TED UNIVERSITY

Faculty of Engineering

Department of Computer Engineering

Fall 2019 - CMPE 362 Digital Image Processing

Bonus Assignment

Image Blending Using Image Pyramids

by

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Image Blending Using Image Pyramids

First of all, in this assignment, I would like to state that before showing the input images and result images within my report, I choose to make a creative blend of two-colored images. So, to mention about the detailed steps of what I have done within my experiment, before going into the details I would like to state that all the input images that I have used and all the binary mask images are 1000x1000 resolution, and I created each binary mask images by myself differently for each 3 experiments. In order to show my experiments, I numbered each experiment;

1. So, in figure 1 to 3 you can see the input images I used within my experiment. My main idea while choosing these input images within figure 1 and 2, was to create a blend image that contains a sight of Istanbul and Prague combined, so, I found two beautiful perspectives of the cities and created a custom binary mask image to satisfy my goal within this experiment. Next, I constructed each image's Laplacian pyramid by using *genPyr.m*, before showing my Laplacian pyramid level results, I would like to state that I have used levels up to 5 and observed that while increasing the Laplacian pyramid level, the corresponding image resolution for that level is decreasing continuously. You can see the Laplacian pyramid level results for the experiment 1 input images, in figure 4.

Figure 1: Input image 1 for exp. 1 (Istanbul)

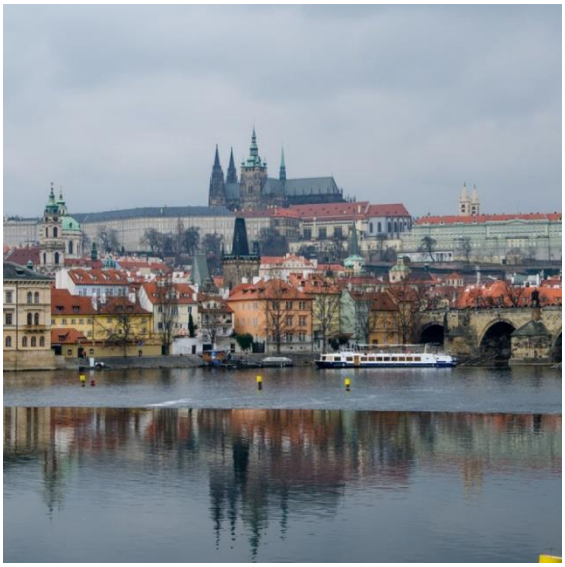

Figure 2: Input image 2 for exp.1 (Prague)

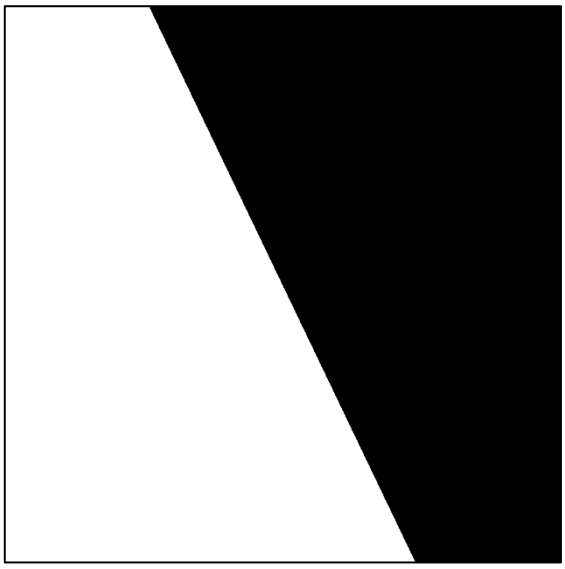

Figure 3: Binary mask image for experiment 2 (Normally, image contains no borders)

Figure 4: From left to right the laplacian pyramid levels are increasing. (Level 1 to 5)

Note: Hence, since I have observed the resolution decrease after an increase of the Laplacian pyramid level, I have decided not to observe the levels of Laplacian in my other extra 2 experiments.

After constructing the Laplacian pyramid for both input images, I have constructed the Gaussian pyramid for my binary mask image and its complement, by using *fspecial* function with *gauss* filter. The results of the Gaussian pyramids are shown below.

