sized layer of gaussian pyramid is

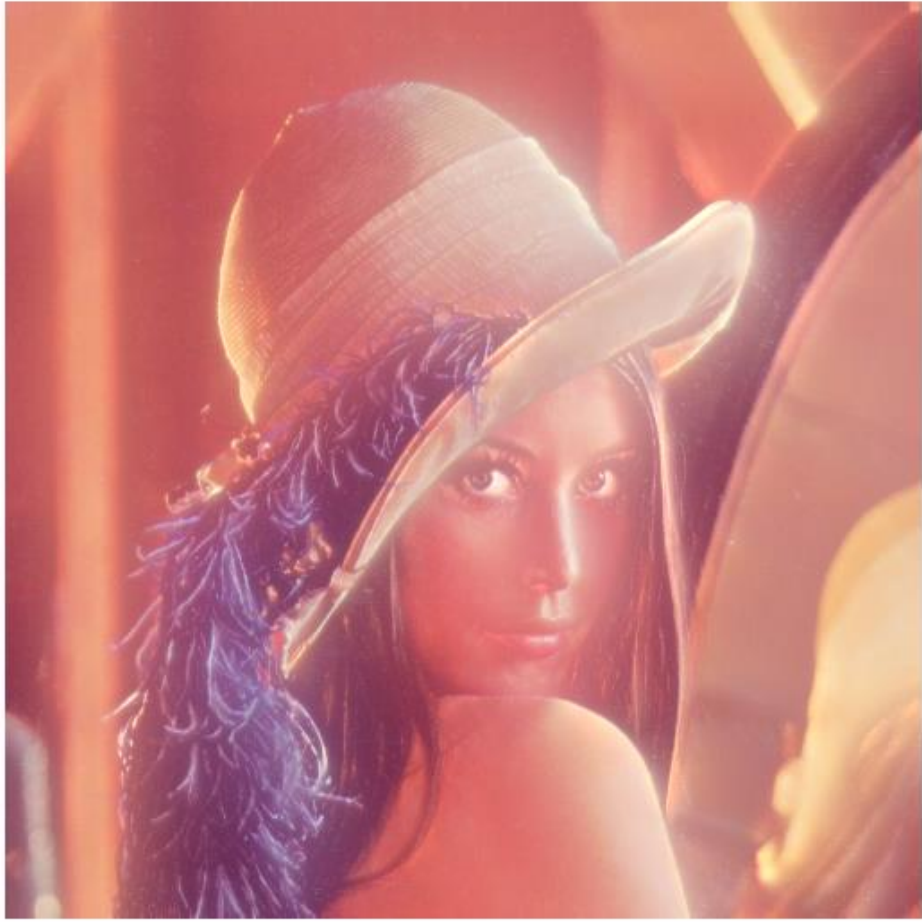
equal to the first element of laplacian pyramid cell array. Then the other layers of laplacian pyramid was obtained with $L_i = G_i - \text{expand}(G_{i+1})$. But there was a problem about size which gives an error because of inconsistency between G_i and $\text{expand}(G_{i+1})$. For example, when G_5 was 32×32 , $\text{expand}(G_6)$ was 31×31 . Because of that, after expanding operation, $\text{expand}(G_6)$ was resized to 32×32 in order to get rid of inconsistency between G_i and $\text{expand}(G_{i+1})$. Then the subtraction is done. The layers of laplacian pyramid are as below



