ACV homework 1

簡要描述

作業使用 python 進行 image matching。以 Trucka.bmp 为基础，按 9×9、11×11 、15×15 、21×21、31×31 大小進行塊采樣。

因爲圖片大小無法分出整數塊，所以采用將多餘邊緣像素刪除的方法，讓每一個塊大小相同。

源代碼為 hw1.py，算法，生成圖像與參數如下

算法

通過將圖像分割成不同方塊，來計算方塊的 MV(motion vector)。MV 搜索水準和垂直位移範圍 [-s，s]。这使得搜索窗口大小为 (2s + 1) x (2s + 1)，s 為 search range。

兩個塊之間的差異通過絕對誤差和演算法（Sum of Absolute Differences，簡稱 SAD 演算法）。

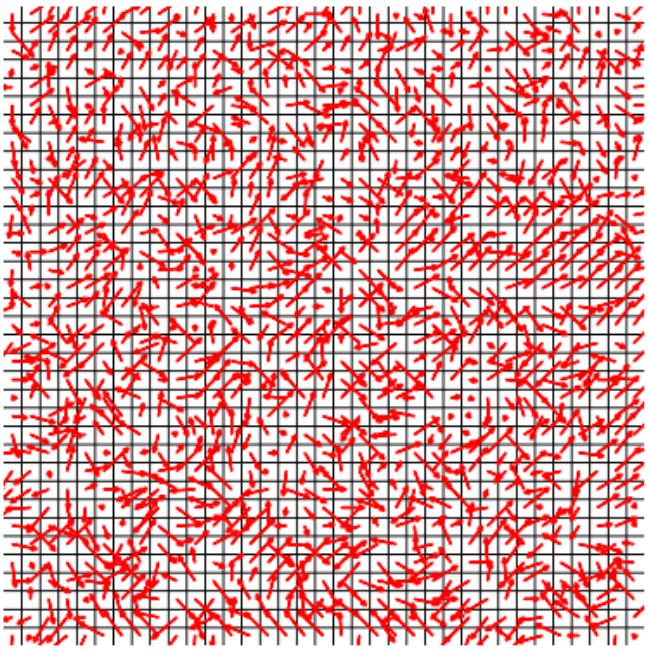
代碼如下：

```python
def block_matching(trucka, truckb, block_size, search_range):
    height= width = 386-image_cut_size
    motion_vectors = np.zeros( shape: (height // block_size, width // block_size, 2), dtype=np.int

    for y in range(0, height, block_size):
        for x in range(0, width, block_size):
            best_sad = float('inf')
            best_dx, best_dy = 0, 0

            # Define the search range for the current block
            search_positions = range(-search_range, search_range + 1)
            for dy in search_positions:
                for dx in search_positions:
                    y1, x1 = y + dy, x + dx
                    if 0 <= x1 < width - block_size and 0 <= y1 < height - block_size:
                        block_a = trucka[y:y + block_size, x:x + block_size]
                        block_b = truckb[y1:y1 + block_size, x1:x1 + block_size]

                        # Sum of Absolute Differences (SAD)
                        sad = np.sum(np.abs(block_a - block_b))
                        if sad < best_sad:
                            best_sad = sad
                            best_dx, best_dy = dx, dy

            motion_vectors[y // block_size, x // block_size] = [best_dx, best_dy]

    return motion_vectors

# Perform block matching for each block size
motion_vectors = block_matching(image_data1, image_data2, block_size, search_range)
print(f"Motion Vectors for block size {block_size}x{block_size}:")
print(motion_vectors)
```