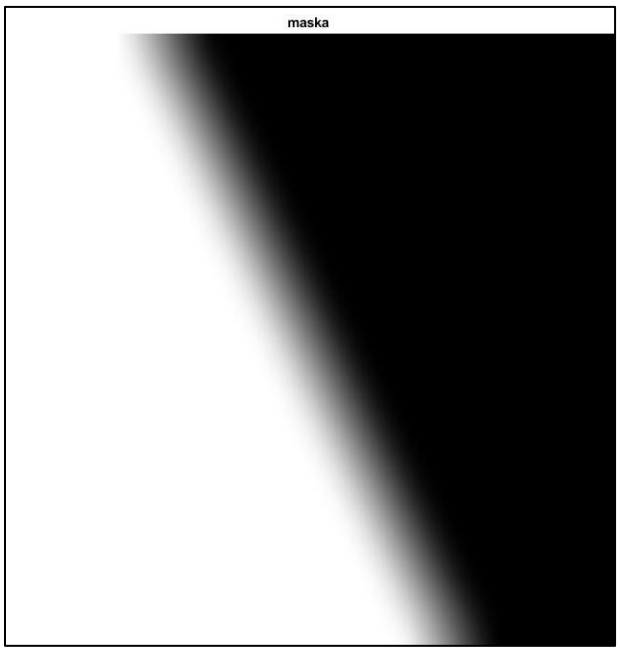

Figure 5: Gaussian result of my binary mask image

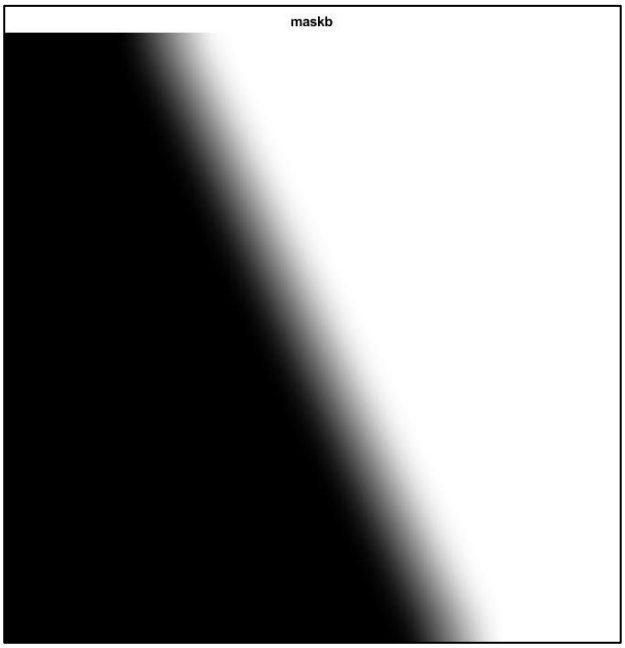

Figure 6: Gaussian result of the complement version of my binary mask image

After constructing the gaussian versions of both binary mask image and its complement, I have multiplied each Laplacian level result with its corresponding mask and sum all the images. The result of this step can be seen in the figure 4, it is the last level version with the smallest resolution. So, it needed a reconstruction to get the final result image for blend experiment. Therefore, I reconstructed the result by using *pyrReconstruct.m,* and I have observed the satisfying result like in the figure 7.