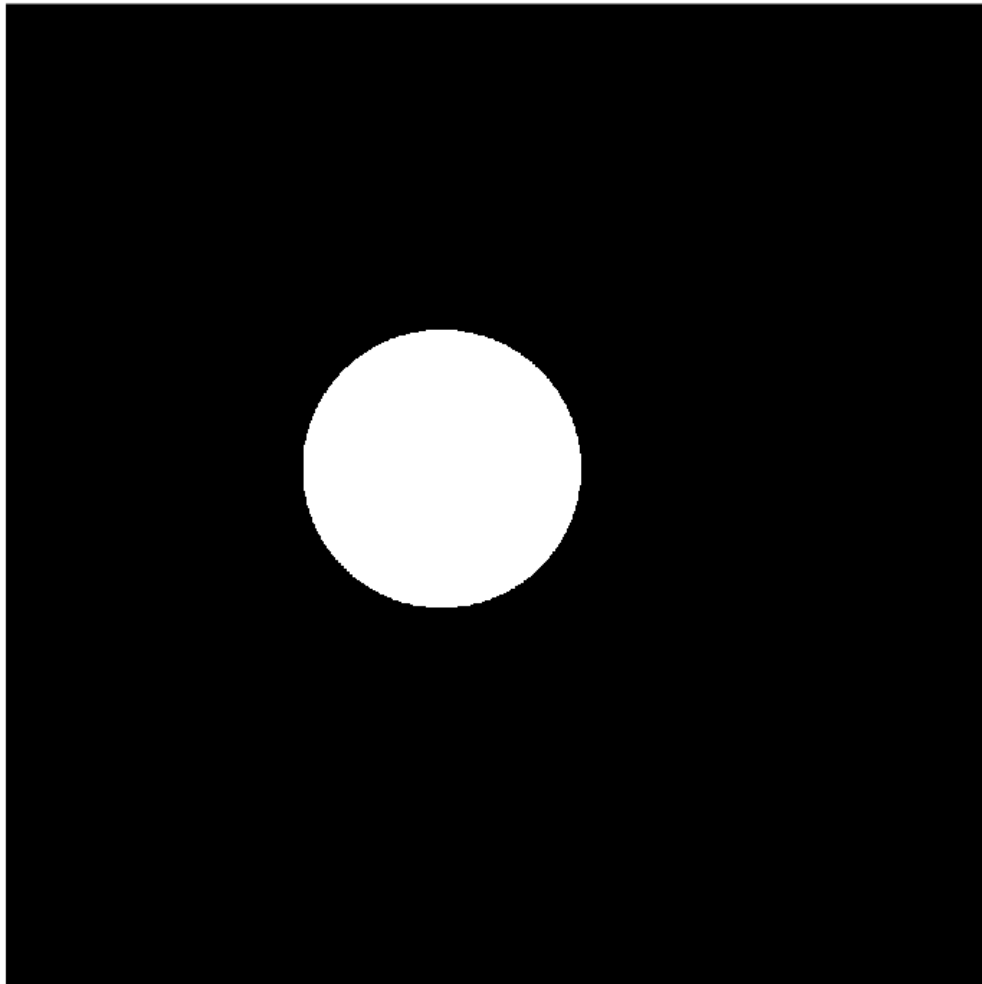




Collapse function takes laplacian pyramid cell array as a parameter. It returns a new construction image from laplacian pyramid layers. While creating construction image, expanding operation was used. At first a variable let's say `img` equals to the first layer of laplacian pyramid. And then it was expanded and resized in order to be compatible with second layer's size. After that `img` equals to `L1 + expand(L0)`. Then `img` was expanded again and added to `L2`. The same operations continued till `L5` which is the construction image was obtained. The construction image is as below.



For the mask operation I used hand and eye images. I created a circle with drawcircle function. The circle corresponds to man's right eye. After that mask was produced with createMask function.

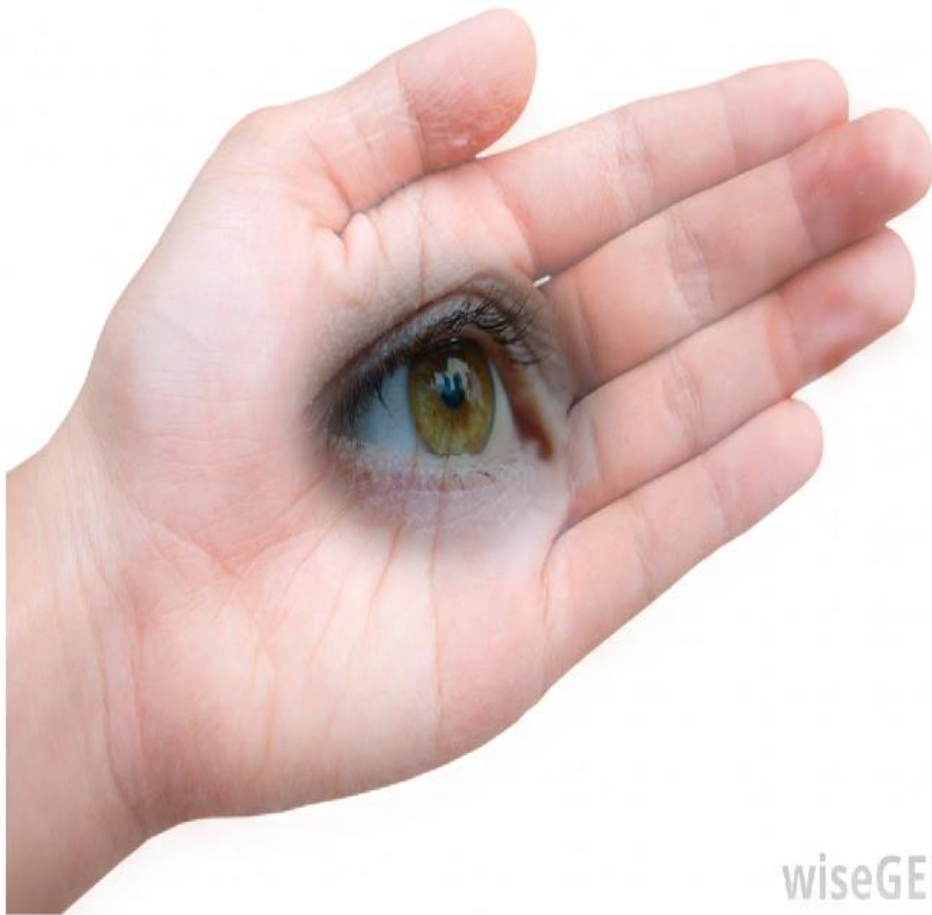


Afterwards, I filled circle with man's right eye and background with hand as below.



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Finally, to apply the image blending, I used matte equation. Accordingly, I got laplace pyramids from hand and eye images and got gaussian pyramid from combined image. Then apply the matte equation for obtaining the new laplacian pyramid. At the end, with the new laplacian pyramid as a parameter of collapse function, construction image was created as below.



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