

BBM 415 - Fundamentals of Image Processing

Laboratory Assignment 3

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1 Introduction

Image blending is a photo editing technique used by many companies. It is frequently used in programs such as Adobe Photoshop and GIMP. In this task, Image Blending technique was applied using image pyramids. The steps and results of the technique are shared. Analysis was done on the outputs.

1.1 Experiment Details

- Build Laplacian pyramids for each image.
- Build a Gaussian pyramid for each region mask.
- Blend each level of pyramid using region mask from the same level. As this formula :

$$L_{12}^i = L_1^i * R^i + (1 - R^i) * L_2^i$$

R^i : Region mask

L_1 : Laplacian pyramid of first image

L_2 : Laplacian pyramid of second image

- Collapse the pyramid to get the final blended image.

1.2 Experiment Results

The results are given below with explanations. It is seen that the overall performance is higher than expected. It is also thought that the deficiencies in the pictures can be eliminated with different solutions. Overall results are successful.

1.2.1 Example 1

For Figure 1, an example of an apple and an orange is given. An orange picture was added to the apple picture and an impression was created as if it were a whole.

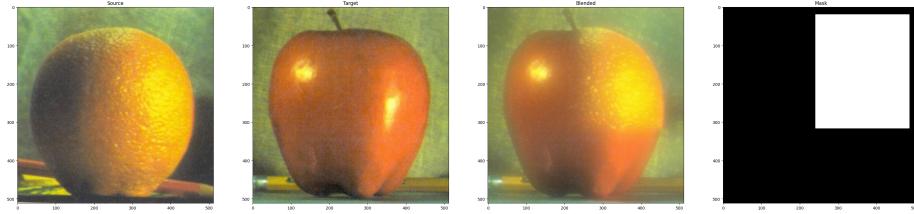


Figure 1: The Result of Example 1

1.2.2 Example 2

For Figure 2, moved a cat to a different area from the picture it was in. Due to the tonal difference in the areas, there are certainties around the cat. To minimize this, the tone of the picture has gradually changed. It is an unsuccessful result compared to other examples.



Figure 2: The Result of Example 2

1.2.3 Example 3

For Figure 3, an angry look has been added to the eyes of a smiling man. This made the photo very natural but strange. This painting is also successful due to the similarity between the paintings. The picture taught was very natural.

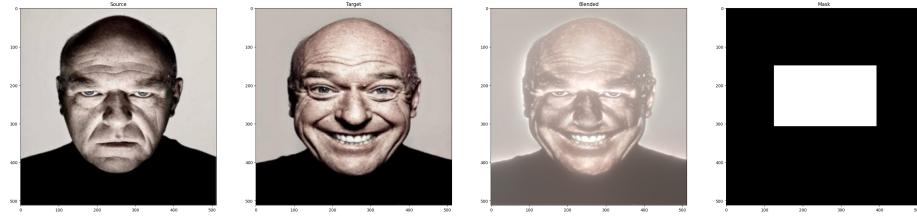


Figure 3: The Result of Example 3

1.2.4 Example 4

For Figure 4, shows how to add crowd to a photo of an empty New York City center. The photo gave a pretty good result. Looking at the photo, it was not understood that it was artificial. But the awkwardness becomes noticeable when the crowd is only in one area.

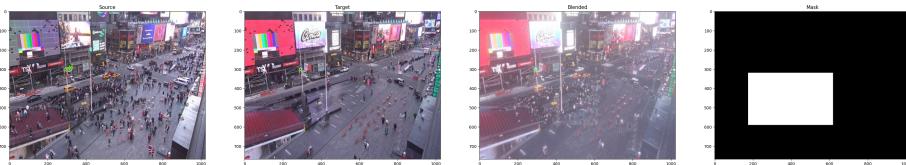


Figure 4: The Result of Example 4

1.2.5 Example 5

For Figure 5, balloons shot in Nevşehir were added to a nature painting. The picture, which seems natural at first, can be considered unsuccessful in details. But still a good result is observed.

