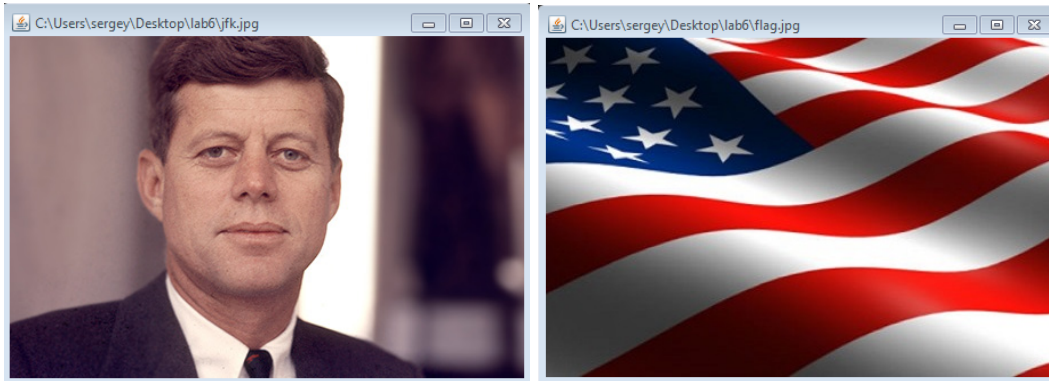


CS 1120: Media Computation Spring 2018

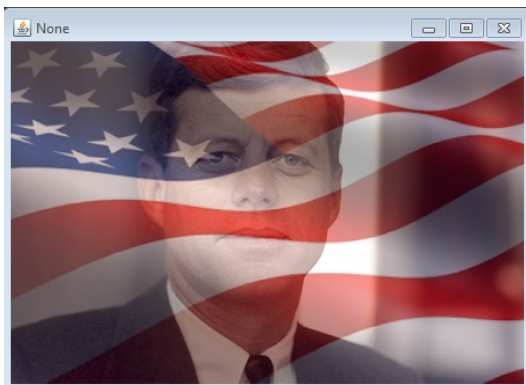
Lab 6: Blending images

Activity A: First attempt

Let's write a function that will superimpose a photo of a person over/with the waving American flag. In other words, we want to use two pictures like these ones:



And add them together to get this:



For this first activity you may begin by looking at Program 86 (pp.184-185). This program took two images and blended them together, but it did it in such a way that they only partially overlapped. In this activity you have two starting images which are exactly the same size. When that is the case it is really easy to “add them together” to produce a new image which is also the exact same size.

Download the media files (you may use your own if you like):

In a file named lab6.py you should:

- Create a function called `mixFaceAndFlag()`
- This function should take no parameters.
- It should immediately open two pictures. `pic1` should be the image of President John F. Kennedy (`jfk.jpg`) and `pic2` should be the waving flag (`flag.jpg`)

- It should create a third, empty image (let's call it output) which is exactly the same size as the first two images (450x300 pixels).
- Since you need to set this new, blank output canvas to have colors in each of the pixels you will need to set up a pair of loops (for the x/y coordinates) that consider every pixel in the output canvas.
- For each (x,y) pair you should grab the color from the face and the color from the flag at that exact pixel location. You should calculate a new color where the red is calculated as 50% of the red from the face and 50% of the red from the flag. Similarly, you should calculate the new green and new blue using the same formula.
- Once you calculate the new r, g, b values you should set the pixel to that color.
- When you are done you should show/return this new picture. It should look like the one above.

Activity B: Creating an adjustable version

The problem with previous function is that it produces an image which has too much flag and not enough John F. Kennedy. It would be better if we had a little more control over how much of each picture is included in the final image. The other thing that is a problem with the previous function is that it is "hardcoded" to work only with the pictures of John F. Kennedy and the American flag. Suppose I wanted to create a blended image of UNI's past President Bill Ruud superimposed with the campanile using 80% President Ruud and 20% campanile. It would take several changes to make that adjustment.

In this part of the lab, we will work on making modifications that convert your specialized program from the previous activity into a much more generalized program that can be reused for similar tasks.

- Begin by copying all of your code from Activity A into a new function.
- Call this function `blendTwoImages`.
- Change the program definition line so that instead of taking in no parameters it takes in two parameters. These two parameters should be labeled `pic1` and `pic2`.
- Now you should remove the lines of code inside of the program that opened up `boehner.jpg` and `flag.jpg`. They are no longer necessary since those images are being passed in as parameters.
- Finally, we need to modify the line of code where you created the blank output canvas. You can no longer assume that you want a canvas that is 450x300. Instead you should look at the width and height of `pic1` that was passed into this function and make the output canvas the same size as `pic1` (We will assume that `pic1` and `pic2` are always the same dimensions. It is acceptable to have the function crash if the user violates that assumption).

Once you have this working you can type:

```
>>> pic1 = makePicture("jfk.jpg")
>>> pic2 = makePicture("flag.jpg")
>>> result = blendTwoImages(pic1, pic2)
```

to get the exact same picture you made in Activity A. But you can ALSO type in:

```
>>> pic1 = makePicture("ruud.jpg")
>>> pic2 = makePicture("uni.jpg")
>>> result = blendTwoImages(pic1, pic2)
```

And get this:



Notice that this has taken a very specialized program (one that only blended President John F. Kennedy and the flag) and turned it into a generalized program that can blend any two pictures that are the same size.

But let's not stop there. Let's make it this new function even more generalized.

- Change the header definition of `blendTwoImages` to take four parameters. The first two should remain as `pic1` and `pic2`. The third parameter should be labeled `weight`.
- It will be assumed that rather than using 50% of `pic1` and 50% of `pic2` you will use `weight%` of `pic1` and $(1 - \text{weight})$ % of `pic2`. Modify the lines of code that you wrote earlier so that instead of multiplying by 0.5 you multiply by `weight` and $(1 - \text{weight})$.

Those are the only changes you need to make. NOW if I run

```
>>> pic1 = makePicture("jfk.jpg")
>>> pic2 = makePicture("flag.jpg")
>>> result = blendTwoImages(pic1, pic2, 0.8)
```

I get a picture that is 80% President John F. Kennedy and 20% American flag. Notice that this is much better looking overall.



Submit your work

And you're done! Save your file and submit it to eLearning. Make sure to save your solution for future reference.