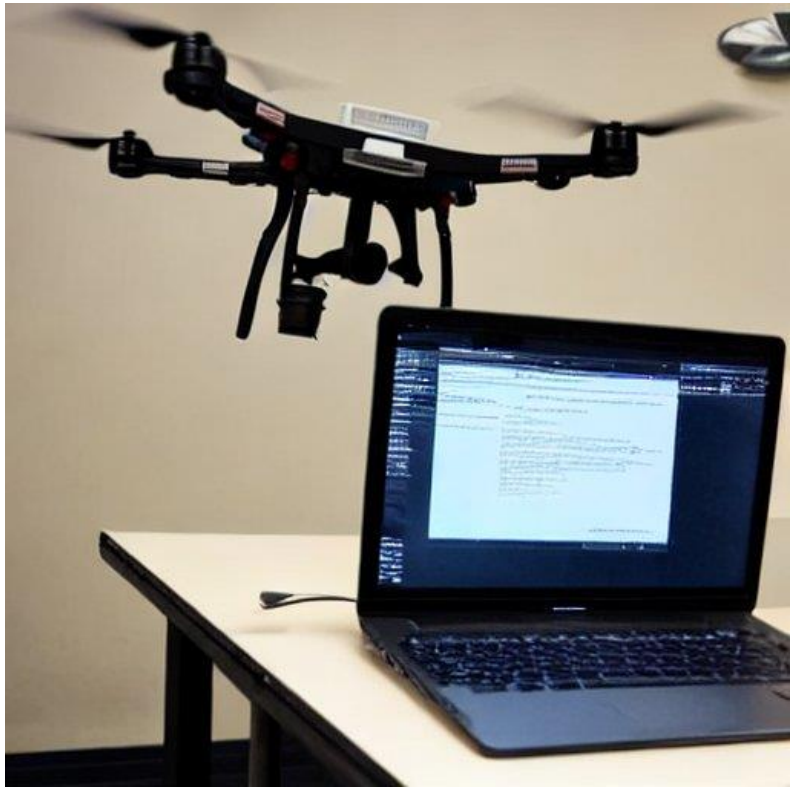
Human Centric Computing - UAV Lab

Class：2nd week, 3rd week, 4th week

- Lab1：UAV Control Lab
  - Principles of UAV flight control
  - UAV flying through web sockets
- Lab2：UAV Communication Lab
  - UAV swarm control
  - UAV video streaming
- Lab3：UAV Computing Lab
  - UAV + AI application



Human Centric Computing – UAV Lab

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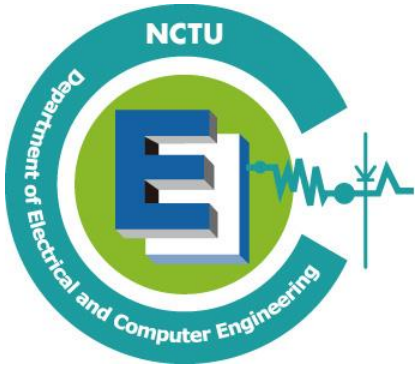

Human Centric Computing
UAV Communication Lab

教授：王蒞君
助教：邱佳詮、廖秉豪、唐晨皓

Objectives

- **UAV swarm control:** Learn to program multiple UAVs to fly simultaneously.
- **UAV Video Streaming:** Learn to use the front camera of the Tello UAV to stream the video.

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UAV swarm control

Experiment Steps

1. Switch the UAV to station mode and connect to the AP.
    - Method 1: Enter SDK mode and change to station mode with a command. (refer to SDK user guide)
2. Prepare a Wi-Fi AP (can use cell phone or computer hotspot).
3. Connect the computer to the same network domain.
4. Begin swarm flight control.

Tello設置為station模式

- 1.確認電腦與Tello連線

1.1 執行

指令	描述	可能的回應
ap ssid pass	將tello設置為station模式，並使用接入點的ssid和密碼連接到新的接入點	ok/error

https://dl-cdn.ryzerobotics.com/downloads/Tello/Tello_SDK_2.0_%E4%BD%BF%E7%94%A8%E8%AF%B4%E6%98%8E.pdf

設定AP

- 2. 打開電腦的行動熱點 (ssid pass要一樣)
  - 例如:
    - 行動熱點:TD1
    - 密碼:00000000

2.1.看見兩台Tello連上電腦

Preparation for UAV swarm control

1. Complete the station mode setting for the drone.
2. Connect the computer to the same network domain.
3. Confirm the IP of all drones.
4. Refer to Lab2/multi_control.py for modifications.
5. Start the swarm flight.

