Lab 1: Hybrid Images and Blended Images

Adrian S. Volcinschi M.
Universidad de los Andes
https://uniandes.edu.co/en
as.volcinschi@uniandes.edu.co

1. Introduction

Salvador Dal made the painting called Lincoln in Dalivision in 1977. This painting appeared to be a woman looking through a window from up close but when you got far away from the painting a face resembling Abraham Lincoln showed [1]. From this, many people got interested in making similar effects but with other kind of images and thus the research of what we call now hybrid images began. There were some limitations back then since image editors were not as easy to get compared to nowadays. As of today, anyone can download a photograph editor and align two different photographs to match on a fixed point or feature watching a video on YouTube.

2. Materials and Methods

The work that had to be done consisted of two parts: align two similar photos to create a hybrid image afterwards and blend two images halves and make it look more natural than simply pasting both halves together using Gaussian and Laplace pyramids. After aligning both images using Photoshop I was able to obtain the images on figure 1 and 2. The final dimensions of these images are 702 of width and 1092 of height in format of jpg.

For the hybrid image I began by loading both images using the skimage.io module. When both images were loaded I filtered both images with a Gaussian filter from skimage.filters. My fathers photo was filtered with a Gaussian filter with $\sigma = 3$ and mine with a $\sigma = 19$. After having both images filtered I extracted the high frequencies of my fathers photo by subtracting the filtered image to the original one. To finally obtain the hybrid image I added both the low frequencies of my photo and the high frequencies of my fathers.

For the blended image I loaded both images once again. When both images were loaded I resized both images to a size of 1024x1024 using the skimage.transform module. The first thing done afterwards was to construct the Gaussian pyramid. The downscale factor used was 0.5 up to a size of 32x32. When the pyramid was built I began to construct the Laplacian pyramid using an upscale factor of 2. Since I had to do a subtraction of the level n of the Gaussian pyramid and the upscaled level n + 1 I handled the negative values by placing 0s whenever a value became negative. I took the left half of my fathers picture and the right half of mines and joined them on the 32x32 size level of the Gaussian pyramid. After this was done, an iterative reconstruction of the original size began by upsampling this 32x32, adding the corresponding level of the Laplacian pyramid and so on.

3. Results

The resulting image of the hybrid process can be seen on the figure 3. To see the effect of distance in this hybrid image I used the code for visualization found on the image filtering and hybrid images of the computer vision course from Brown [2]. This pyramid visualization shown in figure **??** comes from a downsampling of the hybrid image and stack of those downsamples horizontally for its side by side visualization. For the blended image, a first approach is to join a half with another one. This first approach can be seen on the figure 5. Using the algorithm described, the resulting blended image on figure 6 shows a far better result.

4. Conclusions

As expected, the high frequencies are the ones that are far more detailed on the hybrid image than the low ones. Additionally, it is easier to recognize my father rather than myself because of the characteristics found on the high frequencies. In the blended images you can see that the first approach shows a very bad result compared to the final one. The final one shows a more natural look and if it is done with a more similar pair of images the result becomes even better.

References

[1] Anon. Lincoln in dalivision, 1977 by salvador dali. https://www.dalipaintings.com/lincoln-in-dalivision.jsp.

[2] J. Hays, S. Kim, and Y. Hu. Image filtering and hybrid images. http://cs.brown.edu/courses/cs143/proj1/. [Online; accessed 18-02-2019].

5. Annexes

Figure 1. My father

Figure 2. Myself

Figure 3. Hybrid image of my father's high frequencies and my low frequencies

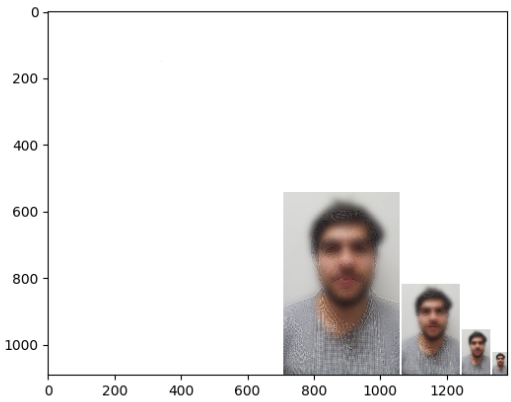

Figure 4. Gaussian pyramid visualization

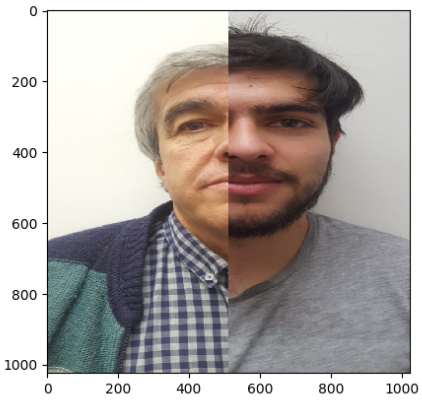

Figure 5. First attempt of blending

Figure 6. Final blended image