Task6

2019 年 6 月 19 日

1 数字图像 +180776+ 胡欣毅 (Python 版)

2 7 周上课随堂测验

题目清单（100/100）1. 拍一张照片（具有清晰易检测边缘），压缩为 255 * 255 大小。对照片进行 2 * 2 max_pooling 操作，滑动间隔为 1 （30/100）

2. 对该照片进行 laplace 边缘检测（40/100）

3. 对该照片进行 laplace 图像增强（30/100）

注：1. 本次实验不可调 opencv 库

2. 本次实验根据完成程度和完成速度评分，分数可能计入总评

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

In [2]: def rgb2gray(rgb):
            return np.dot(rgb[...,:3], [0.299, 0.587, 0.114])

In [3]: im = cv2.imread('../data/4.1.05.tiff')


        gray = rgb2gray(im)
        plt.imshow(gray,cmap='gray')
        plt.axis("off")
        gray.shape
```

```
Out[3]: (256, 256)
```

```
In [4]: def pooling(image , poolSize = 2 , poolStride = 2 , mode = 'max' ):
            # image sizes
            in_row,in_col = np.shape(image)

            # outputMap sizes
            out_row,out_col = int(np.ceil( (in_row - poolSize)/poolStride +1 )),\
                              int(np.ceil( (in_col - poolSize)/poolStride +1 ))
            outputMap = np.zeros((out_row,out_col))

            # 补 0 padding
            temp_map = np.pad(image, ((0,in_row%poolStride),(0,in_col%poolStride)),'edge')

            # pooling
            for r_idx in range(out_row):
                for c_idx in range(out_col):
                    startY = r_idx * poolStride
                    startX = c_idx * poolStride
                    poolField = temp_map[startY:startY + poolSize, startX:startX + poolSize]
                    if mode == 'max':
                        poolOut = np.max(poolField)
                    elif mode == 'mean':
                        poolOut = np.mean(poolField)

                    outputMap[r_idx,c_idx] = poolOut
            return  outputMap

        # 测试实例
        test = np.array([[1,2,3,4],
                         [5,6,7,8],
                         [9,10,11,12],
                         [13,14,15,16]])

        test_result = pooling(test, 2, 2, 'max')
        print(test_result)
```

```
[[ 6.  8.]
 [14. 16.]]
```

```
In [5]: def my_filter2D( img , kel ):
            m,n = kel.shape
            # out 是输出
            out = np.zeros(img.shape)
            # mat 是补完 0 的
            mat = np.zeros( (img.shape[0]+m-1, img.shape[1]+n-1) )
            # 扩充
            #mat = np.pad(img, ((m-1,0),(n-1,0)),'constant')
            mat[(m-1):,(n-1):] = img
            for i in range(img.shape[0]):
                for j in range(img.shape[1]):
                    out[i,j] = np.multiply(mat[i:i+m,j:j+n] , kel ).sum()
            return out

        # 测试 2 维卷积
        my_filter2D(np.ones((3,3)),np.ones((2,2)) )
```

```
Out[5]: array([[1., 2., 2.],
            [2., 4., 4.],
            [2., 4., 4.]])
```

```
In [6]: def my_resize(src, size,mode = 'INTER_LINEAR'):
            dst_width, dst_height = size

            if len(src.shape) == 3:
                height, width, channels = src.shape
                if ((dst_height == height) and (dst_width == width)):
                    return src
                dst_image = np.zeros((dst_height, dst_width, channels) )

                # Scale for resize.
                scale_x = float(width) /dst_width
                scale_y = float(height)/dst_height
                # tmp
                if mode == "INTER_LINEAR":
                    for dst_y in range(dst_height):
                        for dst_x in range(dst_width):
                            # Original coords.
                            src_x = (dst_x + 0.5) * scale_x - 0.5
                            src_y = (dst_y + 0.5) * scale_y - 0.5
                            # INTER_LINEAR:
                            # 2*2 neighbors.(对角线两个值)
                            src_x_0 = int(np.floor(src_x))
                            src_y_0 = int(np.floor(src_y))
                            src_x_1 = min(src_x_0 + 1, width - 1)
                            src_y_1 = min(src_y_0 + 1, height - 1)
                            # 插值 (左上, 右上, 右下, 左下, 顺时针)
                            dst_image[dst_y, dst_x,:] = \
                            (src_y_1 - src_y) *  (src_x_1 - src_x) * src[src_y_0, src_x_0,:]\
                            + (src_y_1 - src_y) * (src_x - src_x_0) * src[src_y_0, src_x_1,:]\
                            + (src_y - src_y_0) * (src_x - src_x_0) * src[src_y_1, src_x_1,:]\
                            + (src_y - src_y_0) * (src_x_1 - src_x) * src[src_y_1, src_x_0,:]
                elif mode == 'nearby':
                    for dst_y in range(dst_height):
                        for dst_x in range(dst_width):
```

