Task3

2019 年 6 月 11 日

1 图像处理 +180776+ 胡欣毅 (Python 版)

1.1 1. 题目清单

1. 如何利用图像的边缘或 SIFT 或 SURF 特征，让模糊的图像变清晰。

1.2 2. 解答

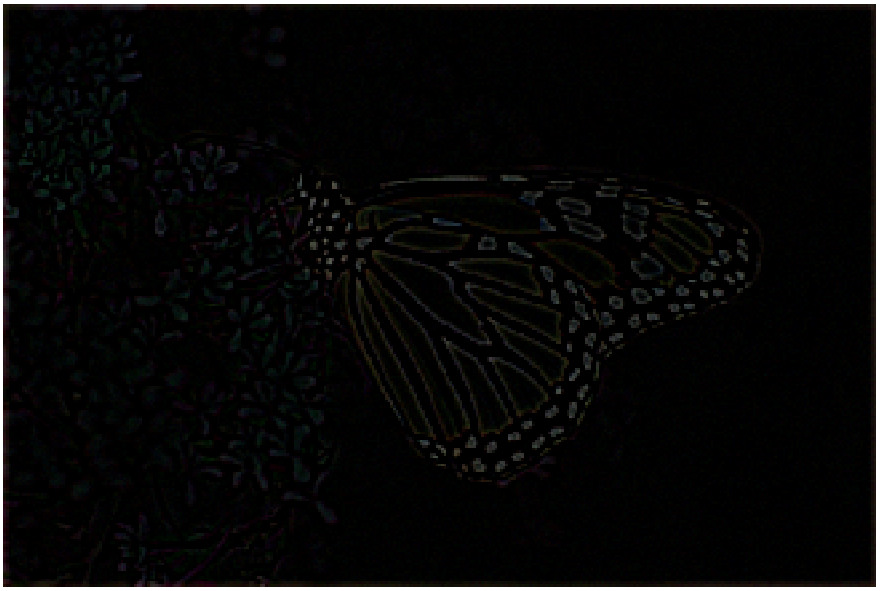
```
In [1]: import matplotlib.pyplot as plt
        import cv2
        import numpy as np
        %matplotlib inline
```

```
In [2]: def getImageVar(image):
            img2gray = cv2.cvtColor(image, cv2.COLOR_BGR2GRAY)
            imageVar = cv2.Laplacian(image, cv2.CV_64F).var()
            return imageVar
```

```
In [3]: image = cv2.imread('../hudie/3.bmp')
        im = cv2.cvtColor(image,cv2.COLOR_BGR2RGB)
        gray = cv2.cvtColor(image , cv2.COLOR_RGB2GRAY)
        plt.imshow(im)
        plt.axis("off")# 去除坐标轴
        plt.show()
        getImageVar(im)
```

```
Out[3]: 24.93315397304654
```

```
In [4]: # 边缘检测
        kernel_1 = np.array([[-1,-1,-1],
                             [-1,8,-1],
                             [-1,-1,-1]])
        edges = cv2.filter2D(image,-1,kernel_1)
        cv2.imwrite("edges.jpg",edges)
        edges = cv2.cvtColor(edges,cv2.COLOR_BGR2RGB)
        plt.imshow(edges)
        plt.axis("off")# 去除坐标轴
        plt.show()
```



原图加上边缘部分，强化边缘，实现图片增强

```
In [5]: imag = image + edges
        cv2.imwrite("imag.jpg",imag)
        imag = cv2.cvtColor(imag,cv2.COLOR_BGR2RGB)
        plt.imshow(imag,cmap='gray')
        plt.axis("off")# 去除坐标轴
        plt.show()
        getImageVar(imag)
```

```
Out[5]: 743.8130453338869
```

```
In [6]: # 低通滤波器
        kernel_2=np.array([[1,1,1],
                           [1,1,1],
                           [1,1,1]])/9.0
        rect=cv2.filter2D(image,-1,kernel_2)
        cv2.imwrite("rect.jpg",rect)
        rect = cv2.cvtColor(rect,cv2.COLOR_BGR2RGB)
        plt.imshow(rect,cmap='gray')
        plt.axis("off")# 去除坐标轴
        plt.show()
        getImageVar(rect)
```

Out[6]: 12.151280508822191

In [7]:
```
# 高斯滤波器
kernel_3=np.array([[1,4,7,4,1],
                  [4,16,26,16,4],
                  [7,26,41,26,7],
                  [4,16,26,16,4],
                  [1,4,7,4,1]])/273.0

gaussian=cv2.filter2D(image,-1,kernel_3)
cv2.imwrite("gaussian.jpg",gaussian)
gaussian = cv2.cvtColor(gaussian,cv2.COLOR_BGR2RGB)
plt.imshow(gaussian,cmap='gray')
plt.axis("off")# 去除坐标轴
plt.show()
getImageVar(gaussian)
```

```
Out[7]: 11.082615003954862
```

第一个锐化卷积核可以理解成

$$\begin{bmatrix} -1 & -1 & -1 \\ -1 & 9 & -1 \\ -1 & -1 & -1 \end{bmatrix} = \begin{bmatrix} -1 & -1 & -1 \\ -1 & 8 & -1 \\ -1 & -1 & -1 \end{bmatrix} + \begin{bmatrix} 0 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 0 \end{bmatrix}$$

左边是边缘提取卷积核，右边是原图

```
In [8]: # 锐化滤波器
        kernel_sharpen_1 = np.array([
                [-1,-1,-1],
                [-1,9,-1],
                [-1,-1,-1]])
        kernel_sharpen_2 = np.array([
                [0,-2,0],
                [-2,9,-2],
                [0,-2,0]])
        kernel_sharpen_3 = np.array([
                [-1,-1,-1,-1,-1],
                [-1,2,2,2,-1],
                [-1,2,8,2,-1],
                [-1,2,2,2,-1],
                [-1,-1,-1,-1,-1]])/8.0
```

```
In [9]: # 卷积
        output_1 = cv2.filter2D(image,-1,kernel_sharpen_1)
        output_2 = cv2.filter2D(image,-1,kernel_sharpen_2)
        output_3 = cv2.filter2D(image,-1,kernel_sharpen_3)
        # 显示锐化效果
        cv2.imwrite('Original.png',image)
        cv2.imwrite('sharpen_1.png',output_1)
        cv2.imwrite('sharpen_2.png',output_2)
        cv2.imwrite('sharpen_3.png',output_3)

        output_1 = cv2.cvtColor(output_1,cv2.COLOR_BGR2RGB)
        output_2 = cv2.cvtColor(output_2,cv2.COLOR_BGR2RGB)
        output_3 = cv2.cvtColor(output_3,cv2.COLOR_BGR2RGB)
```

```
In [10]: plt.figure(figsize=(20,15))
         plt.subplot(131)
         plt.imshow(output_1,cmap='gray')
         plt.axis("off")
         plt.subplot(132)
         plt.imshow(output_2,cmap='gray')
         plt.axis("off")
         plt.subplot(133)
         plt.imshow(output_3,cmap='gray')
         plt.axis("off")
         plt.show()
         getImageVar(output_1),getImageVar(output_2),getImageVar(output_3)
```

```
Out[10]: (587.5096556411387, 595.1843635468845, 63.49824248125525)
```

2 图像处理 +180776+ 胡欣毅 (C++ 版)

c++