filter

September 19, 2024

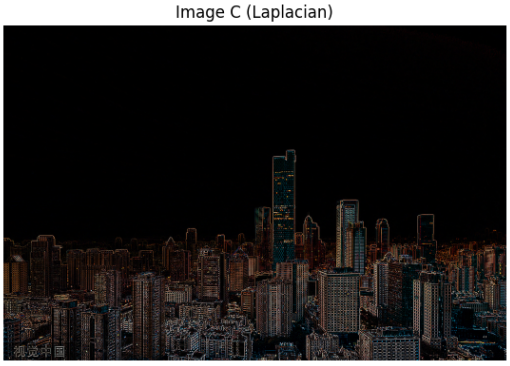
[1]:
```
import cv2
import numpy as np
from PIL import Image
import matplotlib.pyplot as plt

def display(image_list, title_list, figsize=(15,5)):
    fig, axes = plt.subplots(1, len(image_list), figsize=figsize)
    for i, image in enumerate(image_list):
        if len(image.shape) == 2:  # If grayscale
            axes[i].imshow(image, cmap='gray')
        else:
            axes[i].imshow(image)
        axes[i].set_title(title_list[i])
        axes[i].axis('off')
    plt.show()

a = Image.open('./Image_1.jpg')
np_a = np.array(a)
# Write code to implement a 5×5 Gaussian filter (sigma=2).
gaussian = cv2.GaussianBlur(np_a, (5, 5), sigmaX=2)
display([np_a, gaussian], ["Image A (Original)", "Image B (Gaussian)"])

# Write code to implement a Laplacian filter
kernel = np.array([[0,  -1,  0],
                   [-1,  4, -1],
                   [0,  -1,  0]])
laplacian = cv2.filter2D(src=np_a, ddepth=-1, kernel=kernel)
display([np_a, laplacian], ["Image A (Original)", "Image C (Laplacian)"])
```

Image A (Original)

Image B (Gaussian)

Image A (Original)

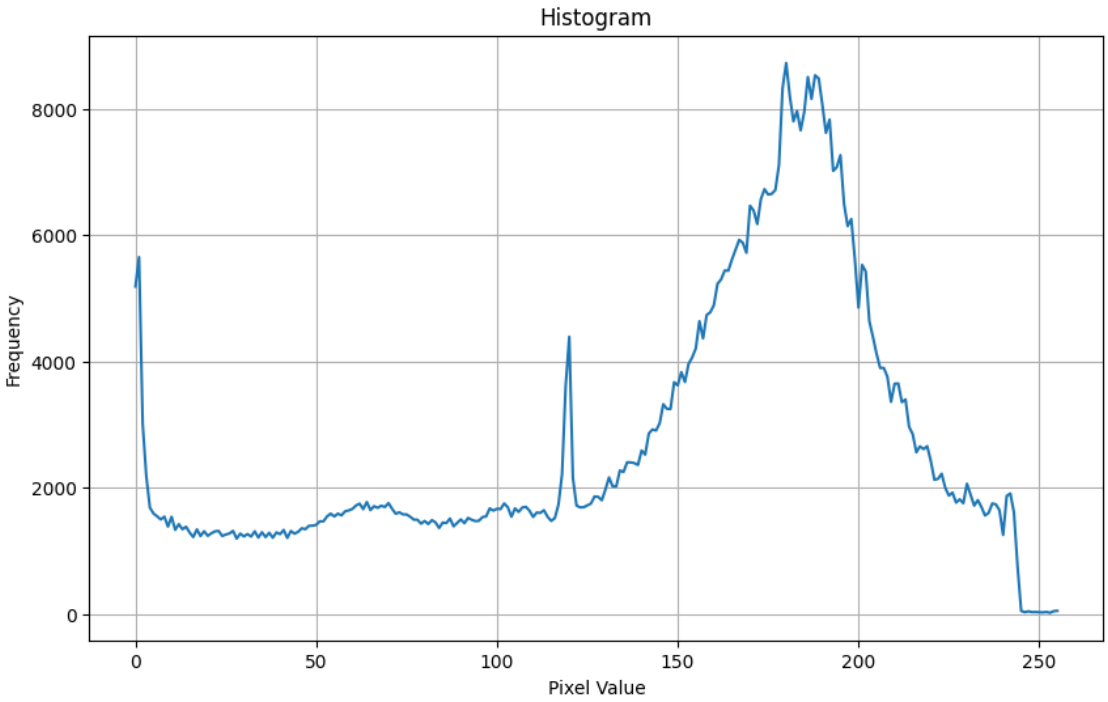
Image C (Laplacian)



