影像辨識 hw2

tags: `CCU HW`

Cover Page

> Homework Title : Image Sharpening
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Technical description

介紹

使用 Laplacian operator and high-boost filtering來補充圖片的輪廓

方法

- Laplacian operator
- high-boost filtering

Laplacian operator 作法

steps

1. 讀取照片
2. 方程式求解

laplacian function

$$g(x,y)=f(x,y)-\left[f(x+1,y)+f(x-1,y)+f(x,y+1)+f(x,y-1)\right]+4f(x,y)$$
$$=5f(x,y)-\left[f(x+1,y)+f(x-1,y)+f(x,y+1)+f(x,y-1)\right], \qquad (3.7\text{-}6)$$

step 1

> 讀取照片

```
    def loadImage(self):
        imgs = []
        for i in range(len(self.filenames)):
            filename = filenames[i]
            img = cv2.imread(filename,0)
            imgs.append(img)
        print(len(imgs))
        return imgs
```

step 2

> 方程式求解

```
    def lap(self,imgs):
        outputs = []
        for i in range(len(imgs)):
            img = imgs[i]
            output = np.zeros((img.shape[0],img.shape[1]))
            for row in range(1,img.shape[0]-1):
                for col in range(1,img.shape[1]-1):
                    output[row][col] = 5*img[row][col] - img[row+1][col] -
                    img[row-1][col] - img[row][col+1] - img[row][col-1]
            outputs.append(output.copy())
        return outputs
```

high-boost 作法

steps

1. 讀取照片
2. 方程式求解(這邊A使用0,2求解)

high-boost function

$$f_{\text{hb}}(x,y) = (A-1)f(x,y) + f_s(x,y) \qquad (3.7\text{-}10)$$

> A=2,把原來照片加上laplacian的結果
> A=0,把原來照片減去laplacian的結果
> A=1,laplacia的結果

step 1

> 讀取照片

```
    def loadImage(self):
        imgs = []
        for i in range(len(self.filenames)):
            filename = filenames[i]
            img = cv2.imread(filename,0)
            imgs.append(img)
        print(len(imgs))
        return imgs
```