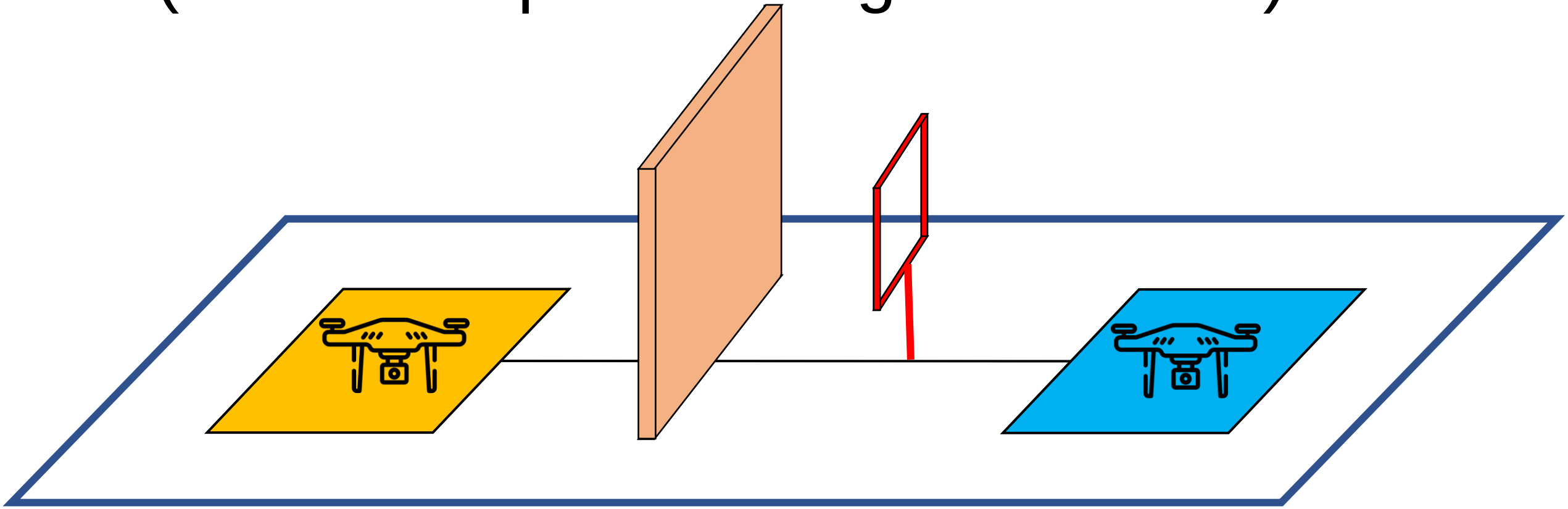
小建議

- 建議使用兩台Tello轉成station模式就好，可以留一台Tello等等還有Check point 2-2會用到
- 長按15秒Tello機身側鈕可以重製，失敗了可以試試 (太熱連不上!!，你沒有失敗)

- Switch the UAV to station mode and connect to the AP (流程在投影片最後)
  - Method 2: Use the Tello EDU app to change to station mode. (Recommend)

Tello edu

Check point 2-1
Exchange positions
(both must pass through the frame)



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ICCL
Intelligent Communication and Computing Lab

UAV video streaming

Introduction to Video Streaming

- Encoding (Compression) Classification
  - Image：jpeg、png……
  - Video：H.264、H.265、VP9、AV1……

Why is compression necessary?

	Without encoding	H.264 encoding
720p HD/ 30 fps (16:9)	1280*720*24*30= 663 Mbps 24=3*8 bits (RGB)	<2 Mbps
1080p FHD/60 fps (16:9)	1920*1080*24*60=2.9 Gbps	<8 Mbps

Video streaming test

- Open the file opencv_test.py and modify the code.
- Modify line 5 to cap=cv2.VideoCapture(0) to turn on the laptop camera."

