Radar patrol

Radar patrol

- Hardware connection
- Control principle
- Main Code
- Program flow chart
- Experimental phenomenon

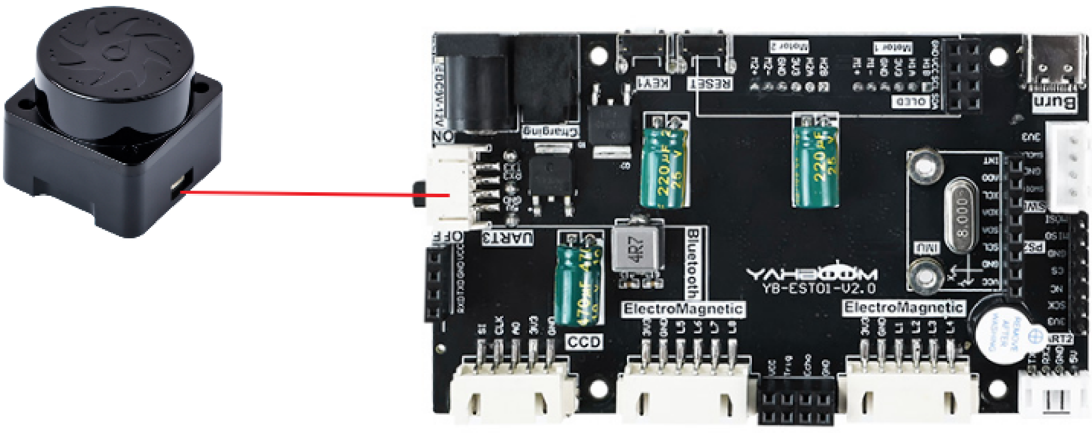
The tutorial mainly demonstrates the patrol function of the balance car combined with the Tmini-Plus radar.

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

Hardware connection

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

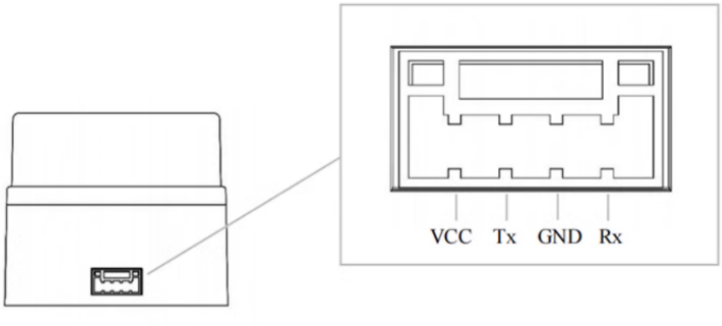
Peripherals	Development board
Tmini-Plus radar: VCC	5V
Tmini-Plus radar: TXD	PC10
Tmini-Plus radar: RXD	PC11
Tmini-Plus radar: GND	GND



Control principle

The program analyzes the radar data and determines whether there is an obstacle directly in front of the patrol route based on the 0° distance.

