

Assignment 3

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1 Introduction

Image Blending is mixing two images of the corresponding pixel values to create a new target image. This project demonstrates the use of Gaussian pyramids and Laplacians(gradients) to perform image blending.

2 Experiment

2.1 Part 1

This assignment focuses on implementing the Laplacian and Gaussian pyramids and Blending each level of pyramid using region mask.

Step 1: Build Laplacian pyramids for each image.

When stitching images, you will need to stack two images together, but it may not look good due to discontinuities between images. In that case, image blending with Pyramids gives you seamless blending without leaving much data in the images.

Step 2: Build a Gaussian pyramid for each region mask.

Gaussian pyramid is a sequence of images, starting with the original, the original shrunk by $\frac{1}{2}$, the original shrunk by $\frac{1}{4}$, and so on. At every transition of the pyramid, we want to downscale the image by a factor of $\frac{1}{2}$.

Step 3: Blend each level of pyramid using region mask from the same level

Step 4: Collapse the pyramid to get the final blended image.

2.2 Number of Pyramid Levels

I experimented different number of pyramid levels. I found that the 8 pyramid levels worked best on the photos I choose.



Figure 1: Pyramid Level 3



Figure 2: Pyramid Level 5



Figure 3: Pyramid Level 8



Figure 4: Pyramid Level 12

As we can see from the photos, the photo does not have a natural look at the 3 and 5 pyramid levels. Although the pyramid level 12 seems to have a natural appearance, the jet has started to lose its color and take on the color of your sky. Since level 8 is in a natural position between these two, I chose 8 as the pyramid level.

2.3 Blend 1: Sky and Jet

Sky and Jet blend seem to be successful in general terms. A small amount of foggy appearance is transferred from the jet picture. We can get rid of the fog by increasing the pyramid level, but then we have to sacrifice the color of the jet.



Figure 5: Source



Figure 6: Target

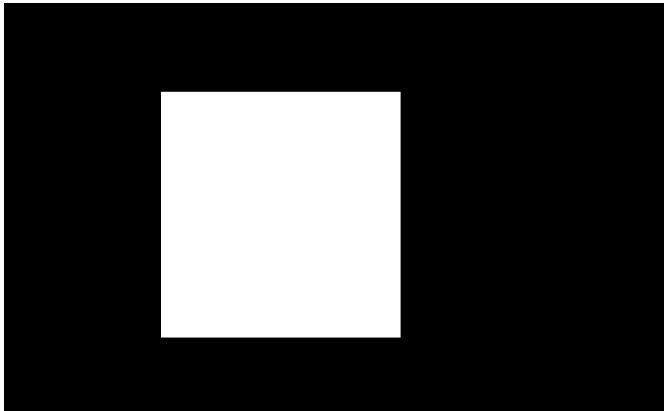


Figure 7: Mask



Figure 8: Result

2.4 Blend 2: Snow and Snowboard

In my opinion, no one can understand from the result picture that the snow and snowboard picture is obtained with the blend. Have a natural look



Figure 9: Source



Figure 10: Target

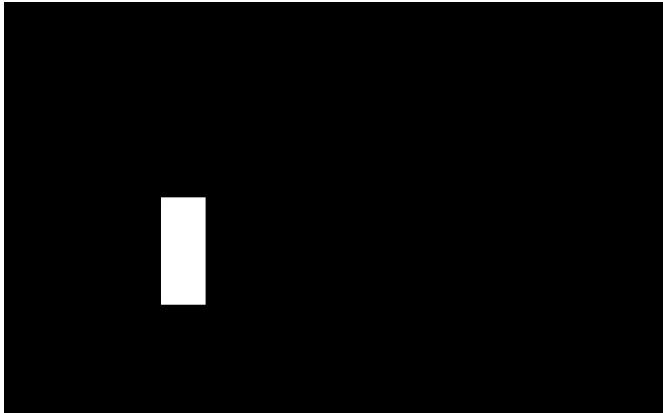


Figure 11: Mask



Figure 12: Result

2.5 Blend 3: Wall and Window

We can say that the blending process between the wall and the window has been accomplished successfully. The glass has become darker due to the dark color of the wall.



