# Computer Vision HW#5

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1. Grayscale Dilation

**grayscale dilation**

structor 為中心相加出的最大值

https://www.youtube.com/watch?v=3PmVBakfqAQ

```
kernel=np.array([[0,1,1,1,0],
                 [1,1,1,1,1],
                 [1,1,1,1,1],
                 [1,1,1,1,1],
                 [0,1,1,1,0]])
kernelRow,kernelCol=kernel.shape
center=kernel[3,3]
```

```
def grayScaleDilation(src,kernel):
    dilationImg=np.zeros(shape=src.shape,dtype=src.dtype)
    dilateKernel=np.zeros(shape=kernel.shape,dtype=kernel.dtype)
    kernelHalf=(kernelCol-1)//2
    maximum=0
    for i in range(2,510):
        for j in range(2,510):
            for a in range(kernelRow):
                for b in range(kernelCol):
                    dilateKernel[a,b]=src[i-kernelHalf+a,j-kernelHalf+b]+kernel[a,b]
            dilationImg[i,j]=dilateKernel.max()
    return dilationImg
```

```
gsd=grayScaleDilation(src,kernel)
cv2.imwrite("grayScaleDilationImg.png",gsd)
```

## 2. Grayscale Erosion

**grauscale erosion**

structor能包住所有值的中心點，減掉structor value後的最小值

https://www.youtube.com/watch?v=oef00Opehkk

```
count=0
minimum=255
def grayScaleErosion(src,kernel):
    erosionImg=np.zeros(shape=src.shape,dtype=src.dtype)
    kernelHalf=(kernelCol-1)//2
    erosionKernel=np.zeros(shape=kernel.shape,dtype=src.dtype)
    global count,minimum
    for i in range(2,510):
        for j in range(2,510):
            count=0
            minimum=255
            for a in range(kernelRow):
                for b in range(kernelCol):
                    if(src[i-kernelHalf+a,j-kernelHalf+b]*kernel[a,b]!=0):
                        count=count+1
                        erosionKernel[a,b]=src[i-kernelHalf+a,j-kernelHalf+b]-kernel[a,b]
                        minimum=min(erosionKernel[a,b],minimum)
                    if(count==np.count_nonzero(kernel)):
                        erosionImg[i,j]=minimum
    return erosionImg
```

```
gse=grayScaleErosion(src,kernel)
cv2.imwrite("grayScaleErosionImg.png",gse)
```



## 3. Grayscale Opening

**grayscale opening**

先erosion再dilation

```
gso=grayScaleErosion(src,kernel)
gso=grayScaleDilation(gso,kernel)
cv2.imwrite("grayScaleOpeningImg.png",gso)
```

True

4. Grayscale Closing

**grayscale closing**

先dilation再erosion

```
1  gsc=grayScaleDilation(src,kernel)
2  gsc=grayScaleErosion(gsc,kernel)
3  cv2.imwrite("grayScaleClosingImg.png",gsc)
```