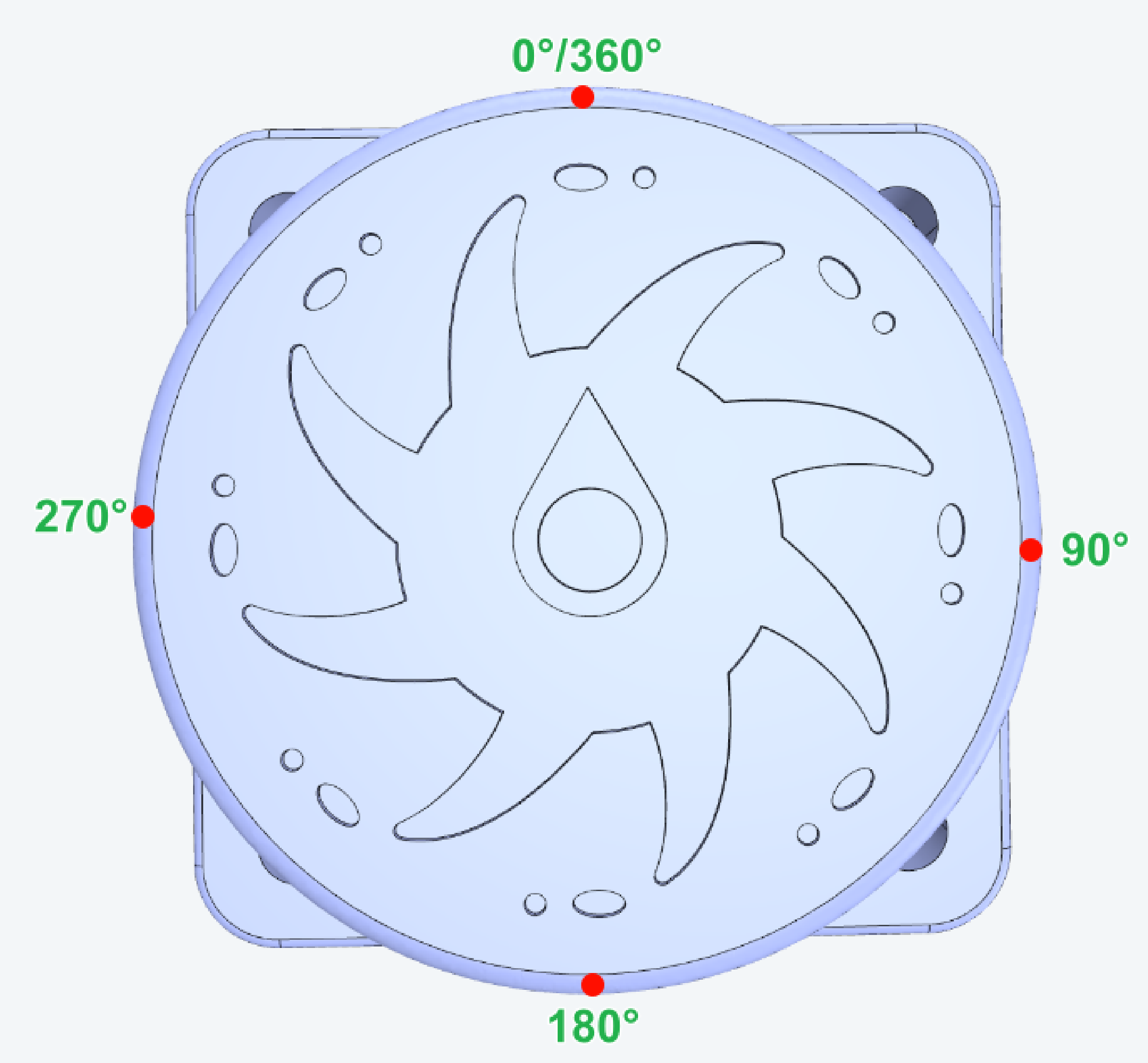
- Tmini-Plus radar



Product name	**Tmini-Plus radar**
Scanning frequency	6-12Hz
Sampling frequency	4000 times/s
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 the radar patrol function. For detailed code, please refer to the corresponding project file.

