Lidar follow

The tutorial mainly demonstrates the following function of the balance car combined with the Tmini-Plus radar.

```
The tutorial only introduces the standard library project code
```

Hardware connection

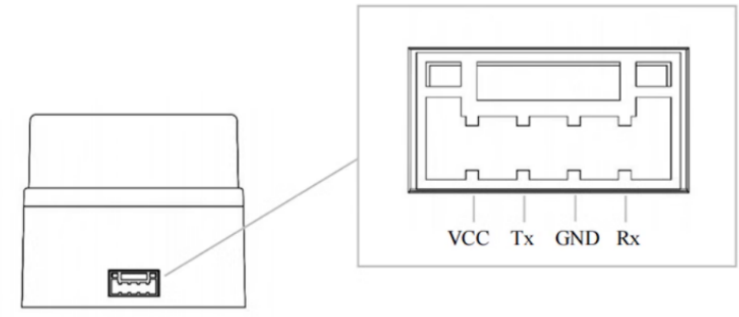
Since we have configured a special connection line, we only need to install it to the corresponding interface.

Peripherals	Development Board
Tmini-Plus radar: VCC	5V
Tmini-Plus radar: TXD	PC10
Tmini-Plus radar: RXD	PC11
Tmini-Plus radar: GND	GND

Control principle

The program analyzes the radar data and determines the direction of movement of the balance car based on the distance information at the specified angle.