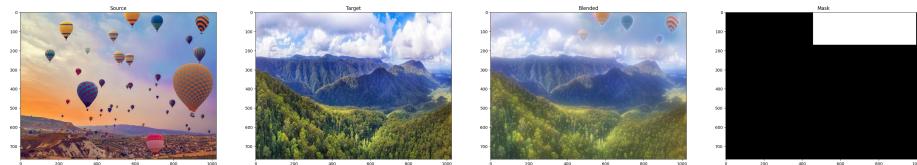


Figure 5: The Result of Example 5

1.3 Pyramid Levels Affect

Image pyramid technique allows us to obtain images of different sizes of an image and to work on them. The reason behind calling it as a pyramid is when we arrange the images in decreasing order of their resolution, we obtain a shape like pyramid with square base. The Gaussian Pyramid technique was used on the mask paintings, and the Laplacian pyramid technique was used on the main paintings.

The Gaussian Pyramid technique applies reduce and expand operations using 5x5 Gaussian filters. Laplacian Pyramid technique is a technique that applies additional steps with the formula $L_1 = g_1 - EXPAND[g_2]$ after the Gaussian pyramid technique application step.

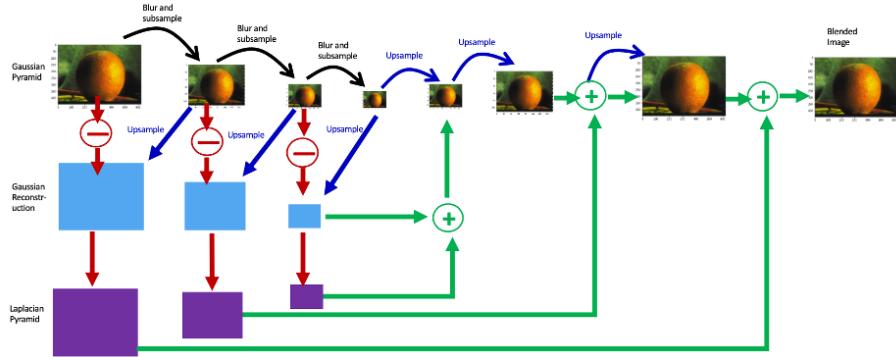


Figure 6: Image explaining how experiment steps are handled with levels and pyramids. The Laplacian pyramid builds from the Gaussian pyramid.

1.3.1 Example 1

For Figure 7, as the level increases, it is observed that the more the combination in the photo increases. Looking at the 4th level, the edges are very clear. But there are more natural transitions as you go to level 8.

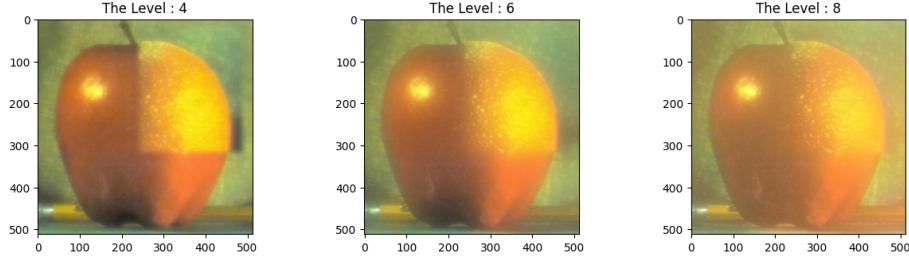


Figure 7: The Comparison of Levels on Example 1

1.3.2 Example 2

For Figure 8, due to the difference in the tones of the photograph, the tonal difference was tried to be equalized as the level increased.

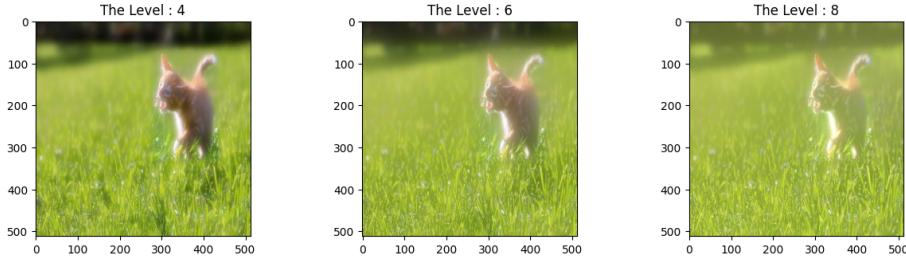


Figure 8: The Comparison of Levels on Example 2

1.3.3 Example 3

For Figure 9, there is a skin difference between the source image and the target image. This difference decreased as the level increased. Thus, a very successful example of high level has emerged.