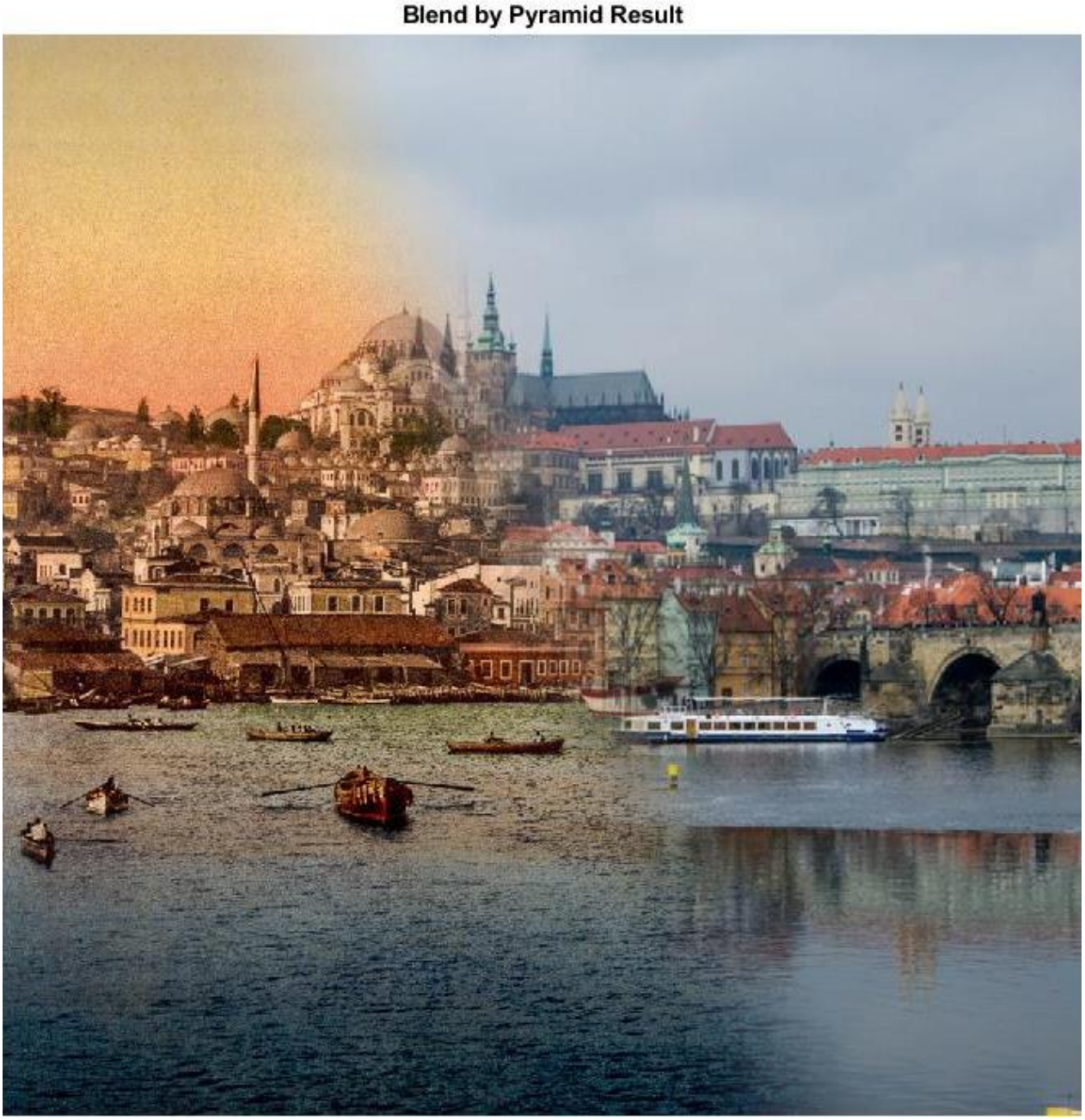

Figure 7: The blended result image of the input images by using the custom binary mask

All in all, I have used my custom binary mask image that I created via paint program and choose two beautiful city sights of Istanbul and Prague in order to combine them with my blend operation. So, the result was looking better than I have imagined. Lastly, I have observed that if we increase the level of Laplacian pyramid the resolution is decreasing, I have tested it with 1,2,3,4 and 5 level of the Laplacian pyramid.

After this experiment, I wanted to continue creating creative blend images so I will add them to my report without any detailed explanations since, I have applied the same steps of my experiment 1. I used the same functions and parameters, I only changed the input images and the binary mask image which will affect the blend result.

2. In this experiment, I have chosen two fruit images in order to create a blend image that contains two fruit images combined together. So, in the result the idea was to have an orange image with partly apple peel around itself. I have created a custom binary mask image in order to have my apple peel around orange only the places that I have wanted.

Figure 8: Input image 2 for experiment 2

Figure 9: Input image 1 for experiment 2

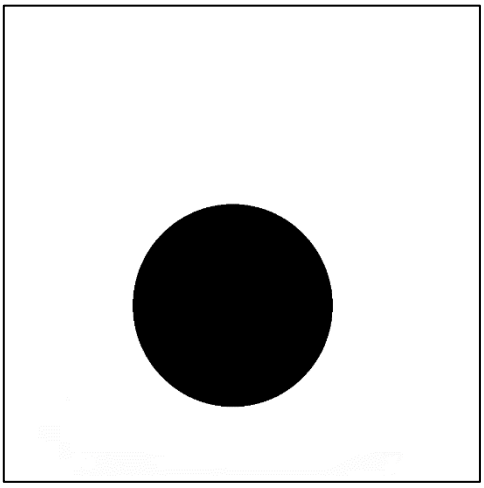

Figure 10: Binary mask image for experiment 1 (Normally, image contains no borders)