UAV video streaming

1. Modify opencv_test.py

   (refer to SDK user guide)

```
cap=cv2.VideoCapture("udp://192.168.10.1:?")
```

2. Enter SDK mode
3. Input ”streamon” to start video streaming.
4. Open a new terminal and run opencv_test.py

Check point 2-2

Successfully viewed the UAV streaming video on the computer

Preparation for lab3

- https://hackmd.io/@s87315teve/S1J4qGpQd

Appendix

- Tello edu
- User manual
- 快速入門指南
- SDK user guide

Experiment Steps

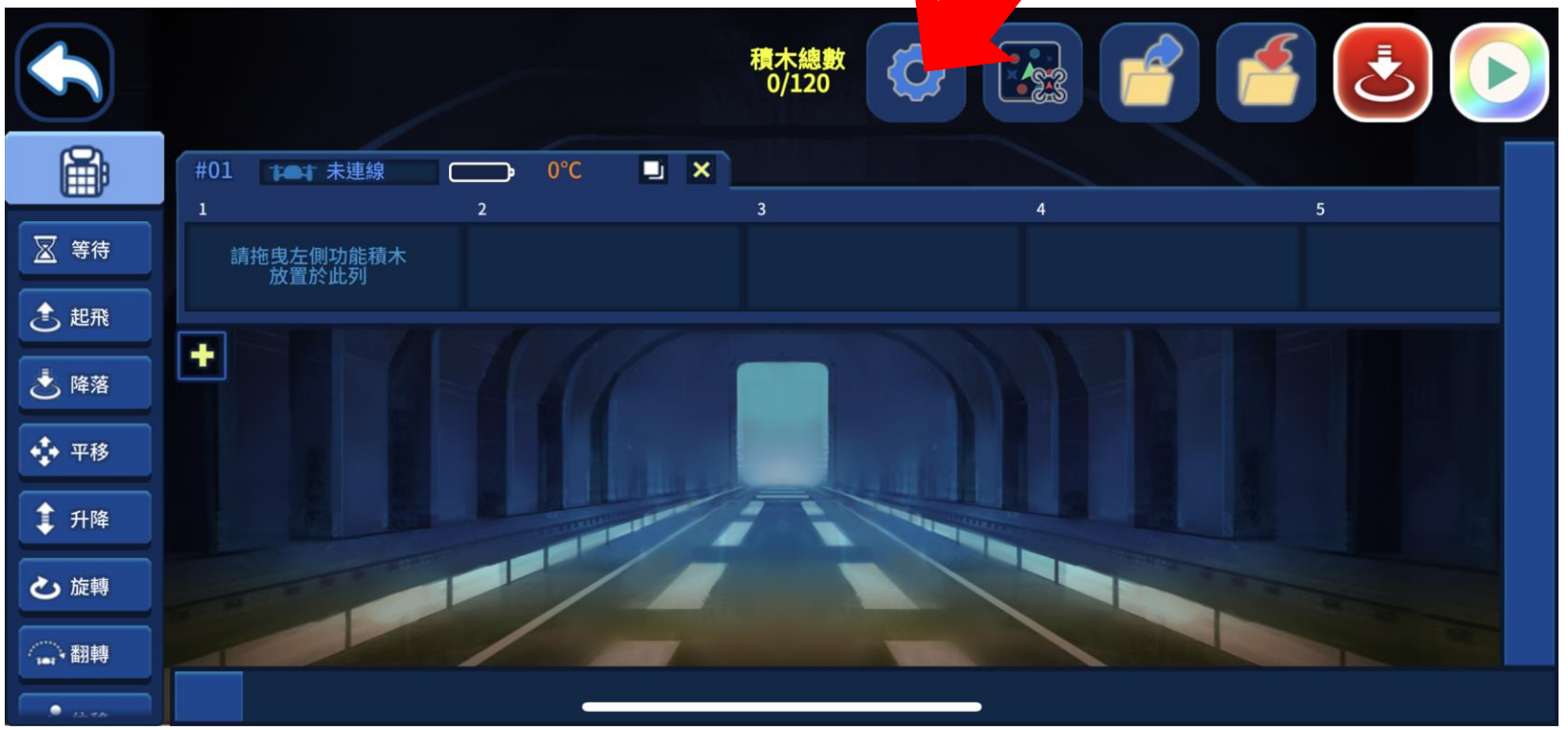
1. Prepare a Wi-Fi AP (can use cell phone or computer hotspot).
2. Switch the UAV to station mode and connect to the AP.
   - Method 1: Use the Tello EDU app to change to station mode. (Recommend)
   - Method 2: Enter SDK mode and change to station mode with a command. (refer to SDK user guide)
3. Connect the computer to the same network domain.
4. Begin swarm flight control.

UAV station mode setting

- Use the Tello EDU app to change to station mode

UAV station mode setting

- Use the Tello EDU app to change to station mode



UAV station mode setting

- Use the Tello EDU app to change to station mode

Input your AP's SSID and password

Preparation for UAV swarm control

1. Complete the station mode setting for the drone.
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