

Lab05

Marker(測距離) & Tello EDU

1. Marker Detection (50%)

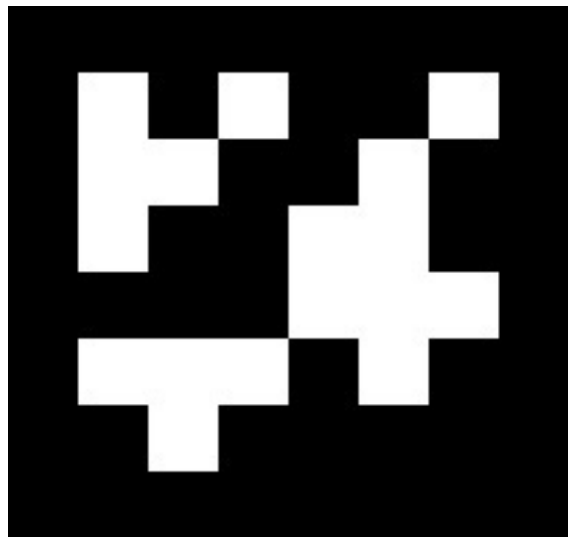
a. calibration

b. marker detection

c. pose estimation

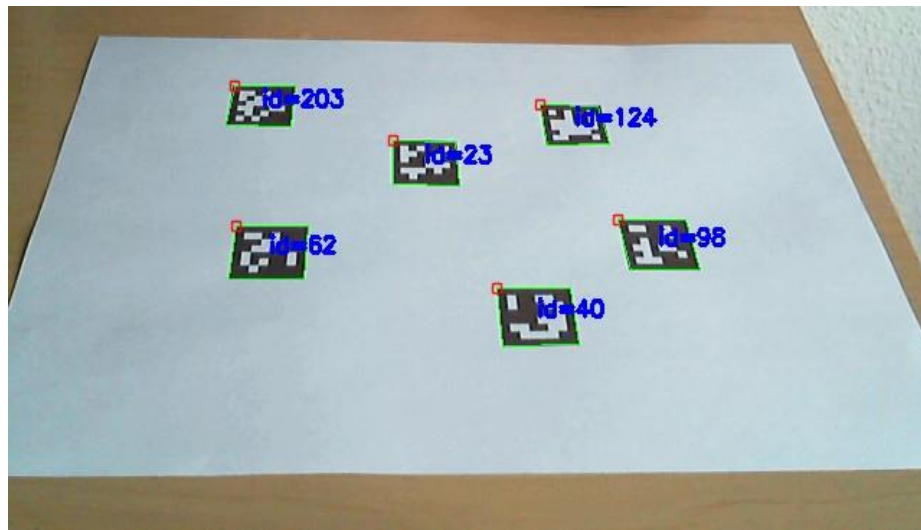
d. controlling

1. Marker Detection (50%)



aruco marker

先跟它說要偵測 $N \times N$ 的 aruco



marker

detection

1. Marker Detection (50%)

Load the predefined dictionary

```
dictionary = cv2.aruco.Dictionary_get(cv.aruco.DICT_6X6_250)
```

Initialize the detector parameters using default values

```
parameters = cv2.aruco.DetectorParameters_create()
```

字典参数初始化

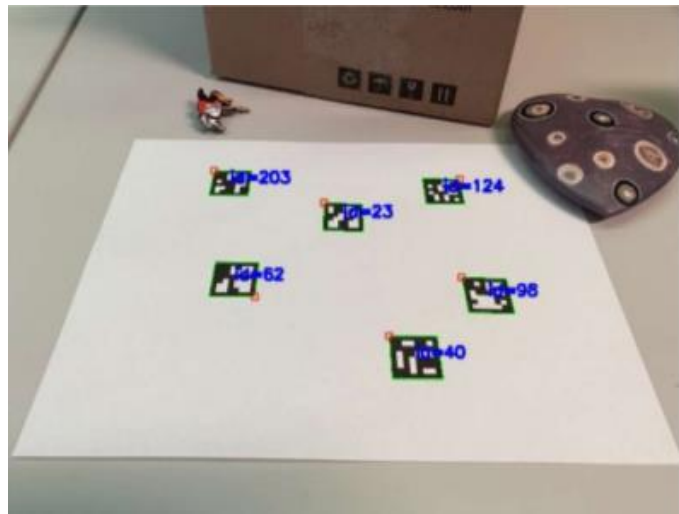
1. Marker Detection (50%)