```
                    # Original coords.
                    src_x = (dst_x + 0.5) * scale_x - 0.5
                    src_y = (dst_y + 0.5) * scale_y - 0.5
                    dst_image[dst_y, dst_x,:] = src[int(src_y), int(src_x),:]
        return dst_image

    elif len(src.shape) == 2:
        height, width = src.shape
        if ((dst_height == height) and (dst_width == width)):
            return src
        dst_image = np.zeros((dst_height, dst_width) )

        # Scale for resize.
        scale_x = float(width) /dst_width
        scale_y = float(height)/dst_height
        # tmp
        if mode == "INTER_LINEAR":
            for dst_y in range(dst_height):
                for dst_x in range(dst_width):
                    # Original coords.
                    src_x = (dst_x + 0.5) * scale_x - 0.5
                    src_y = (dst_y + 0.5) * scale_y - 0.5
                    # INTER_LINEAR:
                    # 2*2 neighbors.(对角线两个值)
                    src_x_0 = int(np.floor(src_x))
                    src_y_0 = int(np.floor(src_y))
                    src_x_1 = min(src_x_0 + 1, width - 1)
                    src_y_1 = min(src_y_0 + 1, height - 1)
                    # 插值 (左上, 右上, 右下, 左下, 顺时针)
                    dst_image[dst_y, dst_x] = \
                    (src_y_1 - src_y) *  (src_x_1 - src_x) * src[src_y_0, src_x_0]\
                    + (src_y_1 - src_y) * (src_x - src_x_0) * src[src_y_0, src_x_1]\
                    + (src_y - src_y_0) * (src_x - src_x_0) * src[src_y_1, src_x_1]\
                    + (src_y - src_y_0) * (src_x_1 - src_x) * src[src_y_1, src_x_0]
        elif mode == 'nearby':
            for dst_y in range(dst_height):
                for dst_x in range(dst_width):
```

```
                # Original coords.
                src_x = (dst_x + 0.5) * scale_x - 0.5
                src_y = (dst_y + 0.5) * scale_y - 0.5
                dst_image[dst_y, dst_x] = src[int(src_y), int(src_x)]
        return dst_image

# 测试 resize
my_resize(np.arange(16).reshape(4,4),(2,2) )
```

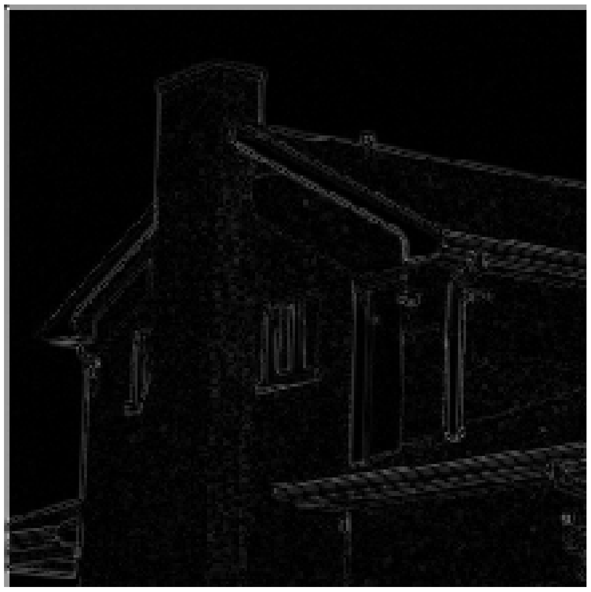
```
Out[6]: array([[ 2.5,  4.5],
               [10.5, 12.5]])
```

```
In [7]: dst_size = (255,255)
        dst = my_resize(gray, dst_size,'nearby')
        plt.imshow(dst,cmap='gray')
        plt.axis("off")
        plt.show()
```

```
In [8]: pool_image = pooling(dst , poolSize = 2 , poolStride = 1 , mode = 'max' )
```

```
In [9]: Laplace_ker = np.array([[1, 1, 1],
                                [1,-8, 1],
                            [1, 1, 1]])

lapace = my_filter2D(pool_image , Laplace_ker)
#cv2.normalize(lapace, lapace,0,1,cv2.NORM_MINMAX)
plt.imshow(abs(lapace), cmap='gray')
plt.axis("off")
plt.show()
lapace.shape
```



```
Out[9]: (254, 254)
```

```
In [10]: labd = 0.1
         re_build = pool_image - labd  * lapace

         plt.figure(figsize=(12,12))
         plt.subplot(121)
         plt.imshow(pool_image,cmap='gray')
         plt.axis("off")
         plt.subplot(122)
         plt.imshow(re_build,cmap='gray')
         plt.axis("off")
         plt.show()
```

3 图像处理 +180776+ 胡欣毅 (C++ 版)

c++