# 影像處理 Assignment3 - 去除影像雜訊

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## 1　產生雜訊

### 1.1　胡椒鹽雜訊 Pepper salt noise

**隨機產生白色或黑色的雜訊，像是灑胡椒鹽在影像上，此作業是使用 1/2 的機率產生雜訊**


Figure 1: Source and Noise Image

## 1.2 程式碼

```
# 加上雜訊
def addNoiseWithPercent(image, percent=0):
    if percent == 0:
        savePhoto('noise_Image', image)
        return image

    height = image.shape[0]
    width = image.shape[1]
    newImage = np.zeros((height, width, 3), np.uint8)
    for x in range(width):
        for y in range(height):
            ran = random.randint(1, 10)
            if ran % 10 < percent:
                noiseRan = random.randint(1, 10)
                if noiseRan % 2 == 0:
                    newImage[y][x] = 0
                else:
                    newImage[y][x] = 255
            else:
                newImage[y][x] = image[y][x]

    savePhoto('noise_Image', newImage)
    return newImage
```

# 2 Median Filter Algorithm

## 2.1 取得參數

先取得 Zmin, Zmax, Zmed, Zxy 的數值

程式碼

```
# 取得zMax, zMed, zMin, zXY各個值
def getGrayLevelValue(image, x, y, mask=3):
    height = image.shape[0]
    width = image.shape[1]
    pixels = []

    for j in range(mask):
        pixelY = y - mask // 2 + j
        if pixelY < 0 or pixelY >= height:
            continue
        for i in range(mask):
            pixelX = x - mask // 2 + i
            if pixelX < 0 or pixelX >= width:
                continue
            pixels.append(image[pixelY][pixelX][0])

    pixels.sort()
    zMin = pixels[0]
    zMax = pixels[-1]
    med = len(pixels) // 2
    zMed = pixels[med]
    zXY = image[y][x][0]
    return zMax, zMed, zMin, zXY
```

## 2.2 實現 Median Filter

依照講義上的 Pseudo Code

程式碼

```
# 做Median Filter
def adaptiveMedianFilter(image, x, y, size=3, sizeMax=7):
    zMax, zMed, zMin, zXY = getGrayLevelValue(image, x, y, size)
    # LevelA
    a1 = int(zMed) - int(zMin)
    a2 = int(zMed) - int(zMax)
    if a1 > 0 and a2 < 0:
    # if zMin < zMed < zMax:
        # Level B
        b1 = int(zXY) - int(zMin)
        b2 = int(zXY) - int(zMax)
        if b1 > 0 and b2 < 0:
        # if zMin < zXY < zMax:
            return zXY
        else:
            return zMed
    else:
        newSize = size + 2

    if newSize <= sizeMax:
        # repeat LevelA
        return adaptiveMedianFilter(image, x, y, newSize)
    else:
        return zXY
```

# 3 結論

**去掉雜訊後與原圖比較，還是會有些許的雜訊無法去除。而且文字是比較難以還原的。**


Figure 2: Source Image


Figure 3: Filter Image