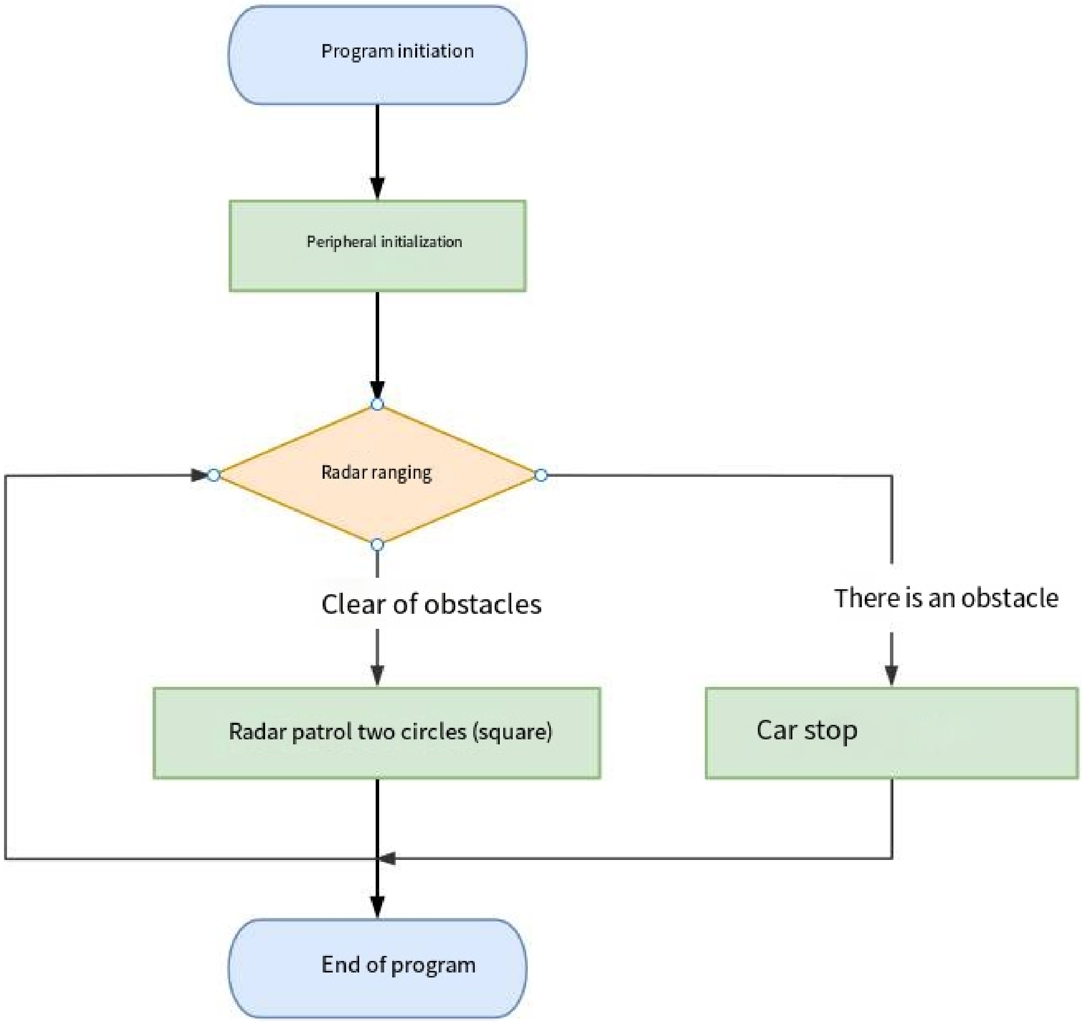
> **Car_Patrol**

The radar 0° distance data is used to determine whether there is an obstacle in front of the balance car, and the patrol function is realized through the set action.

```
void Car_Patrol(void)
{
    //Simply run a square first
    static u8 patrol_step = 0;
    static u8 runtimes = 1;

    float Patroldis = Tminidis[0];//Only handles 0° angles

    if(patrol_step >= 7)
    {
        //Patrol function has stopped
        return;
    }

    //When there are obstacles on the patrol path
    if(Patroldis < 200 && Patroldis>0)
    {
        //The following operations are performed only once
        if(stop_patrol == 1)
        {
            BEEP_ON;
            Move_X_old = Move_X; //Backup
            Move_Z_old = Move_Z; //Backup
            Move_X = 0,Move_Z = 0;//parking
            stop_patrol = 0;//Pause timer
        }
        return;
    }

    if(stop_patrol == 0)
    {
        Move_X = Move_X_old; //recover
        Move_Z = Move_Z_old; //recover
        BEEP_OFF;
        stop_patrol = 1;//Timing
        return;
    }

    switch(patrol_step)
    {
        case 0:myTurn_Kd = string_pd,Move_X = 15;Move_Z = 0; delay_time_int(Go_time);patrol_step++;break; //go ahead
        case 1:if(get_time_int() == 0)patrol_step++;break; //Waiting time to arrive
        case 2:myTurn_Kd = 35,Move_X = 0;Move_Z = 1350; delay_time_int(Trun_time);patrol_step++;break; //Turning
        case 3:if(get_time_int() == 0)patrol_step++;break; //Waiting time to arrive
        //Preventing jitter
        case 4:Move_X = 0;Move_Z = 0;delay_time_int(30);patrol_step++;break;//stop
        case 5:if(get_time_int() == 0)patrol_step++;break; //Waiting time to arrive

        case 6:
            if(runtimes < (patrol_times*4) )
            {
                runtimes++;
                patrol_step = 0;
            }else patrol_step =7;//Reset button clear
            break;
        case 7:Move_X = 0;Move_Z = 0;//stop
    }
}
```

Program flow chart

Briefly introduce the process of function implementation:



Experimental phenomenon

> **Software code**

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

```
Product supporting materials source code path: Attachment → Source code summary →
5.Balanced_Car_Extended → 15.Balance_Radar_Patrol
```

> **Experimental phenomenon**

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

The balance car will patrol twice (the patrol track is a square). If an obstacle is encountered during the patrol, the patrol will stop and an alarm will be sounded (buzzer sounds); if the obstacle is removed, the alarm will be eliminated and the previously unfinished patrol will be resumed.

```
The program has voltage detection. If the voltage is less than 9.6V, a low voltage alarm will be triggered and a buzzer will sound.

Common situations for triggering 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
```