

## Assignment 2

Due on December 5, 2023 (23:59:59)

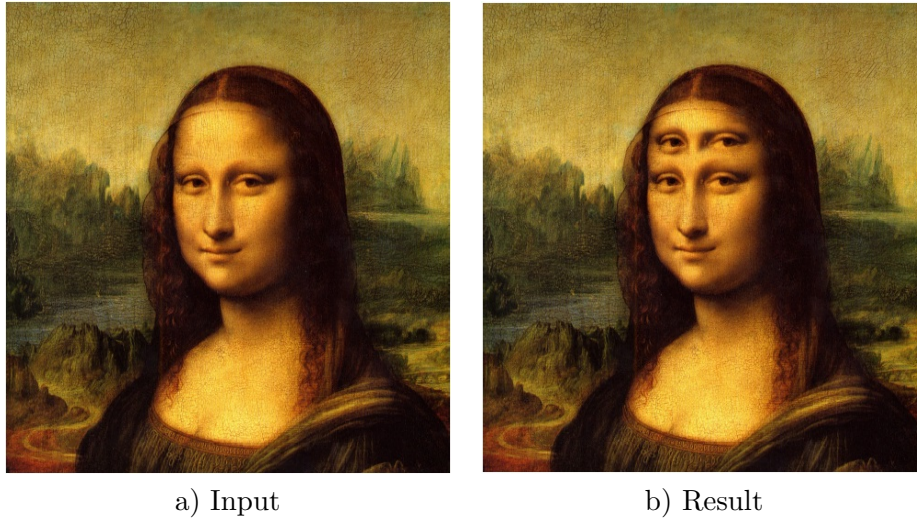


Figure 1: Image Blending

## Using Image Pyramid for Image Blending

### Background

In the image editing tools such as Adobe Photoshop, GIMP, image blending is the one of most fundamental task and used for many purposes. For example you can prepare a poster for an advertisement or a film. The most important thing for image blending methods to blend images seamlessly. In other words for an successful image blending method, seams where images or image regions are stitched must be invisible. There are many ways to blend two or more images. One such approach proposed in [1] Laplacian Pyramid. Accordingly to this approach, images are first decomposed into their Laplacian pyramids, and then these images are blended in pyramid levels so that seamless.

### Overview

The goal of this assignment is to obtain a blended image like in Figure 1-b from the input image (Figure 1-a).

### Details

Your program will take an image as input and a masked image region from another or same image and produce blended image. Specifically, you should carry out the following steps:

1. Build Laplacian pyramids for each image.
2. Build a Gaussian pyramid for each region mask.
3. Blend each level of pyramid using region mask from the same level:

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

$R^i$  : Region mask

$L_1$  : Laplacian pyramid of first image

$L_2$  : Laplacian pyramid of second image

4. Collapse the pyramid to get the final blended image.
  - You must show results of main steps in your report at least 5 different images with your comments.
  - You must analyze how number of Pyramid levels affect your results so you will obtain results for different number of Pyramid levels.
  - You must also continue to increase number of Pyramid levels until the final Pyramid level size is scaled down to minimum dimension for your implementation.
  - You will write your own Python code to select a region to create image mask. (As an alternative you may use selectROI from OpenCV)

## What to Hand In

You are required to submit all your report along with PDF format. For that purpose, prepare a folder containing:

- README.txt (*text file containing details about your assignment and this file also must include a Google Drive link (**without forcing to login**) including all your images (input, mask, blended)*)
- code/ (*directory containing all your code (only ".py" files)*)
- report.pdf (*PDF report*)

Archive this folder as **studentid\_pset2.zip** and send to **submit system**.

## Report

Your report should contain a brief overview of the problem, the details of your approach, and the results of your algorithm with your comments. Show the results of all of the main steps. If your algorithm failed to give a satisfactory result on a particular image, provide a brief explanation of the reason(s).

## Implementation Details

For the four main steps stated in the Details section, you must code your own implementation (building Laplacian and Gaussian pyramids and other formulations in the main steps) except Downsampling, Upsampling and Smoothing operations, for which, you can use library functions.

## Academic Integrity

All work on assignments must be done individually unless stated otherwise. You are encouraged to discuss with your classmates about the given assignments, but these discussions should be carried out in an abstract way. That is, discussions related to a particular solution to a specific problem (either in actual code or in the pseudocode) will not be tolerated. In short, turning in someone else's work, in whole or in part, as your own will be considered as a violation of academic integrity. Please note that the former condition also holds for the material found on the web as everything on the web has been written by someone else.

## References

- [1] Pyramid methods in image processing, E. H. Adelson , C. H. Anderson , J. R. Bergen , P. J. Burt, J. M. Ogden,1984