Detect the markers in the image

输入参数 为 识别标记的 2D 位置

```
markerCorners, markerIds, rejectedCandidates =  
cv2.aruco.detectMarkers(frame, dictionary, parameters=parameters)
```

```
frame = cv2.aruco.drawDetectedMarkers(frame,  
markerCorners, markerIds)
```



1. Marker Detection (50%)

↑ 估计 rotation, translation

#Pose estimation for single markers.

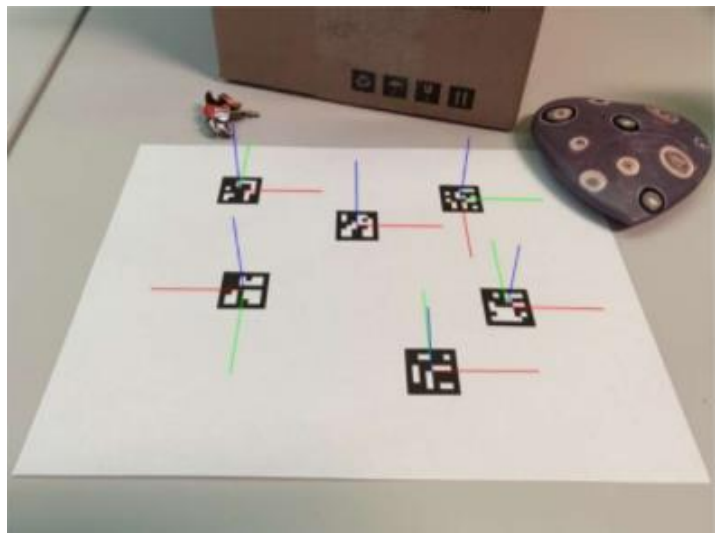
```
rvec, tvec, _objPoints =  
cv2.aruco.estimatePoseSingleMarkers(markerCorners,  
15, intrinsic, distortion)
```

↓
aruco 的 Km (Lm)

```
frame = cv2.aruco.drawAxis(frame, intrinsic,  
distortion, rvec, tvec, 0.1)
```

把 x, y, z 轴画出来

(z 是我 和 机器人的距离)

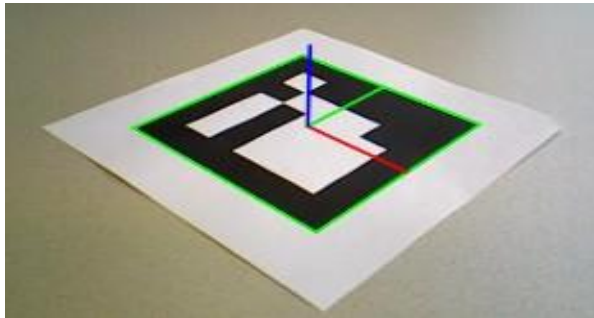


1. Marker Detection (50%)

a. calibrate the drone camera

b. marker detection by drone camera

c. pose estimation



x: 10.3478

y: 21.5618

z: 3.9908

2. Tello EDU (50%)

設備介紹

配件		數量
	飛行器	× 1
	螺旋槳（對）	× 4
	槳葉保護罩（套）	× 1
	電池	× 1
	Micro USB 傳輸線	× 1
	螺旋槳拆卸工具	× 1
	挑戰卡	× 4

電池管家



官方範例程式

- <https://github.com/dji-sdk/Tello-Python>

github.com/dji-sdk/Tello-Python

13 commits 1 branch 0 packages 0 releases 2 contributors View license

Branch: master New pull request Create new file Upload files Find file Clone or download

hanker-lu 1 · Add FAQ file(EN&CH) according recent questions asked by users;2 · Ren... 1 Latest commit 693776d on 15 Feb

