

```

1 import mediapipe as mp      # 10 finger sign for Tello
2 import cv2
3 import threading
4 import socket
5 import time
6
7
8 host = '0.0.0.0'
9 port = 8889
10 #host = '192.168.10.2'
11 #port = 8889
12 locaddr = (host, port)
13
14
15
16 # Create a UDP socket
17 sock = socket.socket(socket.AF_INET, socket.SOCK_DGRAM)
18
19 tello_address = ('192.168.10.1', 8889)
20
21 sock.bind(locaddr)
22
23 def recv():
24     while True:
25         try:
26             data, server = sock.recvfrom(1518)
27             print(data.decode(encoding="utf-8"))
28         except Exception:
29             print('\nExit . . . RECV\n')
30             break
31
32 recvThread = threading.Thread(target=recv)
33 recvThread.start()
34 #send sdk
35 sock.sendto(b'command', tello_address)
36 print('command ok')
37 time.sleep(0.5)
38
39 time.sleep(1)
40 #sock.sendto(b'takeoff', tello_address)
41 #time.sleep(2)
42 #sock.sendto(b'up 80', tello_address)
43 #time.sleep(2)
44 sock.sendto(b'streamon', tello_address)
45 print('stream on')
46
47 LOCAL_IP = '192.168.10.1'
48 LOCAL_PORT = '11111'
49 addr = ("udp://%s:%s?overrun_nonfatal=1&fifo_size=5000000" % ('192.168.10.1',
50 '11111'))
51 cap = cv2.VideoCapture(addr)
52 #cap.set(cv2.CAP_PROP_BUFFERSIZE, 2)
53 cap.set(cv2.CAP_PROP_FPS,20)
54
55 print('start cap')
56
57 mpHands = mp.solutions.hands
58 hands = mpHands.Hands()
59 mpDraw = mp.solutions.drawing_utils
60 draw = True
61
62
63 while True:
64     ret, frame = cap.read()
65     # frame = cv2.flip(frame, 1)      #映像を左右反転させる。
66     if frame is None or frame.size == 0:
67         continue
68
69     resize_frame = cv2.resize(frame, dsize=(480, 360))
70     imageRGB = cv2.cvtColor(resize_frame, cv2.COLOR_BGR2RGB)
71
72
73     results = hands.process(imageRGB)
74     if results.multi_hand_landmarks:
75         for handLms in results.multi_hand_landmarks:
76             for id, lm in enumerate(handLms.landmark):
77                 h, w, c = resize_frame.shape

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78         cx, cy = int(lm.x * w), int(lm.y * h)
79         mpDraw.draw_landmarks(resize_frame, handLms, mpHands.HAND_CONNECTIONS)
80
81     lmList = []
82     handNo = 0
83     draw = True
84     if results.multi_hand_landmarks:
85         myHand = results.multi_hand_landmarks[handNo]
86         for handLms in results.multi_hand_landmarks:           #landmark
87             handIndex = results.multi_hand_landmarks.index(handLms)
88             handLabel = results.multi_handedness[handIndex].classification[0].label
89             hand_landmarks = []
90             for id, lm in enumerate(handLms.landmark):
91                 #print(id, lm)
92                 h, w, c = resize_frame.shape
93                 cx, cy = int(lm.x * w), int(lm.y * h)
94                 #print(id, cx, cy)
95                 lmList.append([id, cx, cy])
96                 #print(lmList)
97
98
99
100     tipIds = [4, 8, 12, 16, 20]
101 #     tipIds = [4, 8, 12, 16, 20]
102     Fingers = []
103     if len(lmList) != 0:           #total finger count
104         fingers = []
105
106         if lmList[tipIds[0]][1] < lmList[tipIds[0] - 1][1]:
107             fingers.append(1)
108         else:
109             fingers.append(0)
110         for id in range(1, 5):
111             if lmList[tipIds[id]][2] < lmList[tipIds[id] - 2][2]:
112                 fingers.append(1)
113             else:
114                 fingers.append(0)
115         totalFingers = fingers.count(1)
116         print(totalFingers)
117         if len(lmList) != 0:
118 #右手
119             if handLabel == "Left" and lmList[tipIds[0]][1] > lmList[tipIds[0] - 1]
120 [1] and totalFingers == 0:           #親指 no.1
121                 cv2.putText(resize_frame, f'Up', org=(50, 50),
122 fontFace=cv2.FONT_HERSHEY_SIMPLEX, fontScale=1.5, color=(255, 0, 0), thickness=3,
123 lineType=cv2.LINE_4)
124                 cv2.putText(resize_frame, f'Right: index finger', (70, 60),
125 cv2.FONT_HERSHEY_SIMPLEX, fontScale=0.7, color=(0, 255, 0), thickness=2,
126 lineType=cv2.LINE_4)
127                 sock.sendto(b'up 20', tello_address)
128                 print('Up')
129
130
131
132             if handLabel == "Left" and lmList[8][2] < lmList[6][2] and totalFingers
133 == 2:           #人差し指 no.2
134                 cv2.putText(resize_frame, f'Takeoff', org=(50, 50),
135 fontFace=cv2.FONT_HERSHEY_SIMPLEX, fontScale=1.5, color=(255, 0, 0), thickness=3,
136 lineType=cv2.LINE_4)
137                 cv2.putText(resize_frame, f'Right: index finger', (70, 60),
138 cv2.FONT_HERSHEY_SIMPLEX, fontScale=0.7, color=(0, 255, 0), thickness=2,
139 lineType=cv2.LINE_4)
140                 sock.sendto(b'takeoff', tello_address)
141                 print('takeoff')
142
143
144             if handLabel == "Left" and lmList[12][2] < lmList[10][2] and
145 totalFingers == 2:           #中指 no.3
146                 cv2.putText(resize_frame, f'Forward', org=(50, 50),
147 fontFace=cv2.FONT_HERSHEY_SIMPLEX, fontScale=1.5, color=(255, 0, 0), thickness=3,
148 lineType=cv2.LINE_4)
149                 cv2.putText(resize_frame, f'Right: middle finger', (70, 60),
150 cv2.FONT_HERSHEY_SIMPLEX, fontScale=0.7, color=(0, 255, 0), thickness=2,
151 lineType=cv2.LINE_4)
152                 sock.sendto(b'forward 30', tello_address)
153                 print('forward')
154
155
156             if handLabel == "Left" and lmList[16][2] < lmList[14][2] and
157 totalFingers == 2:           #薬指 no.4

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141         cv2.putText(resize_frame, f'Clockwise', org=(50, 50),
fontFace=cv2.FONT_HERSHEY_SIMPLEX, fontScale=1.5, color=(255, 0, 0), thickness=3,
lineType=cv2.LINE_4)
142         cv2.putText(resize_frame, f'Right: index finger', (70, 60),
cv2.FONT_HERSHEY_SIMPLEX, fontScale=0.7, color=(0, 255, 0), thickness=2,
lineType=cv2.LINE_4)
143         sock.sendto(b'cw 40', tello_address)
144         print('cw ')
145
146
147         if handLabel == "Left" and lmList[20][2] < lmList[18][2] and
totalFingers == 2: #小指 no.5
148             cv2.putText(resize_frame, f'Left', org=(50, 50),
fontFace=cv2.FONT_HERSHEY_SIMPLEX, fontScale=1.5, color=(255, 0, 0), thickness=3,
lineType=cv2.LINE_4)
149             cv2.putText(resize_frame, f'Right: pinky finger', (70, 60),
