Homework Assignment 2, CS696, applied computer vision

Hsuan Yu, Liu

**My algorithm and decision,**

Before starting to filter, used two if-statements to make sure width and height are odd. I used three for loops to implement the filter, because an image is a 3 dimensions matrix. Thus, my filter will do Width\*Height\*(Color channel) times. If it’s a grayscale image, then ‘color channel’ is one.

For each step, the algorithm will decide an appropriate start and end indexes for extracting data in an image. Using row to be an example. The start index is that subtracting an index of row from half width of a filter. The result is less than or equal to 0 means that the start index is out of the boundary. Thus, the function will revise the start index to 1. The end index is that plusing an index of row from half width of a filter. The result is greater than ‘end’ means that the end index is out of the boundary. Thus, the function will revise the end index to ‘end’.

🡪 Get a sub-image: image(row\_start: row\_end, col\_start: col\_end, dim);

After finding an appropriate area, a size of an area might not match to a filter. Therefore, I created a zero matrix to contain a sub-image.

Finally, the function will be multiplied the matrix with sub-image by a filter, and then use sum() function to get the final value for each pixel.

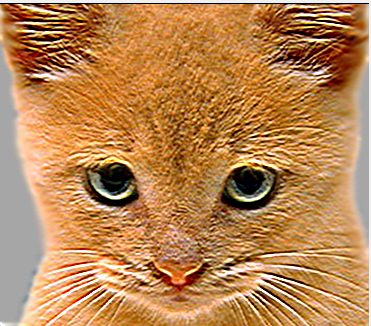
The way to multiple is ‘,\*’, since it’s element-wise multiplication. Sum() function has to use variable(:) to be a parameter, because the result is sum of all elements.

**Test and verification,**

The results of my\_filter() are the same as the results of imfilter() with the same filters.

Filter: [ 1, 2, 1 ; 0, 1, 0 ; -1, -2, -1]

Imfilter(): My\_imfilter():

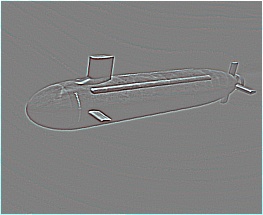
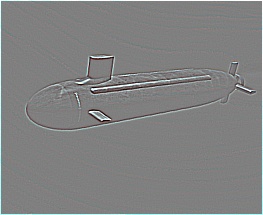
Filter: Small blur with a box filter. [1/9, 1/9, 1/9 ; 1/9, 1/9, 1/9 ; 1/9, 1/9, 1/9]

Imfilter(): My\_imfilter():

Laplacian Filter [-1 -1 -1; -1 8 -1; -1 -1 -1]

Imfilter(): My\_imfilter():

**The intermediate images in the hybrid image pipeline**,

Dog and Cat🡺 cutoff\_frequency = 5

Add one empty column into each image because the columns of the cat image and the dog image are even.

Dog, Low frequencies Cat, High frequencies

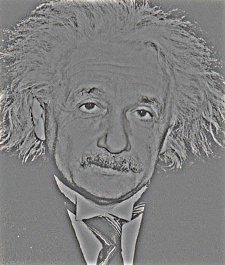
 

Dog & Cat Hybrid scales

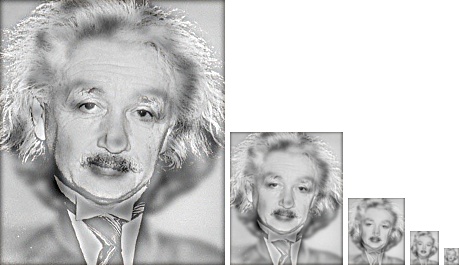


Marilyn and Einstein 🡺 cutoff\_frequency = 3

Marilyn, Low frequencies Einstein, High frequencies

Einstein & Marilyn Hybrid Scales



Bird and Plane 🡺 cutoff\_frequency = 5

Bird, Low frequencies plane, High frequencies

Bird & Plane Hybrid Scales