Single_Tello_Test	modify the readme	last year
Tello_Video	1 · add the vcredist_x64.exe into tello_video_dll.zip;2 · remove the manu...	9 months ago
Tello_Video_With_Pose_Recognition	1 · add the vcredist_x64.exe into tello_video_dll.zip;2 · remove the manu...	9 months ago
doc	Tello-Python SampleCode v1.0.0	last year
.gitattributes	add the .gitattributes	last year
.gitignore	Tello-Python SampleCode v1.0.0	last year
LICENSE.md	Tello-Python SampleCode v1.0.0	last year
README.md	1 · Add FAQ file(EN&CH) according recent questions asked by users;2 · Ren...	9 months ago
TelloPython_FAQ(CH).txt	1 · Add FAQ file(EN&CH) according recent questions asked by users;2 · Ren...	9 months ago
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tello_state.py	Tello-Python SampleCode v1.0.0	last year
tello_video_dll(ForWin64).zip	1 · Add FAQ file(EN&CH) according recent questions asked by users;2 · Ren...	9 months ago

官方範例程式：Tello-Video

- https://github.com/dji-sdk/Tello-Python/tree/master/Tello_Video

- Written in Python 2.7

- 安裝：

- Windows

Go to the "install\Windows" folder, select and run the correct "windows_install.bat" according to your computer operating system bits.

- Linux (Ubuntu 14.04 and above)

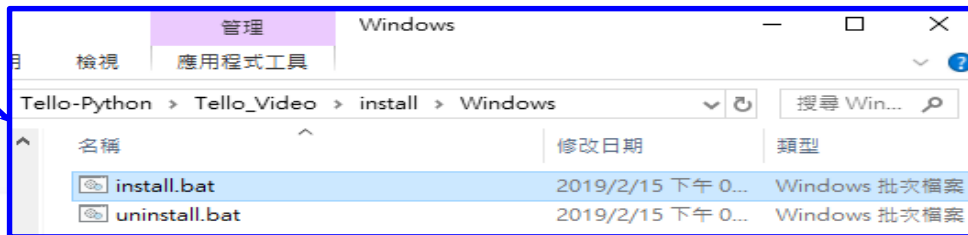
Go to the "install\Linux" folder in command line, run

```
chmod +x linux_install.sh
./linux_install.sh
```

