Simple Compositing
INF01213 Computational Photography – 2020/1

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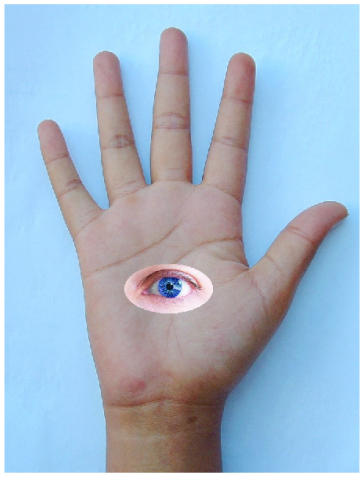
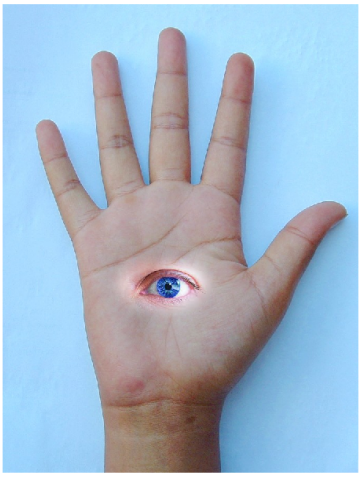
1 Part 1 - Pyramid Compositing

For the first part of this assignment, we were provided with a MATLAB script that implements Pyramid Compositing. Given two images and a binary mask, the algorithm computes the Laplacian sequences for both images and a Gaussian sequence for the mask. Then, for each level of the sequences, it combines both images using alpha compositing, where the value of alpha is given by the corresponding level of the Gaussian sequence of the binary mask.

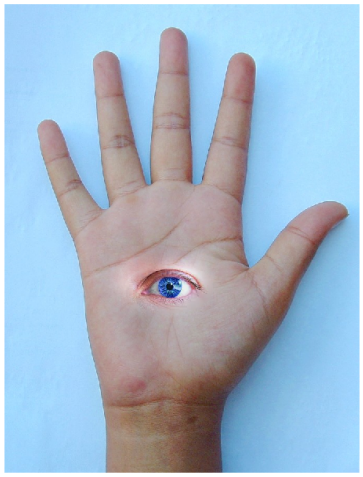
The script, as it was provided, produced the image in Figure 1b. As we can observe, some artifacts resulting from the skin tone differences between the hand and the surroundings of the eye are clearly visible. We improve the quality of the composite by increasing the value of the *Levels* variable, i.e., increasing the length of the Laplacian and Gaussian sequences. The higher these values, the smoother the transition between images becomes (Figure 1). Particularly, with $Levels = 160$, the resulting image becomes very realistic.



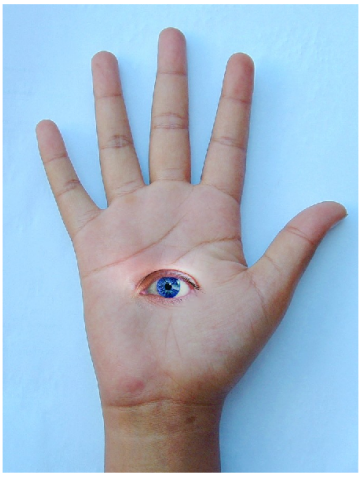
(a) *Levels* = 1.



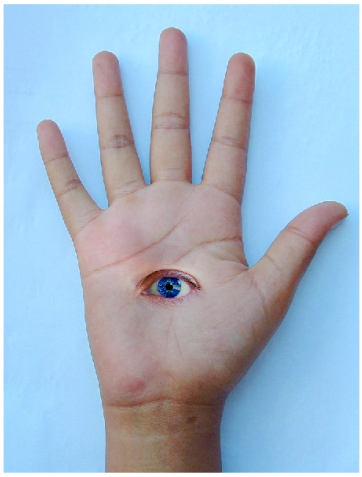
(b) *Levels* = 20.



(c) *Levels* = 40.



(d) *Levels* = 80.



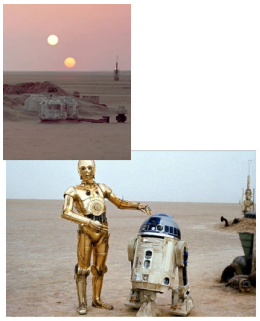
(e) *Levels* = 160.

Figure 1: Pyramid compositing.

In the next task, we should composite the image of the sun in the sky of a night picture, and also composite in the same night picture some object found in a day-light photograph. I decided to take the android R2D2 and the two suns of Tatooine from Star Wars to the darkness and terror of Sauron at Mordor from The Lord of The Rings.

In Figure 2 we can see both images, a version in which they were simply merged together and the resulting Pyramid composition. Note that in the final composition the two suns became darker, and upon closer look, some artifacts are still visible around them. This effect occurs because the sky of Tatooine and Mordor have very distinct color. Even though R2D2 also became darker, the Pyramid compositing produced an unintentional and very nice effect around it. The sand around R2D2 (Figure 2c) appears to have spread across the image, seeming as if the lava or the suns are illuminating the image.