- Tmini-Plus radar

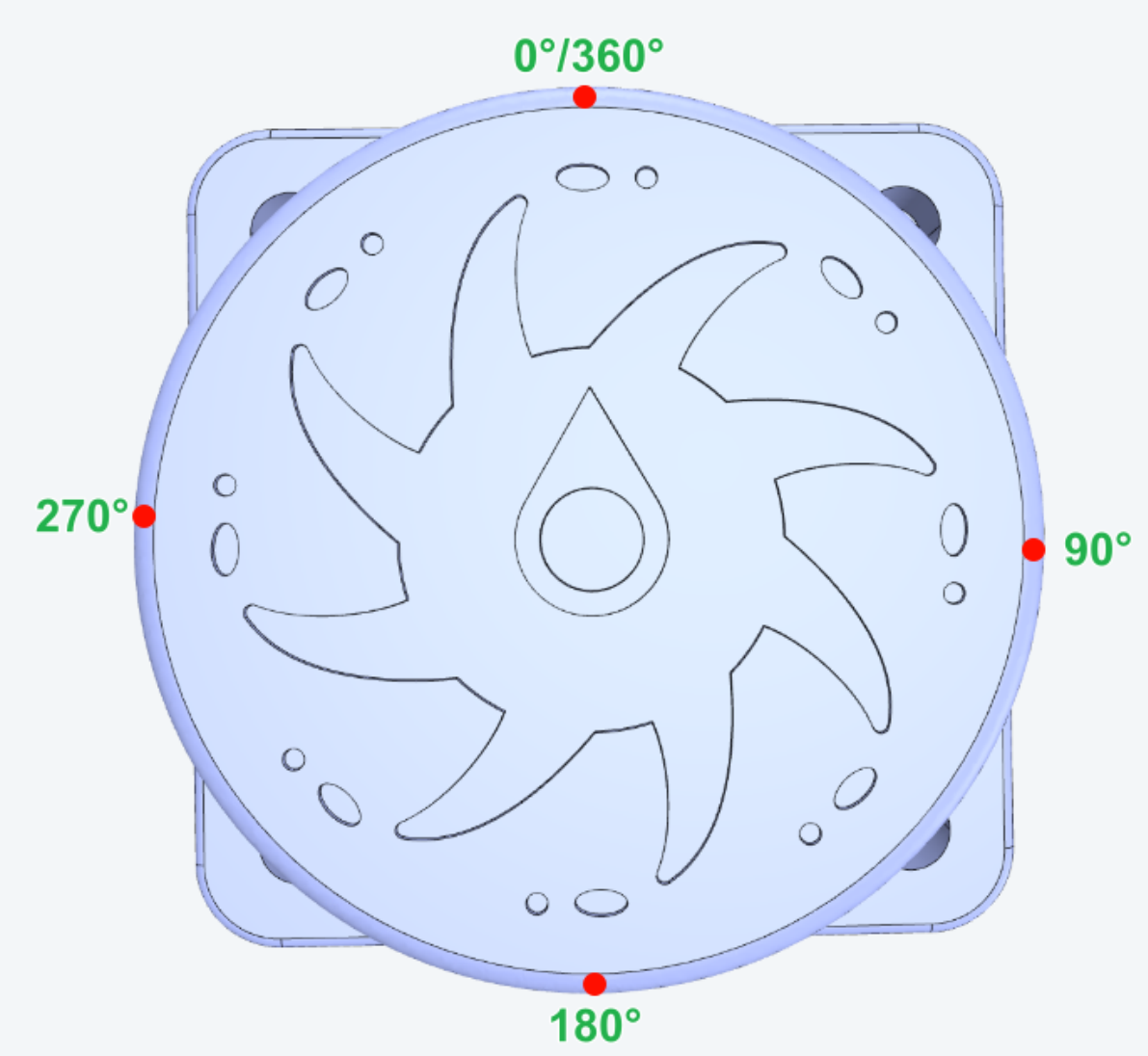


Product name	Tmini-Plus radar
Scanning frequency	6-12Hz
Sampling frequency	4000 times/s

Product name	Tmini-Plus radar
Measuring radius	Black object: 12m
Minimum measuring distance	0.05m
Ranging principle	TOF ranging
Scanning angle	360°
Communication interface	Standard asynchronous serial port (UART) 1. Baud rate: 230400 2. Data bits: 8 3. Check bit: None 4. Stop bit: 1
ROS support	ROS1/ROS2
Windows support	Host computer

Radar angle distribution

The arrow in the center of the radar points to 0°/360°, and the angle increases clockwise.



Communication protocol

```
For detailed information, please refer to the "T_Mini_Plus Manual"
```

Main code

The tutorial mainly explains the code for implementing the radar following function. For detailed code, please refer to the corresponding project file.