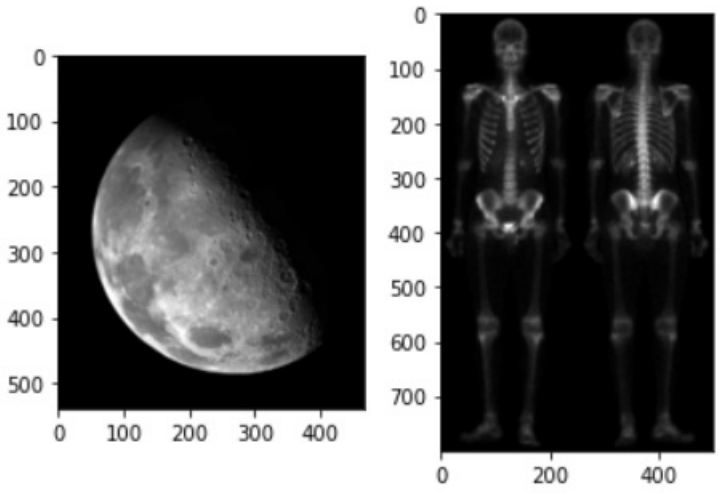
step 2

> 方程式求解(這邊A使用0,2求解)
> A=2，原來圖片 + laplacian的結果
> A=0，原來圖片 - laplacian的結果

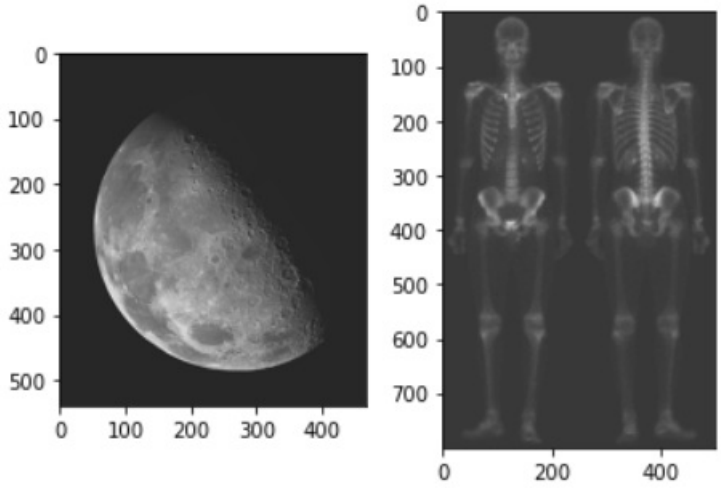
```
    def high_boost(self,imgs,lap_output):
        outputs = []
        for i in range(len(imgs)):
            img = imgs[i]
            lap = lap_output[i]
            #A = 2,img+lap
            output = img + lap
            outputs.append(output.copy())
        return outputs
```

Experimental results

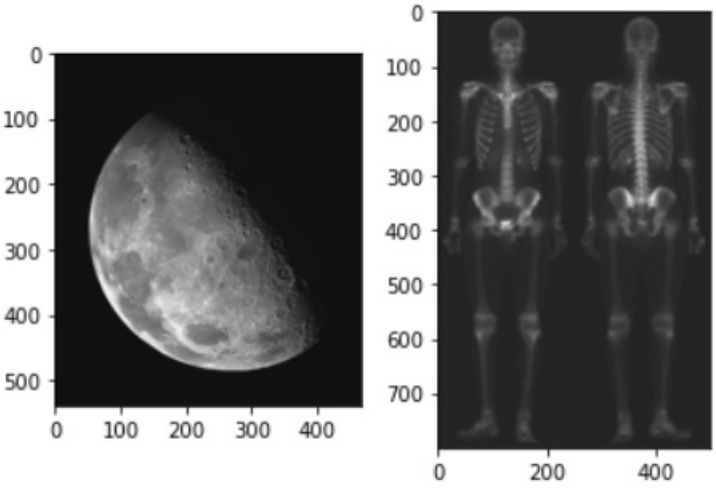
原始圖片



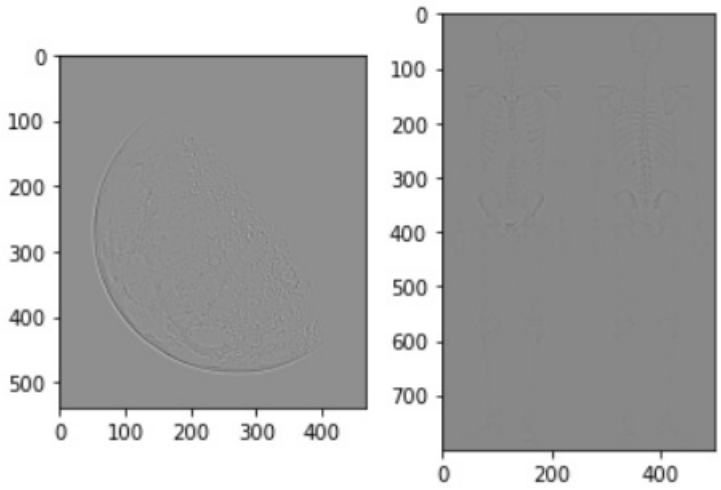
laplacian後的圖片



high_boost後A=2的圖片



high_boost後A=0的圖片



Discussions

這次功課實踐兩種加深影像輪廓的方法，可以看出修補後圖片變得更細緻，比如laplacian後的月亮圖片比原始的圖片，模糊的地方被去除，坑坑巴巴更為明顯。而深度學習中熱門的convolution filter也是加深輪廓的一種方法，利用不同大小的filter所生成的圖片，來讓機器去學習，使機器學習出更為細緻的圖片。

Refferences

https://www.programmersought.com/article/38814806506/