

Efficient Implementation

In the *triangulationMatting* function, instead of calculating the pseudo inverse directly from the definition, I used the *np.linalg.pinv* function which implements the Singular Value Decomposition algorithm.

When creating the composite image, I did the calculations directly on the matrices of images without looping through every pixel.

Experimental Report

I captured multiple sets of images by my phone.

In order to capture images in the exactly same position, some heavy books were used to stabilize my phone.

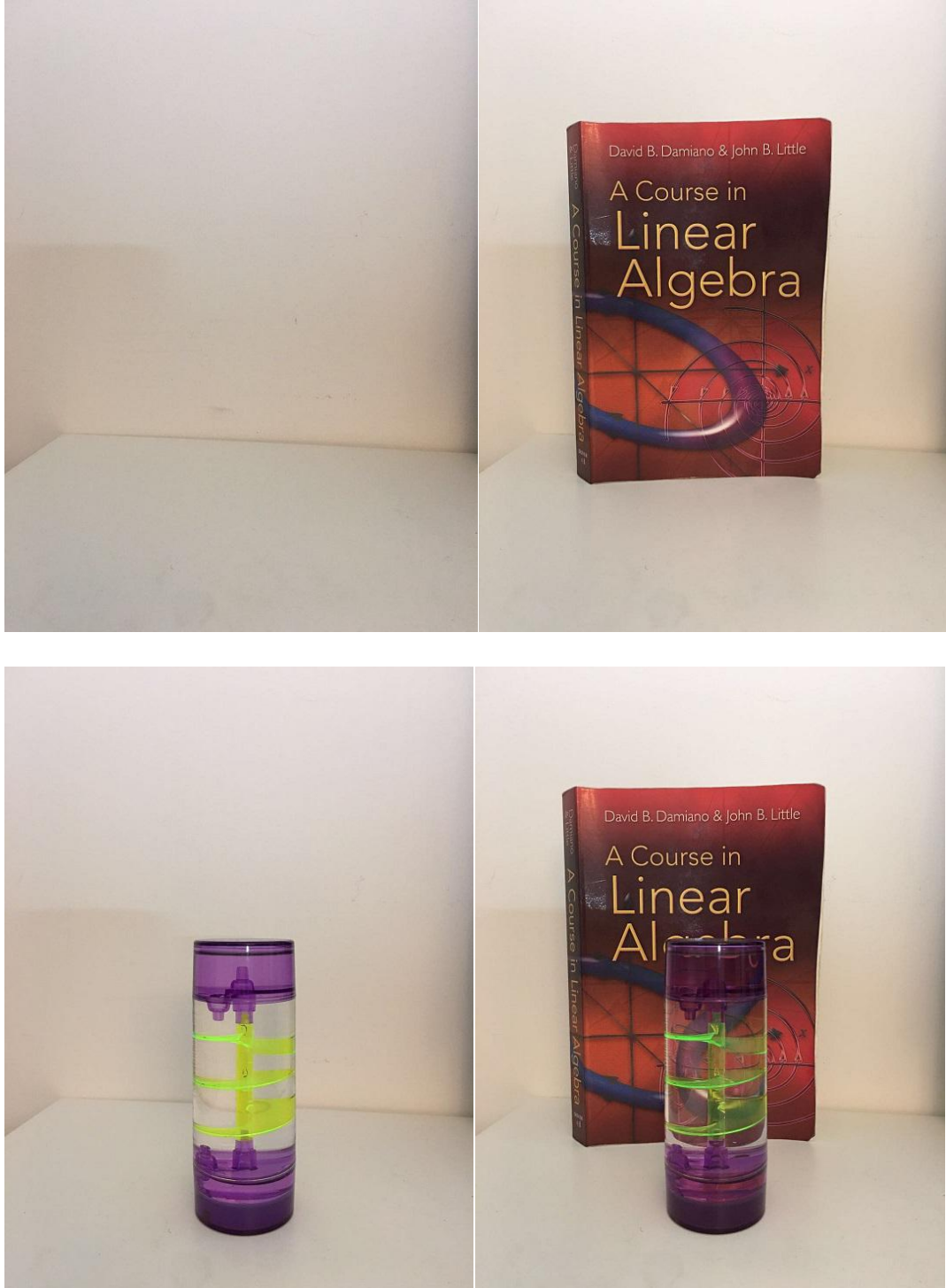
Usually I chose the wall as one of my backgrounds since it is always steady and thus I could cover it with something like a towel as the second background.

Basically, I captured every set of images in the following procedure:

1. Set my phone in an ideal position and take the backA image.
2. Place the object and get the compA.
3. With the object unmoved, cover the original background with something else and take image compB.
4. Finally remove the object and take the image of the second background backB.

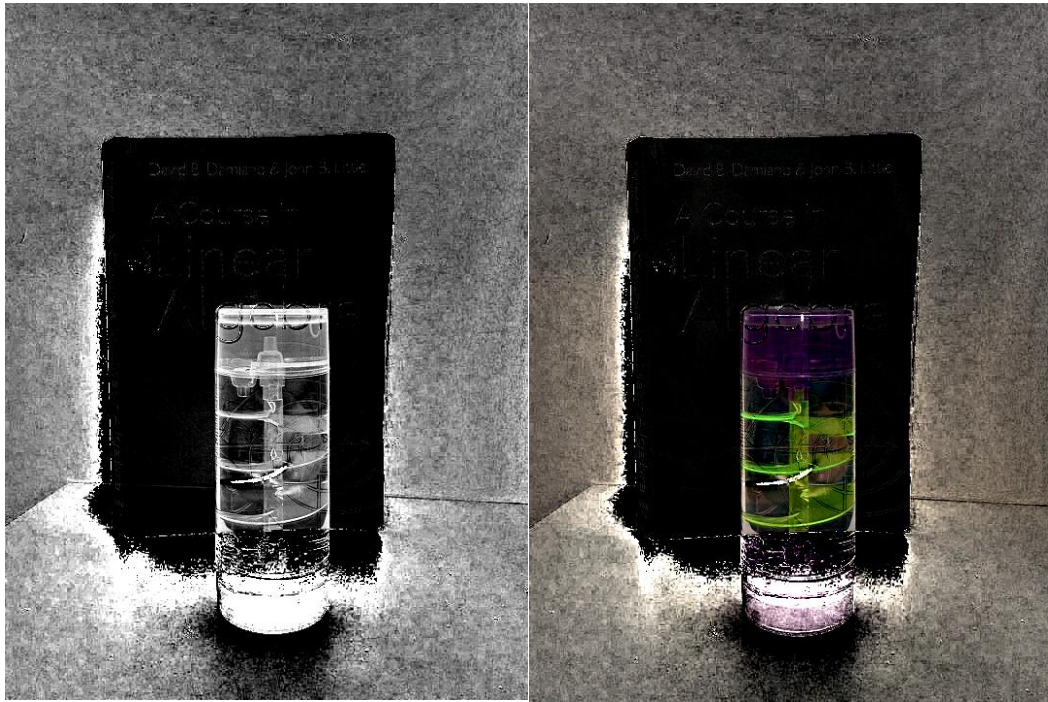
I tried several imaging conditions including overlapping backgrounds, low light level, transparent object and light reflecting object.

In case of overlapping backgrounds (large portion of the two background images being same), the triangulation matting seems unable to correctly distinguish between the background and the object.



I chose the wall and a book as the two backgrounds of my first set of images. However, the book was too small to cover the whole picture, which led to a large area unchanged between two backgrounds. The resulting alpha and

color images showed an unsuccessful triangulation matting.



In an environment with extreme low light level, the contrast between the object and the background will be diminished. Therefore, the triangulation matting will output a higher alpha value. Following is the set of images I took in a dark room with an iphone and default camera settings.





The alpha and color mattes:



In the composite image on the next page, we can see the background buildings through the chips bottle, although originally it is not a transparent object. Therefore, the accuracy of triangulation matting is limited with low contrast images.



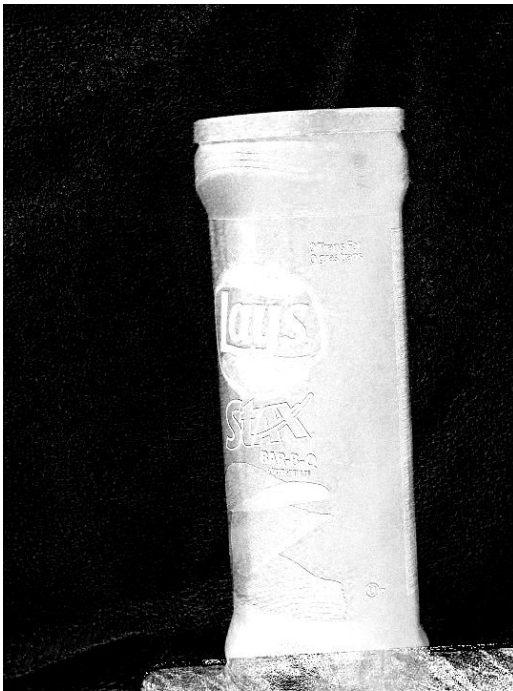
Finally after testing several sets of images in different conditions, I found that the triangulation matting works best with a non-transparent object, monochrome background and adequate but not intense light.

Here is one of my good-looking work:





The alpha and color mattes:



Written question

The pixels having non-zero alpha may due to the difference in color values between the background and the composite images at those pixels.

The light on the background cloth will not always keep the same when an object is put in front of it. The water refracts every beam of light passing through the vase. Thus, the light coming from right of the vase will be redirected, causing a small difference in the left-side background.

When computed by the triangulation matting method, these pixels with slightly different RGB values will result in a non-zero alpha value.