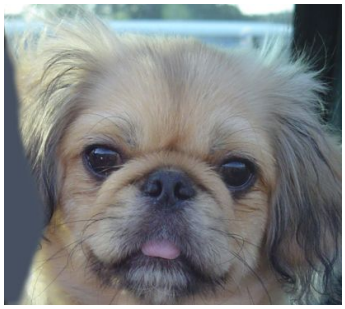
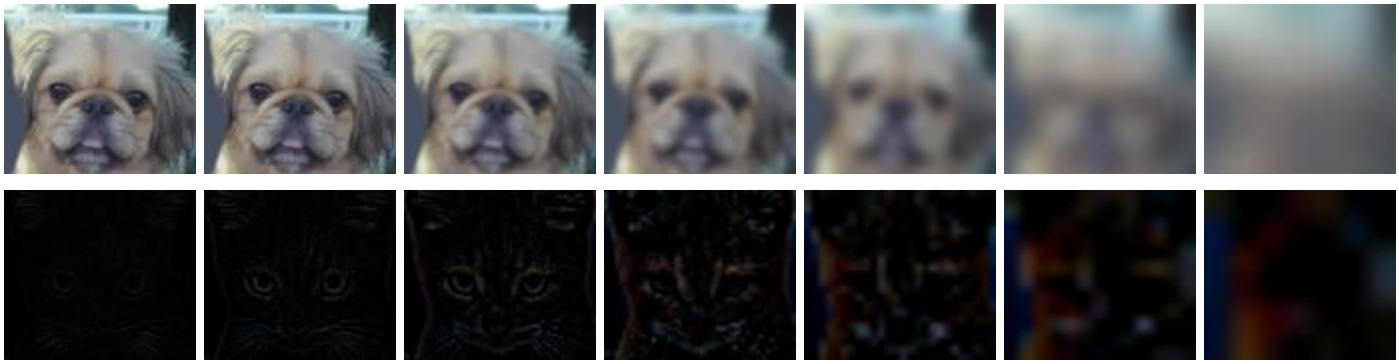
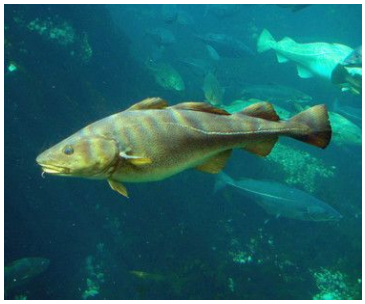
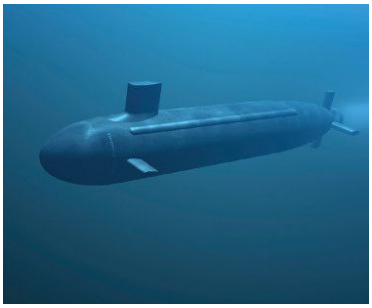
Michael Pedersen
09-06-16
Computer Vision

Assignment 2 - Hybrid Images





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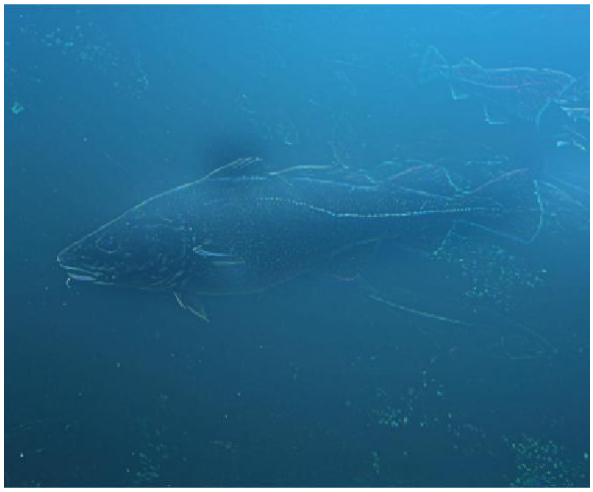

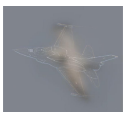

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Description of the Algorithm:

Overall this algorithm is quite simple. First, I read in both images from a directory called ‘source’ in the same folder as the main.m file. I also save the original dimensions of the images. To simplify the program I assume that both images being used as parameters are both the same initial size and are pre-aligned in order to maximize the spatial effect of the distance illusion. Next I cell arrays in order to save each layer of the pyramid for both the low and high pass filters. The number of iterations, both cutoffs, and the blur factor are also initialized.

Once housekeeping is done I first initialize a sample image with the first image. Then to generate gaussian pyramid I first storing the sample image into the cell array, blur the sample image, downsample by a factor of 2, and save the result as an image file. This process is repeated for the number of iterations defined previously.

For the laplacian pyramid I again loop for however many iterations. Each iteration I blur the sample image, calculate the laplacian approximation by subtracting the original sample image from the newly blurred image, then save it to the high pass cell array. Then I downsample it by 2 and save to a image file for debugging. In preparation for combining the two pyramids I first go through each cell array, now populated with sample images of differing sized, and resize them all back into the original dimensions of the input images.

Finally, I simply add the cutoff amount of images from the bottom of the low pass pyramid with the cutoff number of images from the high pass pyramid. In order to keep image values valid I average each slice of the pyramids before they are added.

Adding color to the original algorithm was quite trivial since almost all the functions I used were channel agnostic. The most major change would be the downsampling step which in which I had to add a colon as the third parameter so that it would copy all the RGB channels during the downsampling. Using color for both the high level and low level detail was useful because it allowed the images to blur into each other much better than if a single pyramid (especially the gaussian pyramid) was grayscale while the other was color.

Difficulties:

- Combining the two sections of the Gaussian and Laplacian pyramids was tricky. Finding out how much of each pyramid to add to the final image took some tinkering.
- Generating the laplacian pyramid was a major headache. I tried every mentioned including fspecial with ‘laplacian’ as a parameter and subtracting the pre-blurred image from and current image. No matter what I tried I could not get the images to look like those produced in the homework. Overall the images ‘work’ but I feel like the laplacian filtering should have more detail.