Lesson 4 How to Detect AprilTag

In this lesson, TonyPi Pro will perform a corresponding action after recognizing AprilTag.
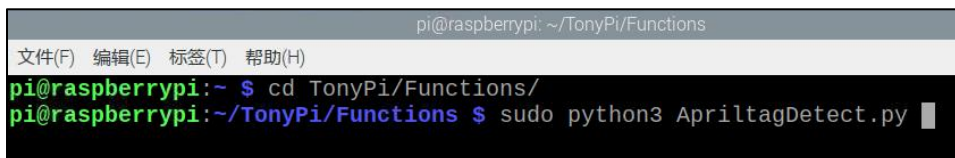
1. Operation Steps

1) Turn on TonyPi Pro and log on VNV remote connect tool.

2) Click [>_] icon or press "Ctrl+Alt+T" to open LX terminal.

3) Enter "cd TonyPi/Functions/" command to come to game programmings

4) Enter "sudo python3 KickBall.py" command and press "Enter" to start game.

5) If want to exit the game, you just need to press "Ctrl+C" in LX terminal. Please try multiple times if fail to exit.

2. Project Outcome

After stating game, take out the provided AprilTag and point them at the camera. After recognizing, TonyPi Pro will perform the corresponding action.

The following table is the corresponding relation between Tag ID and action:

Tag ID	Executed Action
1	bow
2	stepping
3	twist

3. Project Analysis

In this lesson, AprilTag detection is implemented by positioning, image segmentation, and contour search. Then detect quadrilateral after the contour is positioned, and and the straight line is fitted to form a closed loop by acquiring the four corner points.

Therefore, we only need to set the feedback action performed by robot on the basis of tag detection.

Firstly, import the library that calls the action group of robot:

```
import HiwonderSDK.ActionGroupControl as AGC
```

In order to perform the action better, initialize the position of robot's head before detection, that is, the servo on head returns to initial position:

```
def initMove():
    Board.setPWMServoPulse(1, 1500, 500)
    Board.setPWMServoPulse(2, 1500, 500)
```

Then we need to add a new process that enable robot to move closer to target while doing tag recognition:

```
th = threading.Thread(target=move)
th.setDaemon(True)
th.start()
```

The detection part we have learned in the previous lesson can calculate the ID of corresponding tag. Then add the judgement after the tag is detected, which can be realized by if else sentence. For example, when Tag1 is recognized, robot will perform a bowing action.

```
if tag_id == 1:#when the tag ID is 1

    AGC.runActionGroup('wave')#wave

    tag_id = None

    time.sleep(1)

    action_finish = True
```

According to the same logic, set executed actions for the recognized Tag 2 and Tag 3 in turn:

```
elif tag_id == 2:

    AGC.runActionGroup('stepping')#stepping

    tag_id = None

    time.sleep(1)

    action_finish = True

elif tag_id == 3:

    AGC.runActionGroup('twist')#twist

    tag_id = None

    time.sleep(1)

    action_finish = True
```