1.jpg

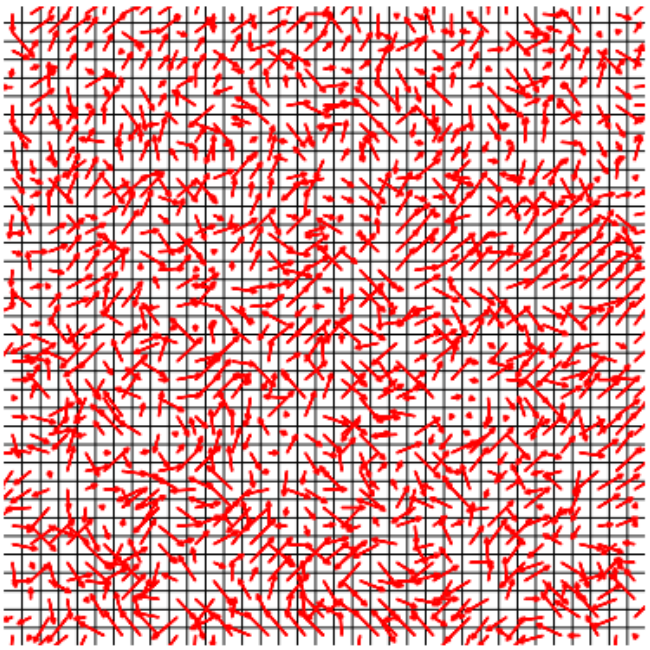
參數和結果圖像

block_size:31, search_range:50



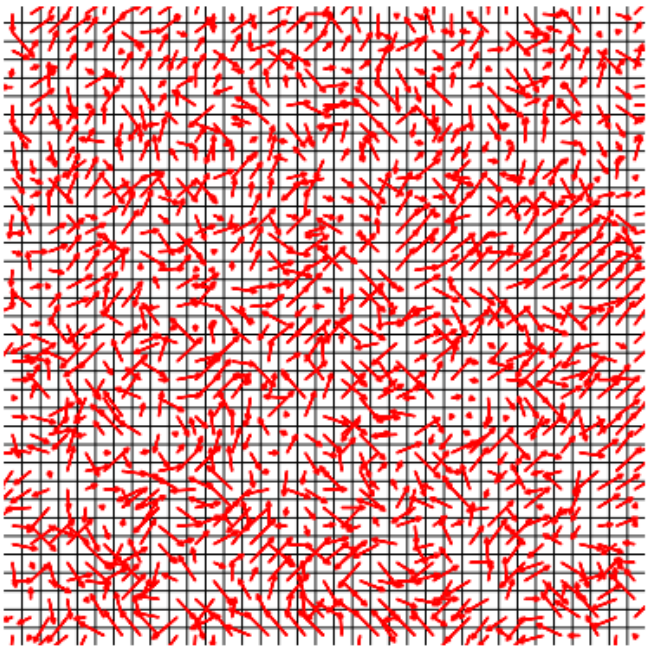
myplot1.png

block_size:21, search_range:30



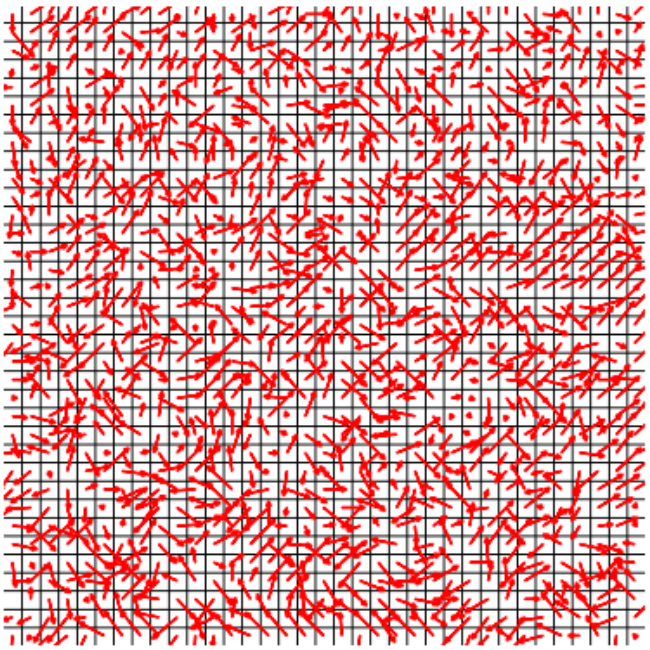
myplot2.png

block_size:15, search_range:20



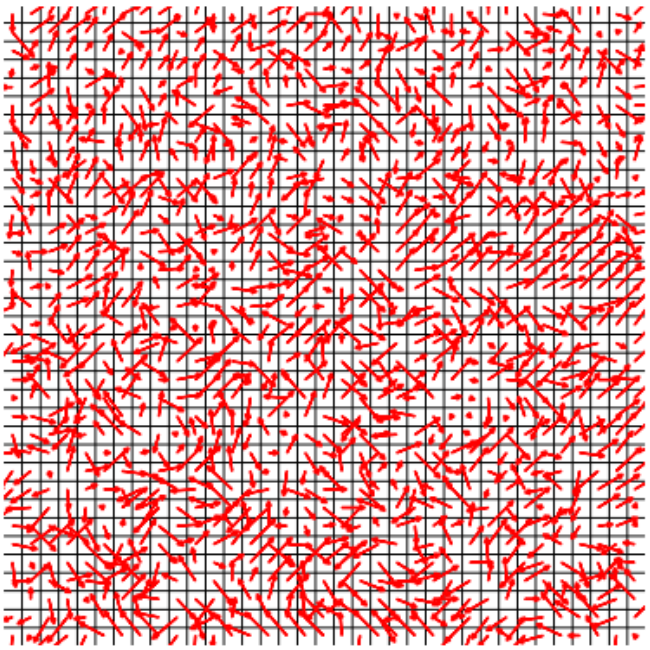
myplot3.png

block_size:11, search_range:15



myplot4.png

block_size:9, search_range:10



myplot5.png