(a) Mordor.



(b) Two suns and R2D2.

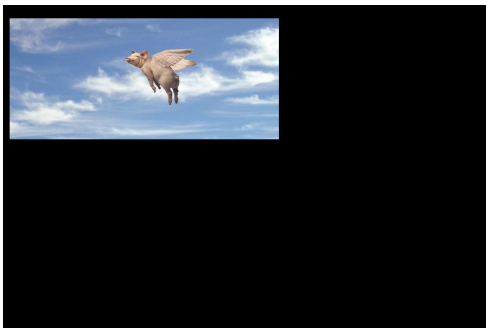
(c) Simple merge.

(d) Pyramid compositing ($Levels = 200$).

Figure 2: Pyramid compositing of the sun and an object from a day-light picture into a night picture.

The third task is to composite an object from a day-light picture into a another day-light picture. I decided to recreate the famous album cover from the Pink Floyd album Animals. I combined a more recent picture of the Battersea building and a flying pig found on the internet.

(a) Battersea.



(b) Flying pig.

(c) Simple merge.

(d) Pyramid compositing ($Levels = 200$).

Figure 3: Pyramid compositing of an object from a day-light picture into a another day-light picture.

Most of the regions around the pig mixed together pretty well (Figure 3d), as it is easy to simply combine two distinct tones of blue. However, some regions around the pig's legs (in which there were very whitened clouds), produced some artifacts.

The final task is to composite an object from a night picture into another night picture. Continuing with the Star Wars/The Lord of The Rings crossover, I tried to combine Darth Vader next to Galadriel in a moonlighted night on Middle Earth.

(a) Galadriel.

(b) Darth Vader.

(c) Simple merge.

(d) Pyramid compositing ($Levels = 200$).

Figure 4: Pyramid compositing of an object from a night picture into another night picture.

In Figure 4d, we note that the blue light around Darth Vader in the original image spread around him in the resulting image in a smoothed way. The same happened with the light around his red light saber, which reached Galadriel's arm in a way that seemed like they were really next to each other.

2 Part 2 - Alpha Compositing

In the second part of the assignment, we were provided with the images of two haired dolls and their respective alpha masks (Figure 5). I wrote a simple python script that implements the Composition Equation in order to merge the foreground and background pictures.

(a) Foreground.

(b) Alpha Mask.

Figure 5: Reference images.

In Figure 6, I show the resulting alpha compositions of the foreground image with the board background given by the professor and three other backgrounds I found on internet. All resulting compositions are very satisfactory, as the quality mostly depends on the alpha mask. The provided alpha mask is very detailed, and I suppose it was generated by a good algorithm. We can see, however, some discontinuities on the hair of the dolls, as the mask has non-binary values, blending the pixels of both images. To further

improve the results, we could use a more sophisticated algorithm which takes into account regions of uncertainty using trimaps.

(a) Squared board.

(b) Beach.

(c) Moon.

(d) Toy Story.

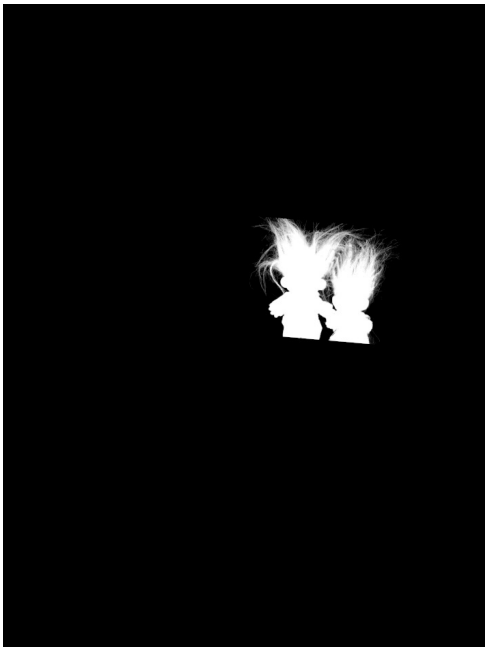
Figure 6: Alpha compositing.

Finally, in the last task I was supposed to composite the dolls into a framed picture found within a selfie. I used as background a selfie I took at the Musikinstrumenten-Museum Berlin with a portrait of Mozart. To achieve this, I needed to apply a linear transformation both to the image of the dolls and to the alpha mask in order to reposition them on the framed picture of Mozart.

The transformed images and the final alpha compositing are shown in Figure 7.

(a) Selfie with Mozart.

(b) Transformed foreground image.



(c) Transformed alpha mask.

(d) Alpha compositing.

Figure 7: Alpha compositing into a selfie with a framed picture.

3 Conclusions and considerations

All assignment tasks were successfully done. In this assignment I became more familiar with Laplacian sequences and the Pyramid compositing method. The resulting compositions looked almost professional, and the process of producing them was quite fun. I had some trouble learning how to use GIMP to produce the binary masks, and it took me some time to find good images on internet. Furthermore, I had no trouble implementing the Compositing Equation, and the part 2 of the assignment was very straightforward.