histogram

September 19, 2024

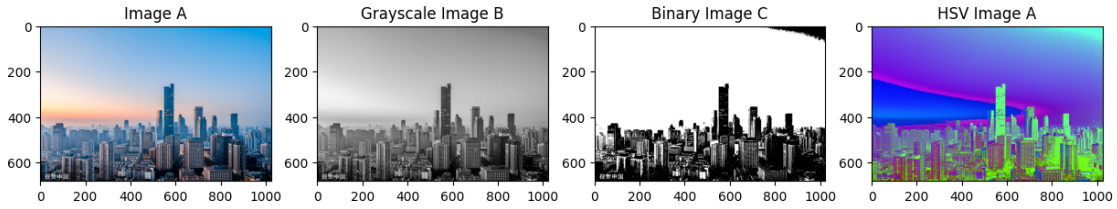
[ ]:
```
from PIL import Image
import numpy as np
import matplotlib.pyplot as plt

a = Image.open('./Image_1.jpg')
gray_a = a.convert('L')  # 'L' mode converts the image to grayscale
histogram = gray_a.histogram()
plt.figure(figsize=(10, 6))
plt.title('Histogram')
plt.xlabel('Pixel Value')
plt.ylabel('Frequency')
plt.plot(histogram)
plt.grid()
plt.show()
```



color_trans

September 19, 2024

[3]:
```
import cv2
import numpy as np
import matplotlib.pyplot as plt

a = cv2.imread('./Image_1.jpg')
b = cv2.cvtColor(a, cv2.COLOR_BGR2GRAY)  # to grayscale
cv2.imwrite('image_B.jpg', b)
_, c = cv2.threshold(b, 127, 255, cv2.THRESH_BINARY)  # to a binary image c
cv2.imwrite('image_C.jpg', c)
hsv_a = cv2.cvtColor(a, cv2.COLOR_BGR2HSV)  # to hsv color space
cv2.imwrite('hsv_image_A.jpg', hsv_a)

ori_a = cv2.cvtColor(a, cv2.COLOR_BGR2RGB)

plt.figure(figsize=(15, 5))
plt.subplot(1, 4, 1)
plt.imshow(ori_a)
plt.title("Image A")
plt.subplot(1, 4, 2)
plt.imshow(b, cmap='gray')
plt.title("Grayscale Image B")
plt.subplot(1, 4, 3)
plt.imshow(c, cmap='gray')
plt.title("Binary Image C")
plt.subplot(1, 4, 4)
plt.imshow(hsv_a)
plt.title("HSV Image A")

plt.show()
```



basic

September 19, 2024

[5]:
```
from PIL import Image
import matplotlib.pyplot as plt

# resize and stitch
a = Image.open('./Image_1.jpg')
b = Image.open('./Image_2.jpg')
ar = a.resize((256, 256))
br = b.resize((256, 256))
# left a, right b
c = Image.new('RGB', (512, 256))
c.paste(ar, (0, 0))
c.paste(br, (256, 0))
c.save('Image_3.jpg')
# Display all images
plt.figure(figsize=(10, 5))
plt.subplot(1, 3, 1)
plt.imshow(ar)
plt.title("Image_A")
plt.subplot(1, 3, 2)
plt.imshow(br)
plt.title("Image_B")
plt.subplot(1, 3, 3)
plt.imshow(c)
plt.title("Image_C")
plt.show()

# crop
# width 200 pixels, height 150 pixels.
box = (100, 50, 300, 200)
cropped_a = a.crop(box)
cropped_a.save('cropped_Image_1.jpg')

plt.figure(figsize=(10, 5))
plt.subplot(1, 2, 1)
plt.imshow(a)
plt.title("Image_A")
plt.subplot(1, 2, 2)
```

```
plt.imshow(cropped_a)
plt.title("Cropped Image_A")
plt.show()
```