Image_Processing HW1

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用 opencv 輸入兩張自拍照，命名為 img1、img2

```python
import numpy as np
import cv2
from matplotlib import pyplot as plt

# 讀取圖檔
img1 = cv2.imread('source/input/selfie1.jpg',0)
img2 = cv2.imread('source/input/selfie2.jpg',0)
```

原圖分別去除 least significant 1、2、3 bits，並嵌入浮水印輸出

```python
# 圖片寬高
height, width = img1.shape[:2]

# 設定加入浮水印圖片的初始直
lsb1bit_img1_watermark = img1.copy()
lsb2bit_img1_watermark = img1.copy()
lsb3bit_img1_watermark = img1.copy()

# 浮水印
watermark = img2.copy()

# 用for迴圈，跑過所有的pixel，執行每個pixel時候，原圖分別去除least significant 1、2、3 bits，再分別加入浮水印
for x in range(width):
    for y in range(height):
        lsb1bit_img1_watermark[y,x] = (img1[y,x] & 0b11111110) | ((watermark[y,x] & 0b10000000)>>7) # least significant 1 bits + watermark
        lsb2bit_img1_watermark[y,x] = (img1[y,x] & 0b11111100) | ((watermark[y,x] & 0b11000000)>>6) # least significant 2 bits + watermark
        lsb3bit_img1_watermark[y,x] = (img1[y,x] & 0b11111000) | ((watermark[y,x] & 0b11100000)>>5) # least significant 3 bits + watermark
```

檔案儲存

```
# 存入檔案
cv2.imwrite('source/output/(1).jpg', lsb1bit_img1_watermark)
cv2.imwrite('source/output/(2).jpg', lsb2bit_img1_watermark)
cv2.imwrite('source/output/(3).jpg', lsb3bit_img1_watermark)
```

去除 LSB

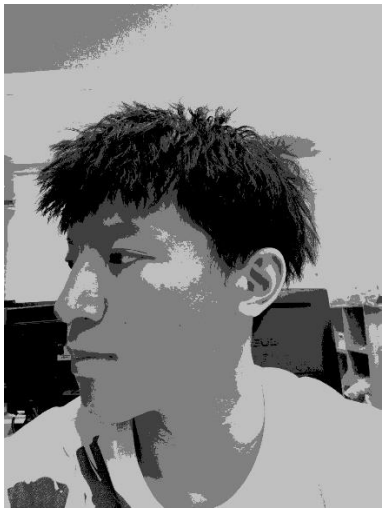
去除 LS 2 bits

去除 LS 3 bits

儲存檔案，並提取出浮水印

```
# 檔案儲存 並提取出浮水印
cv2.imwrite('source/output/(1)Restore_the_embedded_watermark.jpg', (lsb1bit_img1_watermark & 0b00000001)<<7)
cv2.imwrite('source/output/(2)Restore_the_embedded_watermark.jpg', (lsb2bit_img1_watermark & 0b00000011)<<6)
cv2.imwrite('source/output/(3)Restore_the_embedded_watermark.jpg', (lsb3bit_img1_watermark & 0b00000111)<<5)
✓ 0.6s
```

1bit 浮水印



2bits 浮水印

3bits 浮水印