**Assignment 2 -Hybrid Images**

Name - Shubham Amilkanthwar

UNCC ID - 801076647

In this Assignment, Our goal was to create the hybrid image using two different image. . Hybrid images are based on the multiscale processing of images by the human visual system and are motivated by masking studies in visual perception. While creating the hybrid image when we pass the images one of them will be high frequency image and other will be low frequency image. So what exactly high frequency mean is it will have high perception in the image compared to the lower frequency image.

So while doing this assignment, initially I started with reading the paper “Hybrid Images” given by professor. This paper was very helpful to understand the concept of hybrid image technique and I was able to understand how to create textures that become visible only when seen up-close, to generate facial expressions whose interpretation changes with viewing distance, and to visualize changes over time within a single picture.

For this project; Low-spatial scale for image is obtained by filtering image with low pass filter while high-spatial scale image is obtained by filtering image with the high pass filter. And final image will be consist of this two low spatial and high spatial scale image.

So to filter the image I used different types of function like mesh grid, exponents and got the value of filter. Mesh grid is used to return 2-D grid coordinates based on the coordinates contained in vectors x and y. X is a matrix where each row is a copy of x, and Y is a matrix where each column is a copy of y. The grid represented by the coordinates X and Y has length(y) rows and length(x) columns. I also calculate exponent value for the center of x and y in both images. Using exp function in matlab. exp(X) returns the exponential *e*x for each element in array X. For complex elements *z* = *x* + *iy*, it returns the complex exponential.

Along with this I also shifted the image a little which helps in hybrid image to visualize. For that I have used function called fftshift which Shift zero-frequency component to center of spectrum. So fftshift vector swaps the left and right halves of X.

So now I have explained how all the functions works I will tell how my program works. First it will read the images into the variables called Image1 and Image2. Then I used im2double matlab function to convert image to double precision. I have two functions called imagefilter1 and imagefilter2 and I passed them image and filter size. The filter size is the one which I have calculated using sigma and I have put it into the variable called gaussiand. In my functions, imagefilter1 I used for lowpassfilter and first I shift the image then I return the size of my lowpassfilter image using size function. I used those array size in mesh function which I already explained in above paragraph. After getting X and Y value from meshgrid function I calculate the exponent and used it on my image by multiplying with the exp variable “G”. Then I shift the image using ifftshift function i.e. inverse zero frequency shift. And finally I used 2-D inverse fast Fourier transform using function called ifft2.

I did everything same for the highpass i.e. imagefilter2 function except in exp I did 1- exp value to calculate the G and then pass it to shift and Fourier function.

And after getting this value for both image functions I added back both in final variable.

Code steps- you can just run the code directly once you have all images in same directory as your code. I have created multiple read variable in comments to check other images. You can just remove comment and add comment to previous image and run again for testing different images.

It was really great learning experience. I hope to such fun assignment in future. Also let me know if I can make an improvements in this code and how?