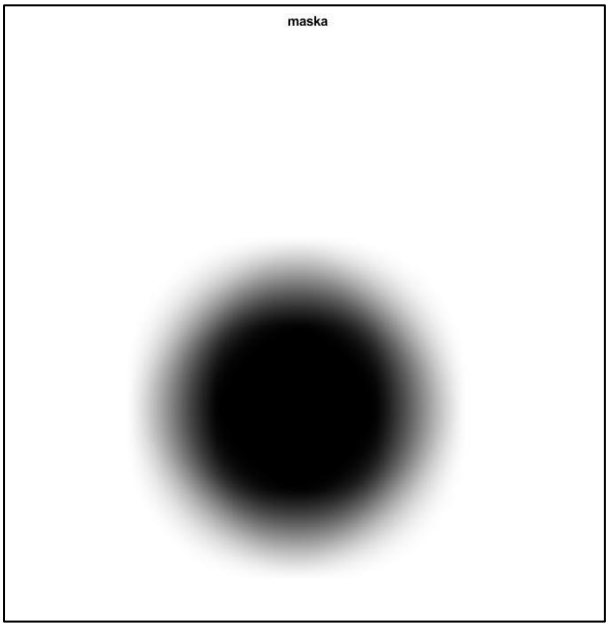

Figure 21: Gaussian result of my binary mask image

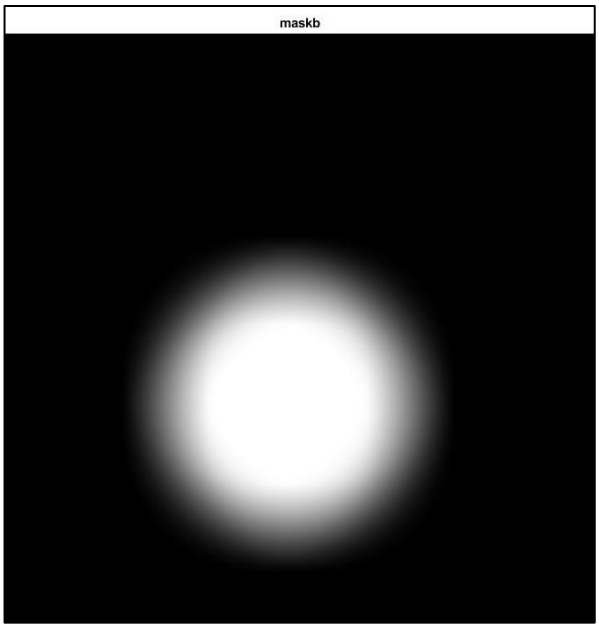

Figure 12: Gaussian result of the complement version of my binary mask image

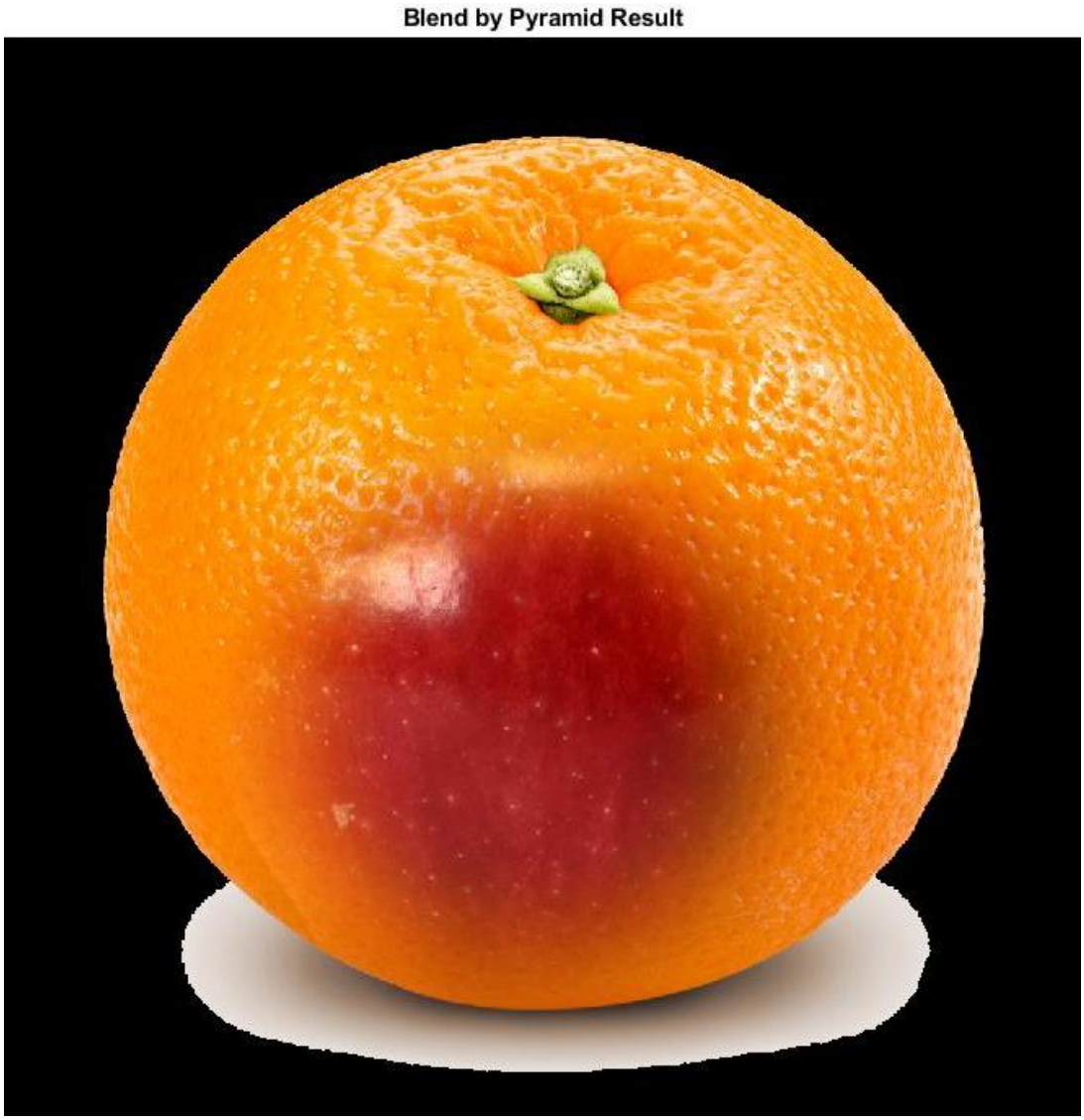

Figure 13: The blended result image of the input images by using the custom binary mask

3. In this experiment, I have chosen two planet images in order to create a blend image that contains half-moon and half-earth image combined smoothly. So, in the result the idea was to have a planet image with half-moon and half-earth appearance. I have created a custom binary mask image in order to have a planet separated into two equal pieces.