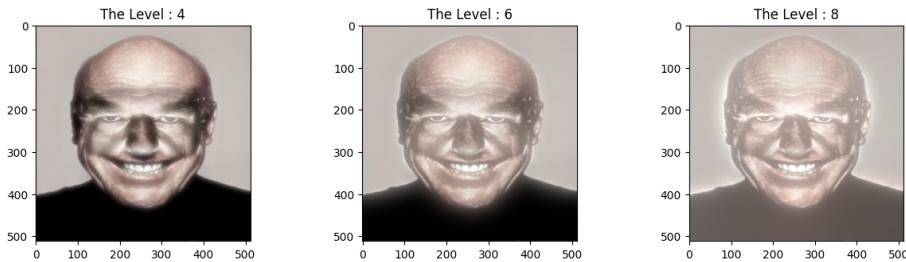


Figure 9: The Comparison of Levels on Example 3

1.3.4 Example 4

For Figure 10, at the 4th level, you can select the crowd, while at other levels the crowd is integrated with the picture.

1.3.5 Example 5

For Figure 11, as you look at the levels, it is seen that the sky difference decreases. But in the 8th picture, the circumference of the balloons is very evident. Level 6 seems to be more successful at this point.

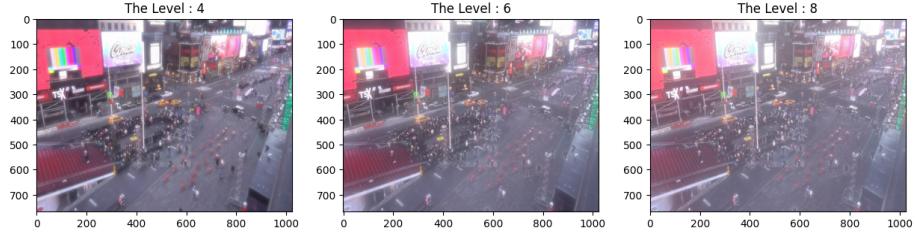


Figure 10: The Comparison of Levels on Example 4

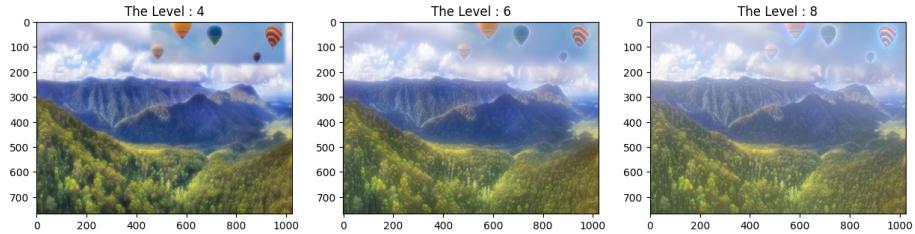


Figure 11: The Comparison of Levels on Example 5

2 Conclusion

In this assignment, we implemented the Image Blending technique using image pyramids. With this algorithm, we blended images with different masks on different images. Thanks to the theoretical knowledge underlying the algorithm, it was learned about the techniques of operations performed in programs such as Adobe Photoshop. It provided extensive information about the work that can be done in the field.

Gained experience with application in subjects such as Gaussian pyramid, Laplacian pyramid, image blending. In the image pyramids section, a comparison was made with different levels and a difference was observed between them. In practice, the results were generally successful.

3 references

OpenCV Python Tutorial - Image Blending using Pyramids in OpenCV
 Image Pyramids and Blending
 Image Blending Using Laplacian Pyramids- Medium