> **Car_Follow**

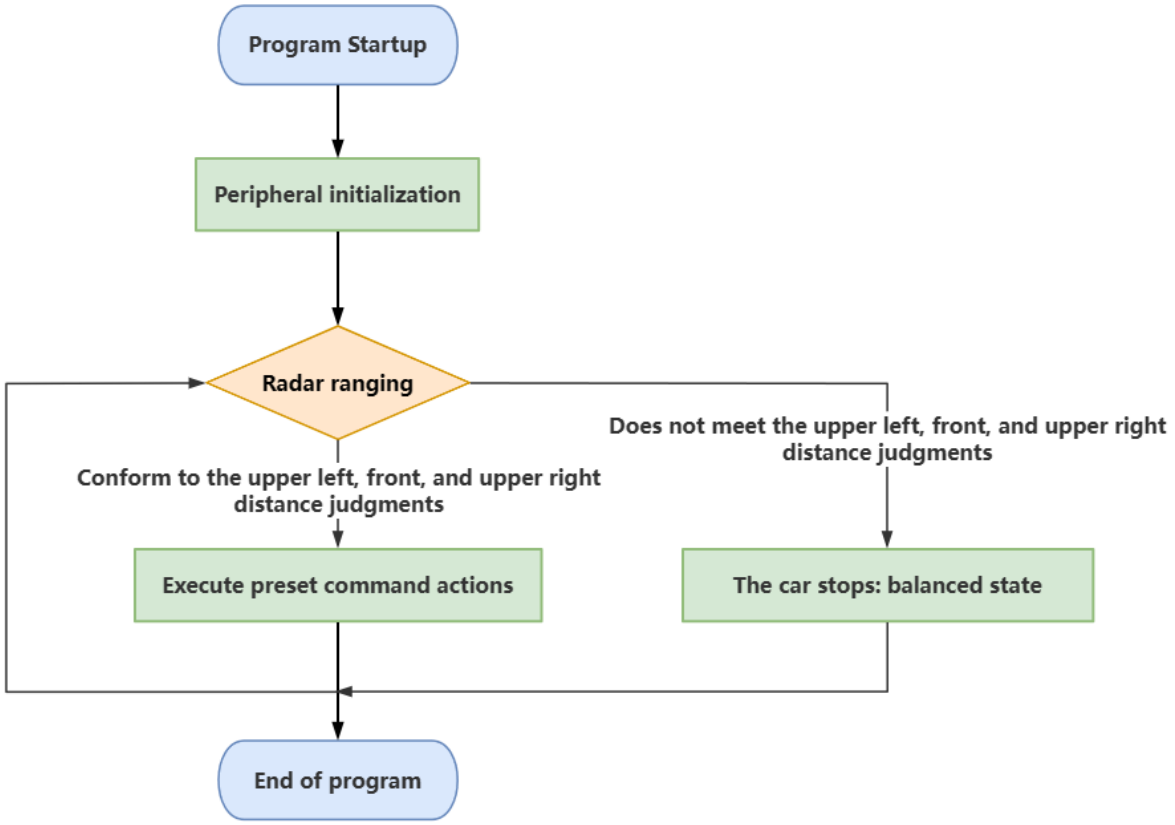
The position of the following object is determined and the movement of the balance car is controlled through the distance data of the radar at 0°, 45°, and 315°.

```
void Car_Follow(void)
{
    float get_data_mid = Tminidis[0];

    float get_data_LL = Tminidis[315];

    float get_data_RR = Tminidis[45];

    printf("data = %.2f\t %.2f\t %.2f\r\n",get_data_mid,get_data_LL,get_data_RR);

    // positive direction
    if(get_data_mid < 130 && get_data_mid>0)
    {
        // The car moves backward
        Move_X = -15;
        Move_Z = 0;
    }
    else if (get_data_mid > 220 && get_data_mid < 350)
    {
        // The car moves forward
        Move_X = 15;
        Move_Z = 0;
    }

    // Left direction
    else if (get_data_LL < 340 && get_data_mid>200)
    {
        // Left rotation of the car
        Move_X = 0;
        Move_Z = -450;
    }

    // Right direction
    else if (get_data_RR < 340 && get_data_mid>200)
    {
        // The car turns right
        Move_X = 0;
        Move_Z = 450;
    }

    else//Not following
    {
        Move_X = 0;
```

```
        Move_Z = 0;
    }
}
```

Program flow chart

Briefly introduce the process of function implementation:



Experimental phenomenon

> **Software code**

The Balance_Radar_Follow.hex file generated by the project compilation is located in the OBJ folder of the Balance_Radar_Follow project. Find the Balance_Radar_Follow.hex file corresponding to the project and use the FlyMcu software to download the program into the development board.

```
Product supporting data source code path: Attachment → Source code summary → 5.Balanced_Car_Extended → 14.Balance_Radar_Follow
```

> **Experimental phenomenon**

After the program is started, press KEY1 according to the OLED prompt to start the radar following function of the balance car: OLED displays start control!

The radar detects the following object in front (0mm<following object distance<130mm): the car moves backward

The radar detects the following object in front (200mm<following object distance<340mm): move forward

The radar detects the following object on the left (the distance to the left of the following object <340mm, the distance in front>200mm): the car turns left

The radar detects the following object on the right (the distance to the right of the following object <340mm, the distance in front>200mm): the car turns right

```
The program has voltage detection. If the voltage is less than 9.6V, a low
voltage alarm is triggered and the buzzer will sound.
Common situations that trigger voltage alarms:
1. The power switch of the development board is not turned on, and only the Type-
C data cable is connected for power supply
2. The battery pack voltage is lower than 9.6V and needs to be charged in time
```