cv2.FONT_HERSHEY_SIMPLEX, fontScale=0.7, color=(0, 255, 0), thickness=2,
lineType=cv2.LINE_4)
150             sock.sendto(b'left 30', tello_address)
151             print('Left')
152
153
154
155 #左手
156         if handLabel == "Right" and lmList[tipIds[0]][1] < lmList[tipIds[0] - 1]
[1] and totalFingers == 1: #親指 no.1#
157             cv2.putText(resize_frame, f'Down', org=(50, 50),
fontFace=cv2.FONT_HERSHEY_SIMPLEX, fontScale=1.5, color=(255, 0, 0), thickness=3,
lineType=cv2.LINE_4)
158             cv2.putText(resize_frame, f'Left: index finger', (70, 60),
cv2.FONT_HERSHEY_SIMPLEX, fontScale=0.7, color=(0, 255, 0), thickness=2,
lineType=cv2.LINE_4)
159             sock.sendto(b'down 20', tello_address)
160             print('Down')
161
162
163         if handLabel == "Right" and lmList[8][2] < lmList[6][2] and totalFingers
== 1: #人差し指 no.2
164             cv2.putText(resize_frame, f'Land', org=(50, 50),
fontFace=cv2.FONT_HERSHEY_SIMPLEX, fontScale=1.5, color=(255, 0, 0), thickness=3,
lineType=cv2.LINE_4)
165             cv2.putText(resize_frame, f'Left: index finger', (70, 60),
cv2.FONT_HERSHEY_SIMPLEX, fontScale=0.7, color=(0, 255, 0), thickness=2,
lineType=cv2.LINE_4)
166             sock.sendto(b'land', tello_address)
167             print('Land')
168
169         if handLabel == "Right" and lmList[12][2] < lmList[10][2] and
totalFingers == 1: #中指 no.3
170             cv2.putText(resize_frame, f'Back', org=(50, 50),
fontFace=cv2.FONT_HERSHEY_SIMPLEX, fontScale=1.5, color=(255, 0, 0), thickness=3,
lineType=cv2.LINE_4)
171             cv2.putText(resize_frame, f'Left: middle finger', (70, 60),
cv2.FONT_HERSHEY_SIMPLEX, fontScale=0.7, color=(0, 255, 0), thickness=2,
lineType=cv2.LINE_4)
172             sock.sendto(b'back 30', tello_address)
173             print('back')
174
175         if handLabel == "Right" and lmList[16][2] < lmList[14][2] and
totalFingers == 1: #薬指 no.4
176             cv2.putText(resize_frame, f'counterClockwise', org=(50, 50),
fontFace=cv2.FONT_HERSHEY_SIMPLEX, fontScale=1.5, color=(255, 0, 0), thickness=3,
lineType=cv2.LINE_4)
177             cv2.putText(resize_frame, f'Right: index finger', (70, 60),
cv2.FONT_HERSHEY_SIMPLEX, fontScale=0.7, color=(0, 255, 0), thickness=2,
lineType=cv2.LINE_4)
178             sock.sendto(b'ccw 40', tello_address)
179             print('counterClockwise')
180
181
182         if handLabel == "Right" and lmList[20][2] < lmList[18][2] and
totalFingers == 1: #小指 no.5
183             cv2.putText(resize_frame, f'Right', org=(50, 50),
fontFace=cv2.FONT_HERSHEY_SIMPLEX, fontScale=1.5, color=(255, 0, 0), thickness=3,
lineType=cv2.LINE_4)
184             cv2.putText(resize_frame, f'Left: pinky finger', (70, 60),
cv2.FONT_HERSHEY_SIMPLEX, fontScale=0.7, color=(0, 255, 0), thickness=2,

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```
lineType=cv2.LINE_4)
185     sock.sendto(b'right 30', tello_address)
186     print('right')
187
188
189     cv2.imshow("Output", resize_frame)
190     if cv2.waitKey(1) & 0xff == 27:
191         break
192 sock.sendto(b'land', tello_address)
193 cap.release()
194 cv2.destroyAllWindows()
195 sock.close()
```