CSCE448-500 Project 3

Lam Nguyen

February 21, 2023

1 Task 1: Image Hybrid

For this task, we will be combining two images together to form a hybrid image. The process involves aligning the images and overlay the high frequency of one image on top of the low frequency of the other. At close range, we interpret the image as the high frequency image and far away, we interpret the image as the low frequency image. Below is an example of a successful hybrid image of Mona Lisa and Mr. Bean:

Figure 1: Original Image - Low Frequency

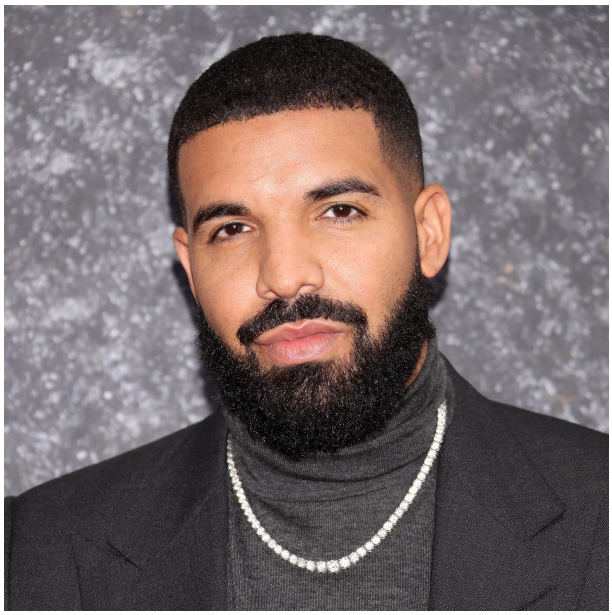

Figure 2: Original Image - High Frequency

Figure 3: Successful Hybrid Image (Zoom in to see Drake)

After combining Figure 1 and Figure 2 to get the hybrid image seen in Figure 3, we can see that the code follows the theory that the low frequency image will appear the farther away you are, and the high frequency will appear when closer. Some challenges to get this to work was mainly playing around with the sigma value to get it to come together in a way that looks more clean.

One thing we also notice is that the two original images have favorable conditions to be successful; this means that they both have similar lighting, resolutions, and color palettes. In the case where none of this happens, we get an hybrid image such as seen below:

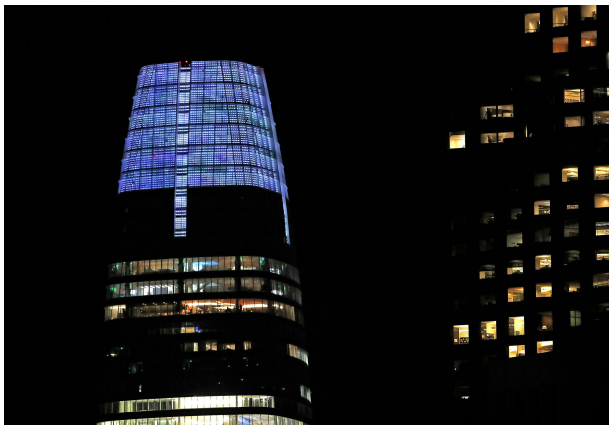

Figure 4: Original Image - Low Frequency

Figure 5: Original Image - High Frequency

Figure 6: Unsuccessful Hybrid Image

As we can see in Figure 6, the hybrid of the two images Figure 4 and 5 did not work well because one has significantly different lighting conditions that the other (e.g. night vs day). No matter how close or far you are, the night image will always be there. Playing around with low and high sigma values also does not help much either. Also here is the image of Einstein and Monroe using my implmentation:

Figure 7: Monroe and Einstein Hybrid Image

2 Task 2: Pyramid Blending

For this second task, we will be blending images together using Gaussian and Laplacian pyramids. The process involves:

1. Find the Gaussian pyramid for the source and destination images.
2. Use the Gaussian pyramids to find the Laplacian pyramids.
3. Then the Gaussian pyramid was found for the mask.
4. Apply this formula: LC(l) = GM(l) × LS(l) + (1 GM(l)) × LT(l)

   where l = layer on pyramid
5. Collapse the blended pyramid LC

The result of implementing the code gave the following blended image when using two similar looking actress:

Figure 8: Source Image - Rachel Brosnahan

Figure 9: Target Image - Rachel Wood

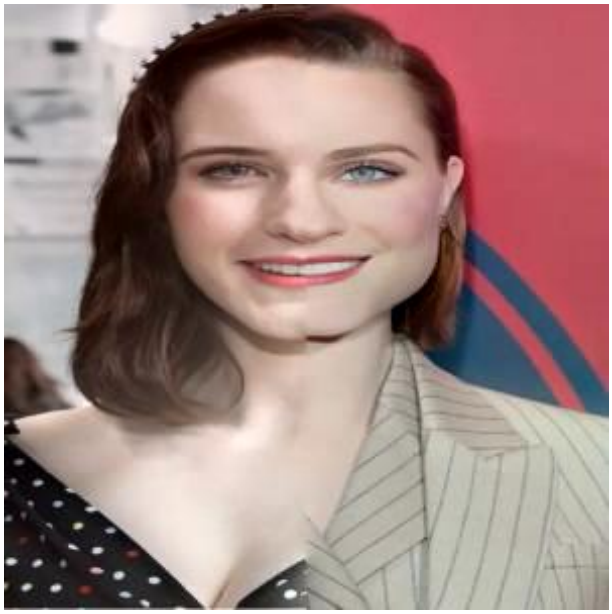

Figure 10: Successful Blended Image

As we can see from Figure 9, the blending works well except the chin area and eyes, and it really does look like Woods and Rosnahan look exactly the same when blended. Some technical issues faced when accomplishing this was that resulting image needed to be clamped between 0 and 1 or else the image would hold negative and large values. Another issue faced was that the blending requires the image to be aligned well and have similar lighting. An example is show below of an unsuccessful blend:

Figure 11: Source Image - Natalie Portman

Figure 12: Target Image - Keira Knightley

Figure 13: Unsuccessful Blended Image

As we can see, the alignment is really off and so is the lighting to an extent. This approach fails because the two images have different visual characteristics so it is difficult to make a natural looking blend with a mask; it also highlights how sensitive the alignment is using this approach with masks due to the massive seam. This results in an image as seen in Figure 12 where they are blended terribly. Also here is the image of the Apple and Orange using my implementation:

Figure 14: Apple and Orange Blended Image