- Mac

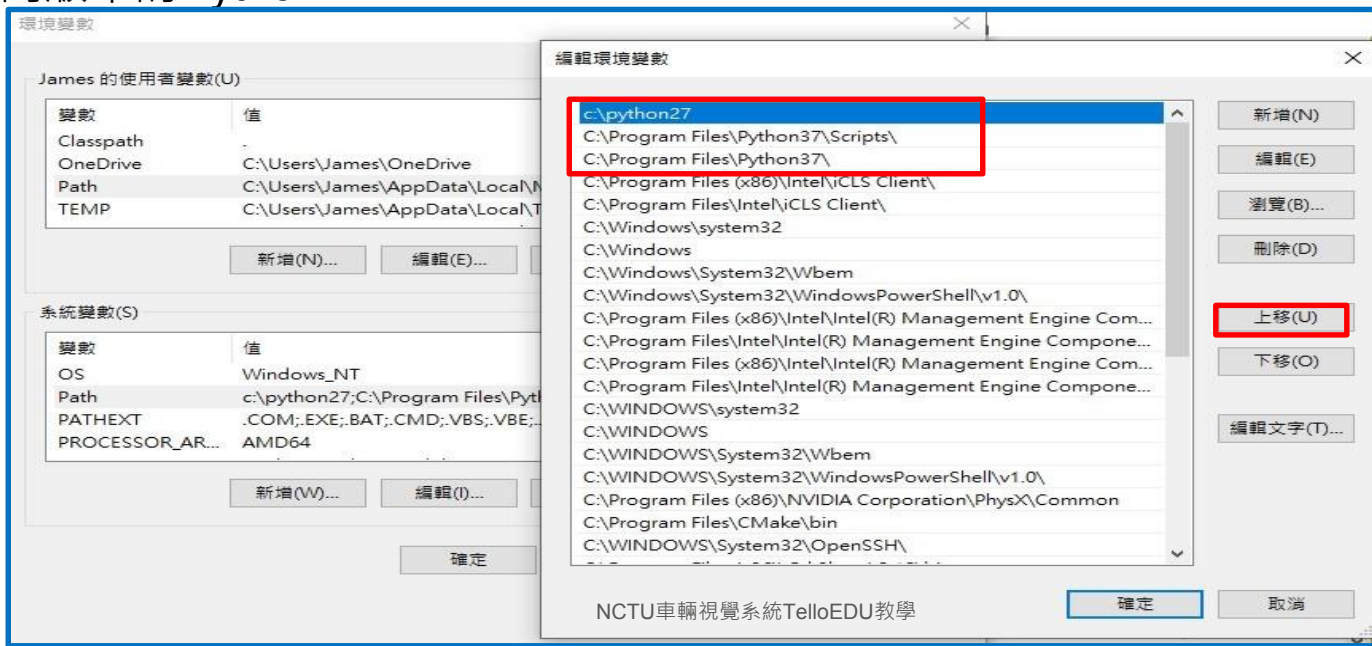
- Make sure you have the latest Xcode command line tools installed. If not, you might need to update your OS X and XCode to the latest version in order to compile the h264 decoder module
- Go to the "install\Mac" folder in command line, run

```
chmod a+x ./mac_install.sh
./mac_install.sh
```



官方範例程式：Tello-Video

- 不同版本的Python



官方範例程式：執行 Tello-Video

- 第一步。打開Tello無人機，並透過Wi-Fi將筆電連接到Tello

↑ 開關



官方範例程式：執行 Tello-Video

- 第一步。打開Tello無人機，並透過Wi-Fi將筆電連接到Tello

Branch: master ▼ Tello-Python / Tello_Video /

Create new file Find file History

hanker-lu 1 · add the vcrcdist_x64.exe into tello_video_dll.zip;2 · remove the manu... ...

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..

h264decoder

adding missing include

16 months ago

img

add the 'img'file

17 months ago

install

1 · add the vcrcdist_x64.exe into tello_video_dll.zip;2 · remove the manu...

14 months ago

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README.md

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main.py

Tello-Python SampleCode v1.0.0

17 months ago

tello.py

Tello-Python SampleCode v1.0.0

17 months ago


tello_control_ui.py

Tello-Python SampleCode v1.0.0

17 months ago

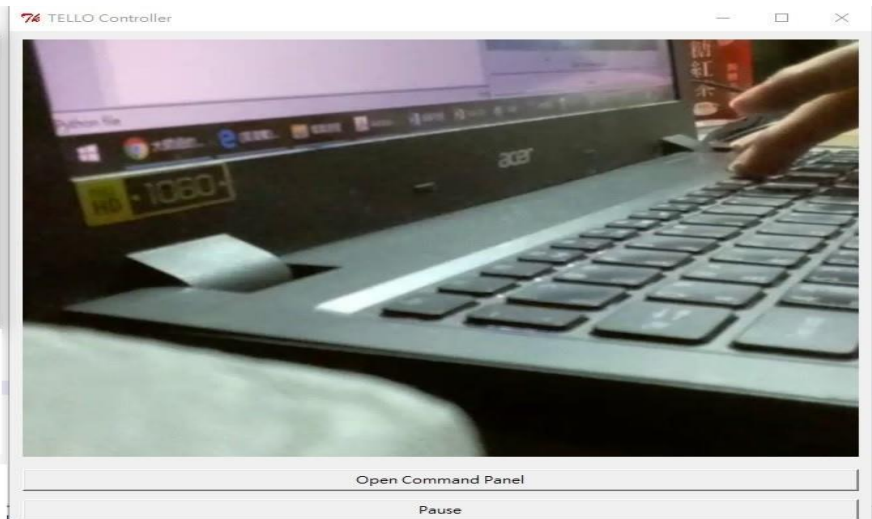
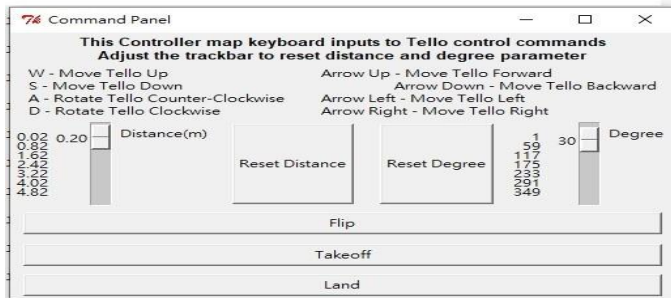
官方範例程式：執行 Tello-Video

