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EECS 841

13 February 2024

Homework 1

Section I

1a)

From Textbook, Chapter 1, 1.4.1

$$(1.3) \ i = y(\text{width}) + x$$

where i is index and x and y are coordinates from $[x, y]$

Then,

$$i = 52 * 640 + 38$$

$$i = 33280 + 38$$

$$i = 33318$$

1b)

$$I(0,1) = 6$$

$$I(1,1) = 7$$

$$I(2,1) = 8$$

Section II

'''

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@Course: EECS 841 (Computer Vision)

'''

import tkinter as tk

from tkinter import filedialog

import numpy as np

import matplotlib.pyplot as plt

from PIL import Image

'''

@param: Numpy Image Array

@output: Numpy Image Array

@description: This function uses slicing to mirror an image and flip it vertically to attain a flip flopped image.

'''

def flipflopim(image):

 flipped_image = image[:, ::-1] #Using python's built in slicing functionality, we select all the rows to be in the same order, however the columns are selected in reverse order using -1

 flipfloppedimage = flipped_image[::-1, :] #Using python's slicing ability to flip the rows in the array while keeping the columns same since the passed image is already flipped

```
'''
```

```
@param: None
```

```
@output: 2 pillow images
```

```
@description: The function asks the user to select an image using tkinter dialog box.  
The image is processed as a pillow image which is converted to a numpy array for  
transformations. The function then displays the 2 pillow images, the original and the  
transformed image.
```

```
'''
```

```
def ImageProcess_Select():
```

```
    #Set up tkinter permissions for dialog and select an image
```

```
    root = tk.Tk()
```

```
    root.withdraw()
```

```
    file_path = filedialog.askopenfilename(
```

```
        title="Select an image",
```

```
        filetypes=(("Image files", "*.jpg;*.jpeg;*.png;*.gif"), ("All files", "*.*"))
```

```
    )
```

```
    #Check if file exists
```

```
    if not file_path:
```

```
        print("File does not exist")
```

```
        return
```

```
    #Load the selected image and process using pillow and convert to a numpy array
```

```
    pillow_image = Image.open(file_path)
```

```
    numpy_image = np.array(pillow_image)
```

```
    #Transform the image using the flipflopim function
```

```
TransformedI = flipflopim(numpy_image)
```

```
#Convert the image back to a pillow image for display
```

```
TransformedI_pillow = Image.fromarray(TransformedI)
```

```
#Display the original image and the transformed Image
```

```
plt.figure(figsize=(10, 5))
```

```
plt.subplot(1, 2, 1)
```

```
plt.imshow(pillow_image)
```

```
plt.title("Original Image")
```

```
plt.axis('off') # Hide axes for better visualization
```

```
plt.subplot(1, 2, 2)
```

```
plt.imshow(TransformedI_pillow)
```

```
plt.title("Processed Image")
```

```
plt.axis('off') # Hide axes for better visualization
```

```
plt.show()
```

```
ImageProcess_Select() #Function Call to start the process
```