# HW3

姓名:岳紀伶
學號:01057113
日期:2024/05/14

## 方法

你**至少**可以說明下面項目:

● 想法,演算步驟。

● 重要程式片段說明。

步驟:
先使用 ChArUco Board 做相機校正,得到 camera matrix and distortion coefficients。再讀入 AruCo_marker.mp4 偵測 AruCo marker,並把偵測到的 AruCo marker 依照 id 順序填入影片

讀入要覆蓋在 AruCo marker 上的影片並把每一部影片的起始畫面設為從第一幀開始,用 detection1~6 判斷是否已經覆蓋過影片

```python
ret1, frame1 = v1.read()
ret2, frame2 = v2.read()
ret3, frame3 = v3.read()
ret4, frame4 = v4.read()
ret5, frame5 = v5.read()
ret6, frame6 = v6.read()

detection1 = False
frame_count1 = 0
detection2 = False
frame_count2 = 0
detection3 = False
frame_count3 = 0
detection4 = False
frame_count4 = 0
detection5 = False
frame_count5 = 0
detection6 = False
frame_count6 = 0
```

若還沒覆蓋過影片,將起始位置設為第 0 frame,且若要覆蓋的影片長度小於 AruCo_marker.mp4 就在播放一次

```python
if detection1 == False:
    v1.set(cv2.CAP_PROP_POS_FRAMES, 0)
    frame_count1 = 0
else:
    if frame_count1 == v1.get(cv2.CAP_PROP_FRAME_COUNT):
        v1.set(cv2.CAP_PROP_POS_FRAMES, 0)
        frame_count1 = 0
    ret1, frame1 = v1.read()
if detection2 == False:
    v2.set(cv2.CAP_PROP_POS_FRAMES, 0)
    frame_count2 = 0
else:
    if frame_count2 == v2.get(cv2.CAP_PROP_FRAME_COUNT):
        v2.set(cv2.CAP_PROP_POS_FRAMES, 0)
        frame_count2 = 0
    ret2, frame2 = v2.read()
if detection3 == False:
    v3.set(cv2.CAP_PROP_POS_FRAMES, 0)
    frame_count3 = 0
else:
    if frame_count3 == v3.get(cv2.CAP_PROP_FRAME_COUNT):
        v3.set(cv2.CAP_PROP_POS_FRAMES, 0)
        frame_count3 = 0
    ret3, frame3 = v3.read()
```

```python
if detection4 == False:
    v4.set(cv2.CAP_PROP_POS_FRAMES, 0)
    frame_count4 = 0
else:
    if frame_count4 == v4.get(cv2.CAP_PROP_FRAME_COUNT):
        v4.set(cv2.CAP_PROP_POS_FRAMES, 0)
        frame_count4 = 0
    ret4, frame4 = v4.read()
if detection5 == False:
    v5.set(cv2.CAP_PROP_POS_FRAMES, 0)
    frame_count5 = 0
else:
    if frame_count5 == v5.get(cv2.CAP_PROP_FRAME_COUNT):
        v5.set(cv2.CAP_PROP_POS_FRAMES, 0)
        frame_count5 = 0
    ret5, frame5 = v5.read()
if detection6 == False:
    v6.set(cv2.CAP_PROP_POS_FRAMES, 0)
    frame_count6 = 0
else:
    if frame_count6 == v6.get(cv2.CAP_PROP_FRAME_COUNT):
        v6.set(cv2.CAP_PROP_POS_FRAMES, 0)
        frame_count6 = 0
    ret6, frame6 = v6.read()
```

依照 id 順序找對應 corner 覆蓋影片

```python
if ids is not None:
    i=0
    for id in ids:
        if id==1:
            detection1=True
            frame = augmentation(np.array(corners)[i], frame, frame1)
        elif id==2:
            detection2=True
            frame = augmentation(np.array(corners)[i], frame, frame2)
        elif id==3:
            detection3=True
            frame = augmentation(np.array(corners)[i], frame, frame3)
        elif id==4:
            detection4=True
            frame = augmentation(np.array(corners)[i], frame, frame4)
        elif id==5:
            detection5=True
            frame = augmentation(np.array(corners)[i], frame, frame5)
        elif id==6:
            detection6=True
            frame = augmentation(np.array(corners)[i], frame, frame6)
        i+=1
```

讀下一幀影片

```python
frame_count1+=1
frame_count2+=1
frame_count3+=1
frame_count4+=1
frame_count5+=1
frame_count6+=1
```

## 結果

https://youtu.be/bjGI_312TgY

在 id=1 放入 hw3_1.mp4，在 id=2 放入 hw3_2.mp4，在 id=3 放入 hw3_3.mp4，在

id=4 放入 hw3_4mp4，在 id=5 放入 hw3_5.mp4，在 id=6 放入 hw3_6.mp4，直到撥放完  AruCo_marker.mp4。

## 結論

在作業中學到如何校準相機，並過 camera matrix 和 distortion coefficients 推出沒偵測到的角點，使影片永遠有六組角點可以操作。另外在判斷 id 時，一開始沒有注意到 id 沒有按照順序，導致在判斷角點時出現問題，覆蓋的影片一直更換位置，下次會更加注意這些細節。

## 參考文獻

https://www.youtube.com/watch?v=hb-iCauwRH0

https://github.com/seraj94ai/Augmented-reality-with-Python-and-OpenCV/blob/master/Augmented_reality3.py

https://www.youtube.com/watch?v=D1biUn9X7H8&t=233s

https://github.com/codegiovanni/Augmentation_Aruco_marker/blob/main/augmentation.py

https://steam.oxxostudio.tw/category/python/ai/opencv-resize.html

https://docs.opencv.org/4.x/d5/dae/tutorial_aruco_detection.html