- 在命令列打開程式所在資料夾，並輸入 `python main.py`，將顯示一個使用者界面。



```
C:\> 命令提示字元


D:\CodingArea\Tello-Python\Tello_Video>python main.py
```



官方範例程式：執行 Tello-Video


- 第一步。打開Tello無人機，並透過Wi-Fi將筆電連接到Tello

Branch: master ▼ Tello-Python / Tello_Video / Create new file Find file History

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 [tello_control_ui.py](#)

Tello-Python SampleCode v1.0.0

17 months ago

放入lab05.py

tello.py

```
5  # import libh264decoder
25      # self.decoder = libh264decoder.H264Decoder()
51      # self.socket_video.bind((local_ip, self.local_video_port))
```

註解掉def _h264_decode 跟 def _receive_video_thread

tello.py

✓ 改成这样

```
def _receive_video_thread(self):  
    video_ip = "udp://{}:{}".format("0.0.0.0", 11111)  
    video_capture = cv2.VideoCapture(video_ip)  
    retval, self.frame = video_capture.read()  
    while retval:  
        retval, frame = video_capture.read()  
        self.frame = frame[..., ::-1] # From BGR to RGB
```

tello_control_ui.py

```
import Tkinter as tki
```

```
from Tkinter import Toplevel, Scale
```

改成

```
import tkinter as tki
```

```
from tkinter import Toplevel, Scale
```

tello_control_ui.py

except RuntimeError, e:

改成

```
100         except RuntimeError as e:
```

所有的print全部加括號

```
print('reset distance to %.1f' % self.distance)
```

取像控制

在Tello_Video內

放入lab05.py

```
import tello
import cv2
import time

def main():
    drone = tello.Tello('', 8889)

    time.sleep(10) → 先等一下, 再開始取像

    while(True):
        frame = drone.read()
        frame = cv2.cvtColor(frame, cv2.COLOR_RGB2BGR)

        cv2.imshow("drone", frame)
        key = cv2.waitKey(1)

        if key != -1:
            drone.keyboard(key)

    cv2.destroyAllWindows()

if __name__ == "__main__":
    main()
```

去連無人機

Tello API

```
self.tello.takeoff()  
  
self.tello.land()  
  
self.tello.flip('l')  
self.tello.flip('r')  
self.tello.flip('f')  
self.tello.flip('b')  
  
self.tello.rotate_cw(degree)  
self.tello.rotate_ccw(degree)  
  
self.tello.move_forward(distance)  
self.tello.move_backward(distance)  
self.tello.move_left(distance)  
self.tello.move_right(distance)  
self.tello.move_up(dist)  
self.tello.move_down(dist)
```