Figure 13: Source

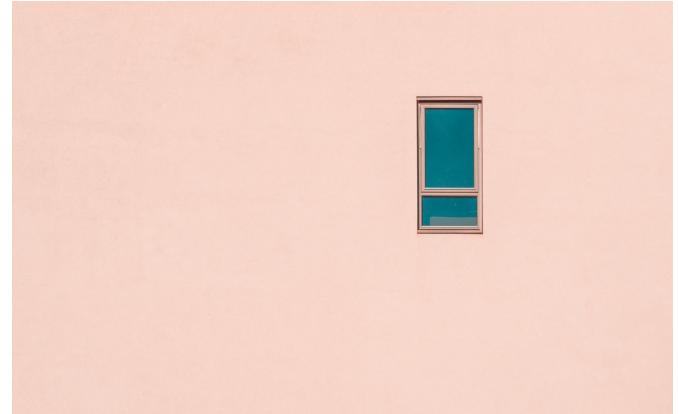


Figure 14: Target

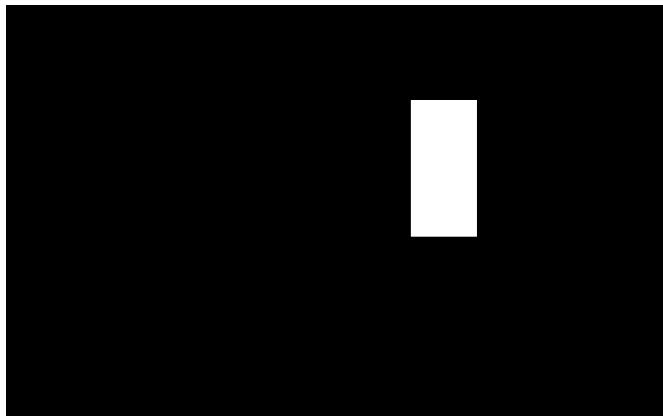


Figure 15: Mask

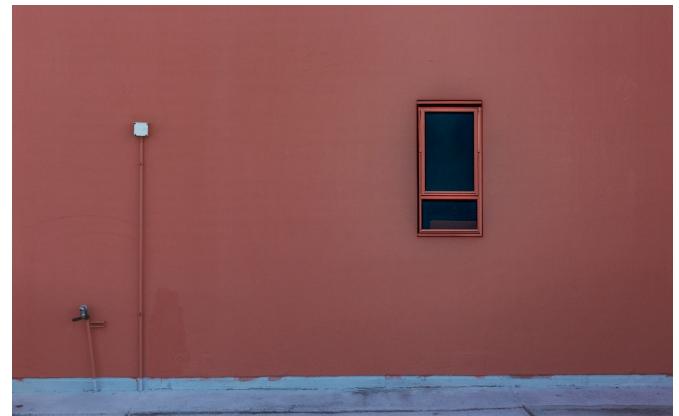


Figure 16: Result

2.6 Blend 4: Sea and Boat

I wanted to work on a more difficult example by choosing the picture of the sea and the boat. In this picture, it is clearly understood that the blending process has been performed. Although the sea part is matched, the inconsistency in the sky colors stands out. An improvement can be made using gradient-domain blending methods



Figure 17: Source



Figure 18: Target



Figure 19: Mask



Figure 20: Result

2.7 Blend 5: Dessert and Motorcycle

I had a bad result at first in desert and motorcycle images. I thought about how I could improve the picture and got rid of the unwanted parts by using a polygon instead of a rectangle. I performed this operation using the `tril` and `triu` functions of the numpy library.



Figure 21: Source



Figure 22: Target



Figure 23: Mask



Figure 24: Result

2.8 Blend 6: Ball and Ball

Finally, I used the mirrored version of the same image for the transfer. I can say that I achieved the most successful result in this picture. This is because the images have the same texture.



Figure 25: Source



Figure 26: Target



Figure 27: Mask



Figure 28: Result

3 Conclusion

In this project we implemented Gaussian pyramids and Laplacians to perform image blending. We can do same operation with image stitching, you will need to stack two images together, but it may not look good due to discontinuities between images. In that case, image blending with Pyramids gives you seamless blending without leaving much data in the images.