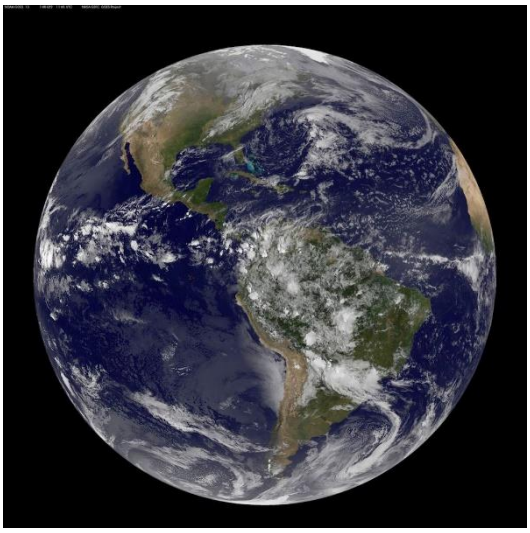

Figure 13: Input image 1 for exp. 3

Figure 15: Input image 1 for exp. 3

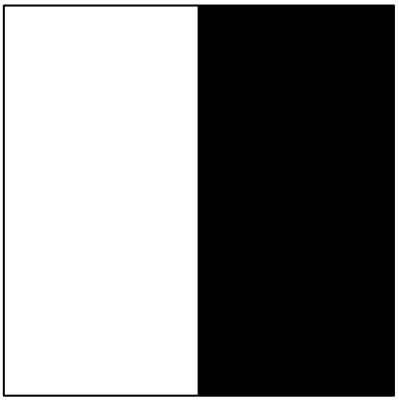

Figure 16: Custom binary mask image for experiment 3

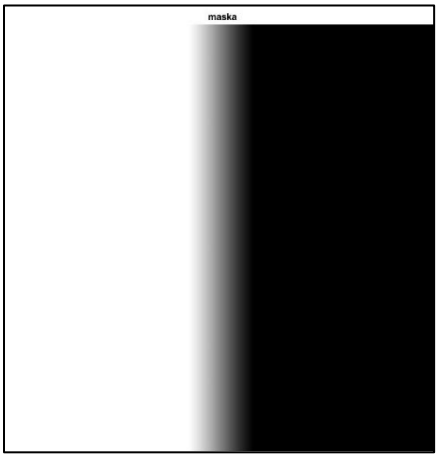

Figure 17: Gaussian result of my binary mask image

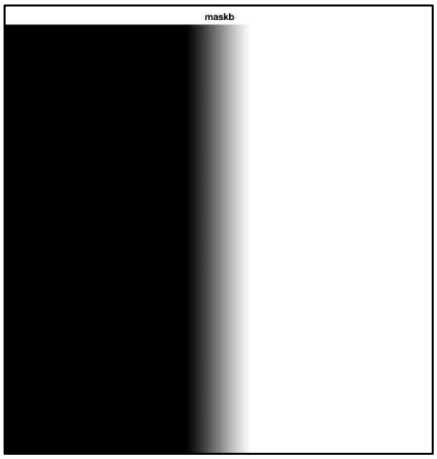

Figure 18: Gaussian result of the complement version of my binary mask image

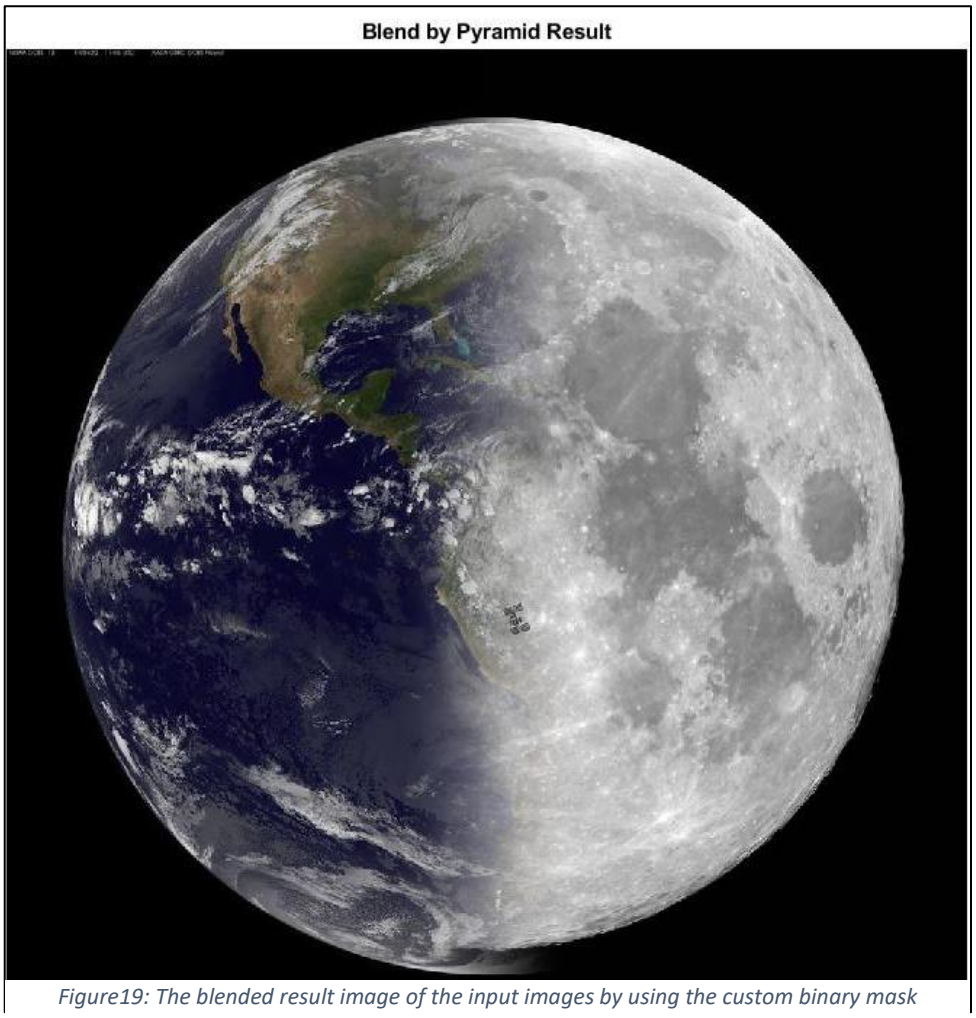

Figure19: The blended result image of the input images by using the custom binary mask