distance和dist的單位為公尺！

所以在測試時，建議distance和dist的數字不要設超過"1"！

```

def keyboard(self, key):
    print("key:", key)
    distance = 0.9
    degree = 30

    if key == ord('1'):
        self.takeoff()
    if key == ord('2'):
        self.land()
    if key == ord('i'):
        self.move_forward(distance)
        print("forward!!!!")
    if key == ord('k'):
        self.move_backward(distance)
        print("backward!!!!")
    if key == ord('j'):
        self.move_left(distance)
        print("left!!!!")
    if key == ord('l'):
        self.move_right(distance)
        print("right!!!!")
    if key == ord('s'):
        self.move_down(distance)
        print("down!!!!")
    if key == ord('w'):
        self.move_up(distance)
        print("up!!!!")
    if key == ord('a'):
        self.rotate_cw(degree)
        print("rotate!!!!")
    if key == ord('d'):
        self.rotate_ccw(degree)
        print("counter rotate!!!!")
    if key == ord('5'):
        height = self.get_height()
        print(height)
    if key == ord('6'):
        battery = self.get_battery()
        print(battery)

```

- **Note:**
 往後撰寫自動飛行的程式碼時，
 一定也要有 keyboard control 功能，
 且要有最高優先權，
 確保自動飛行狀況不佳時仍能手動控制。
- 將keyboard加入 tello.py 中的Tello物件

Keyboard control

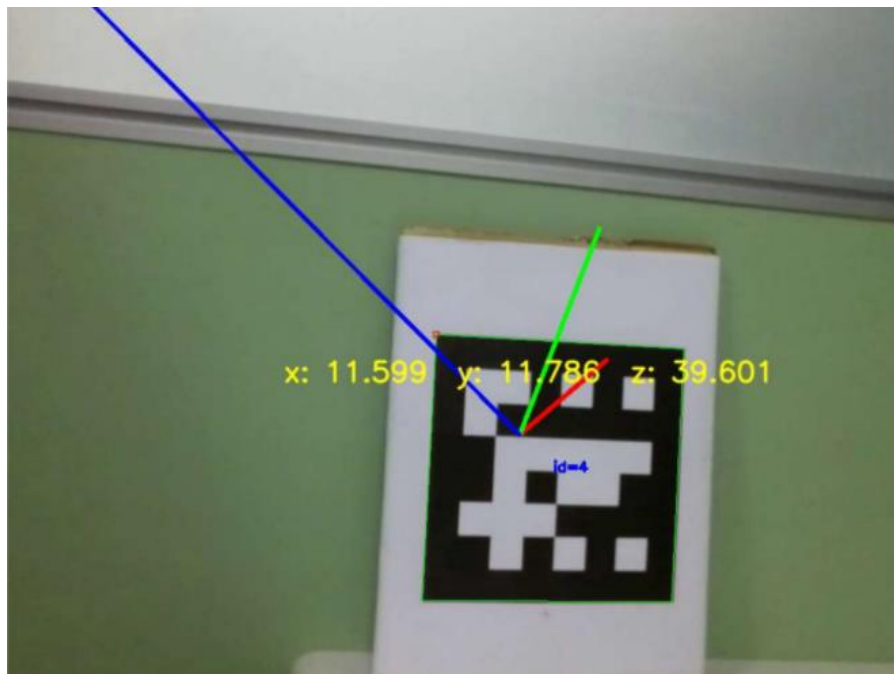
- **Note:**

往後撰寫自動飛行的程式碼時，
一定也要有 **keyboard control** 功能，
且要有最高優先權，
確保自動飛行狀況不佳時仍能手動控制。

```
"*****"
"*      CV Drone sample program      *"
"*      - How to play -                *"
"*****"
"*                                     *"
"* - Controls -                        *"
"*   'Space'  — Takeoff/Landing        *"
"*   'Up'     — Move forward           *"
"*   'Down'   — Move backward         *"
"*   'Left'   — Turn left              *"
"*   'Right'  — Turn right              *"
"*   'Q'      — Move upward            *"
"*   'A'      — Move downward         *"
"*                                     *"
"* - Others -                          *"
"*   'C'      — Change camera          *"
"*   'Esc'    — Exit                   *"
"*                                     *"
"*****"
```


測距離

利用cv2.putText() → 標 x, y , 主軸



測距離

若找不到aruco module

```
pip install opencv-contrib-python
```