Palm control 2DOF servo PTZ

Note: The VM and ROS-wifi image transfer module must be consistent with the microROS control board ROS_DOMAIN_ID and set the value to 20. You can check [MicroROS control board Parameter configuration] to set the microROS control board ROS_DOMAIN_ID. Check the tutorial Connecting to MicroROS Agents to see if the ids are the same.

1、synopsis

MediaPipe is an open source and data stream processing machine learning application development framework developed by Google. It is a graph-based data processing pipeline for building data sources that use many forms, such as video, audio, sensor data, and any time series data. MediaPipe is cross-platform and can run on embedded platforms (Raspberry PI, etc.), mobile devices (iOS and Android), workstations and servers, and supports GPU acceleration on mobile. MediaPipe provides cross-platform, customizable ML solutions for live and streaming media.

2、Program specification

After the program starts, after the camera captures the image, the two-dimensional head of the car will follow the movement of the palm in the picture. The moving speed of the palm movement here should not be too fast, otherwise the image processing can not keep up, which will cause a lag.

2.1、Program code reference path

```
/home/yahboom/yahboomcar_ws/src/yahboom_esp32ai_car/yahboom_esp32ai_car/control_
shape.py
```

3、Program initiation

3.1、Start command

Terminal input,

```
ros2 run yahboom_esp32ai_car control_shape
```

If the Angle of the camera is not at this Angle, please press CTRL+C to end the program and run again, this is because the network delay causes the Angle of sending the steering gear to lose packets

If the camera picture image appears upside down, you need to see **3. Camera picture correction (must see)** document itself correction, the experiment is no longer described.

After the function is turned on, the two-dimensional head of the car will follow the palm movement.

FPS : 4
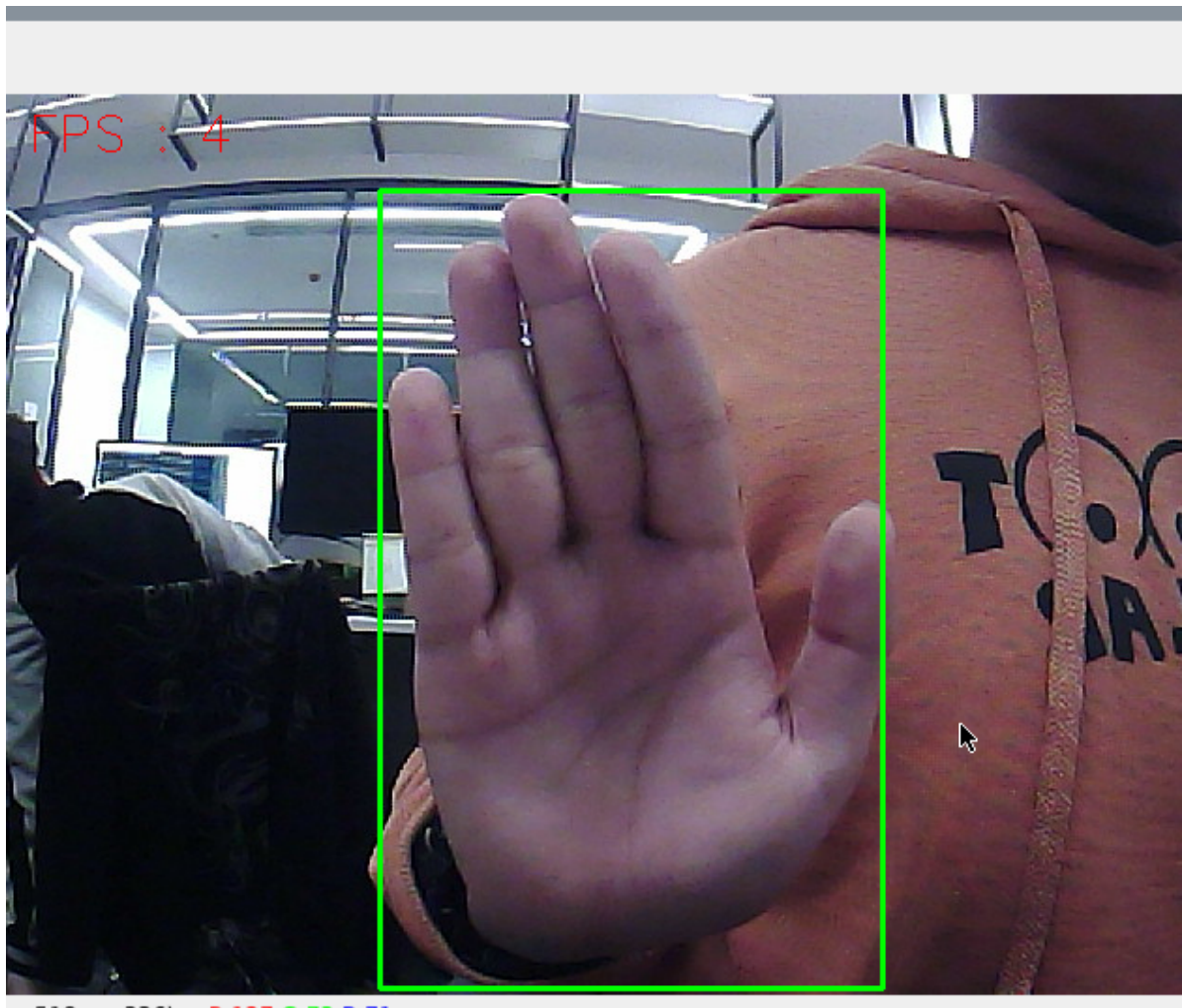
4、Code parsing

4.1、control_shape.py

```
/home/yahboom/yahboomcar_ws/src/yahboom_esp32ai_car/yahboom_esp32ai_car/control_
shape.py
```

- Code parsing

  1) 、Import important library files

  ```
  from media_library import *
  ```

  2) 、Check the hand, get finger information

  ```
  frame, lmList, bbox = self.hand_detector.findHands(frame)

  angle = self.hand_detector.ThumbTOforefinger(lmList)
  ```

  3) 、Calculate the Angle of each steering gear

```
point_x = lmList[9][1]
point_y = lmList[9][2]
if point_y >= 200: self.y -= 1
elif point_y <= 100: self.y += 1

if point_x >= 420: self.x -= 1
elif point_x <= 300: self.x += 1

if self.x <= -45: self.x = -45
elif self.x >= 45: self.x=45
if self.y <= -90: self.y = -90
elif self.y >=40: self.y = 40
```

It can be seen that indexX and indexY are the coordinates of the center point of the picture frame, and the Angle of rotation of the steering gear should be calculated through judgment. The parameters of each Angle calculation method are calibrated according to the actual rotation Angle and the visual range of the camera.

4.2、 Flow chart

```
                    start
                      |
Open the camera, obtain the image, and enter the process function
                      |
                  Detect palm
   frame, lmiList, _=self.hand_detector.findHands(frame)
                      |
              get number of fingers
       fingers=self.hand_detector.fingersUp(lmList)
                      |
According to the position of the coordinate value on the screen,
send the movement angle data of the servo
                      |
                     End
```