HW0_ShusenXu

September 5, 2019

[1]:
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# Load libraries and convenience functions

from IPython import display
import matplotlib.pyplot as plt
import numpy as np

def load_image(filename):
    img = np.load(filename)
    img = img.astype("float32") / 255.
    return img

def gray2rgb(image):
    return np.repeat(np.expand_dims(image, 2), 3, axis=2)

def show_image(img):
    plt.imshow(img, interpolation='nearest')
```

[2]:
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images = [load_image('red.npy'),
          load_image('green.npy'),
          load_image('blue.npy')]

show_image(gray2rgb(np.concatenate(images, axis=1)))
```

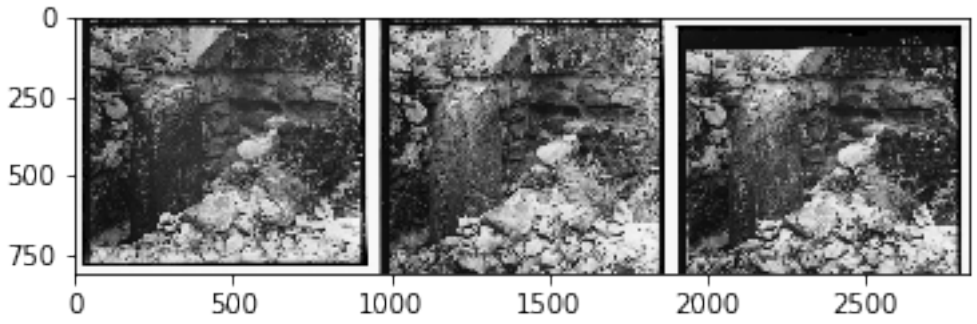

[4]:
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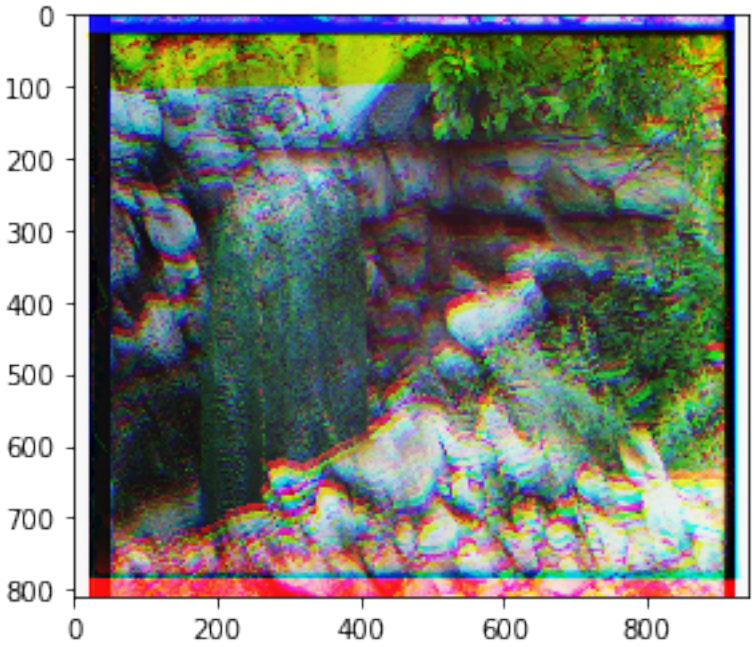
show_image(np.stack(images, axis=-1))
```



[66]:
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# Store the height and width of the images
height, width = images[0].shape

# Pad each image with black by 30 pixels. You do not need to use this, but
# padding may make your implementation easier.
pad_size = 30
images_pad = [np.pad(x, pad_size, mode='constant') for x in images]

# Given two matrices, write a function that returns a number of how well they␣
 ↪are aligned.
# The lower the number, the better they are aligned. There are a variety of␣
 ↪scoring functions
# you can use. The simplest one is the Euclidean distance between the two␣
 ↪matrices.
def score_function(im1, im2):
    # TODO
    score = np.sqrt(np.sum(np.square(im1-im2)))
    pass
    return score

# Given two matrices chan1 and chan2, return a tuple of how to shift chan2 into␣
 ↪chan1. This
# function should search over many different shifts, and find the best shift␣
 ↪that minimizes
# the scoring function defined above.
```

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def align_channels(chan1, chan2):
    best_offset = (0,0)
    best_score = score_function(chan1,chan2)
    # choose chan1 as the base image
    # TODO
    x_offest = 0
    y_offest = 0
    x_max , y_max = chan1.shape
    length_x , length_y = images[0].shape
    while x_offest <=pad_size*2:
        while y_offest <= pad_size*2:
            #temp_chan2 = chan2.copy()
            #temp_chan2[:,:] = 0.
            #temp_chan2[x_offest : x_offest + length_x, y_offest : y_offest +␣
 ↪length_y] = chan2[30: 30+length_x,30:30+length_y]
            temp_chan2 = chan2[pad_size:pad_size+length_x,pad_size:
 ↪pad_size+length_y]
            temp_chan1 = chan1[x_offest:x_offest+length_x,y_offest:
 ↪y_offest+length_y]
            temp_score = score_function(temp_chan1,temp_chan2)
            if temp_score < best_score:
                best_score = temp_score
                best_offset = (x_offest-pad_size,y_offest-pad_size)
            y_offest += 1
        x_offest += 1
    return best_offset

rg_dx, rg_dy = align_channels(images_pad[0], images_pad[1])
rb_dx, rb_dy = align_channels(images_pad[0], images_pad[2])
```

[69]:
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# Use the best alignments to now combine the three images. You should use any␣
 ↪of the variables
# above to return a tensor that is (Height)x(Width)x3, which is a color image␣
 ↪that you can visualize.
def combine_images():
    #TODO
    #length_x , length_y = images[0].shape
    final_g = images_pad[0].copy()
    final_g[:,:] = 0.
    final_g[rg_dx+pad_size:rg_dx+pad_size+height,rg_dy+pad_size:
 ↪rg_dy+pad_size+width] = images[1]


    final_b = images_pad[0].copy()
    final_b[:,:] = 0.
    final_b[rb_dx+pad_size:rb_dx+pad_size+height,rb_dy+pad_size:
 ↪rb_dy+pad_size+width] = images[2]
```

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    #crop the padding
    final_image = [
        images[0],
        final_g[pad_size:pad_size+height,pad_size:pad_size+width],
        final_b[pad_size:pad_size+height,pad_size:pad_size+width]
    ]
    return np.stack(final_image,axis=-1)
```

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final_image = combine_images()
if final_image is not None:
    show_image(final_image)
```