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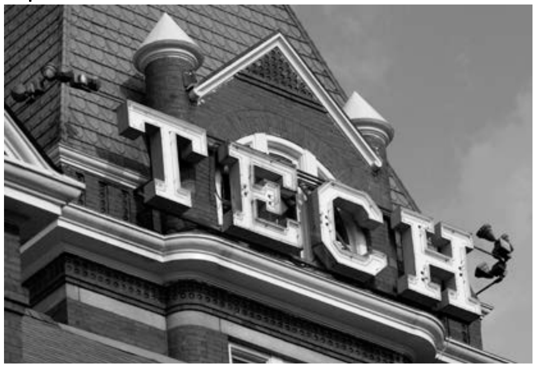
CS6475 Computational Photography Assignment #2

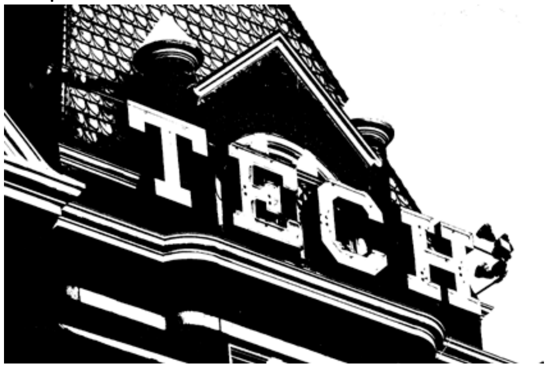
In the PDF we want you to write how you approached each of the five functions above (a brief description), and we want you to include input / output images (of your choosing) for functions 3, 4, and 5. Please include your name and GTID in this PDF.

1. numberOfPixels()
   This function returns the total number of pixels in an image (i.e. image_width * image_height). The input grayscale image is represented as an array, with each element corresponding to a pixel. Thus, the size of the array would also give the amount of pixels. I verified that this matched the calculated value of 2048 x 1365 = 2795520.

2. averagePixel()
   This function returns the average color value of a grayscale image, which is the sum of all pixels divided by the total number of pixels. I used the numpy sum() function to add all elements in the array, then divided by the total pixels calculated from numberOfPixels(). I also rounded the average result (a float) and casted to int data type to match the expected output in the test program. My result was an average pixel value of 110, which is in the 0 to 255 range.

3. convertToBlackAndWhite()
   This function generates a 1-bit image based on if the color value is higher or lower than 128. I iterated over the image array with a for loop, and checked each pixel value to assign a new "binary" value in an output array. This function took a few seconds to run, as it had to iterate through the entire array. I wonder if there is a faster method using vector operations…

   Input:
   

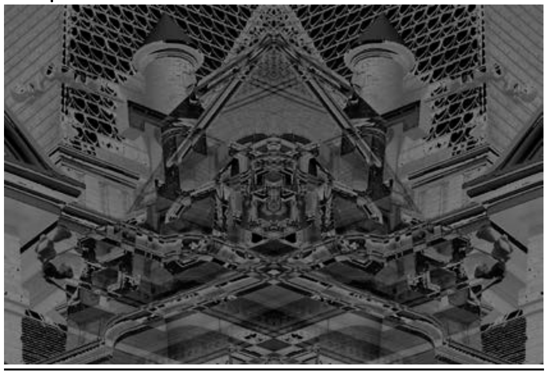
   Output:
   

4. averageTwoImages()
   This function averages the pixels of two input images. For this, I just simply added the corresponding elements in each array, then divided by two. The output seemed to make sense

as a merging of both images (like a flattened overlay). I didn't use any special functions, but I'm wondering if one exists for this particular use case.

Input:

Output:



5. flipHorizontal()
   This function essentially mirrors the image across the horizontal axis. I used a special OpenCV function, flip(), to perform this image transformation. The flip() function takes in an input image and a parameter to signify the type of flip. I used a '1' to indicate a flip on the horizontal axis. The image output matched with the provided test image.

Input:

Output: