

Car line patrol

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This tutorial is a comprehensive experiment combining multiple peripherals. You can first understand a single peripheral before performing this experiment.

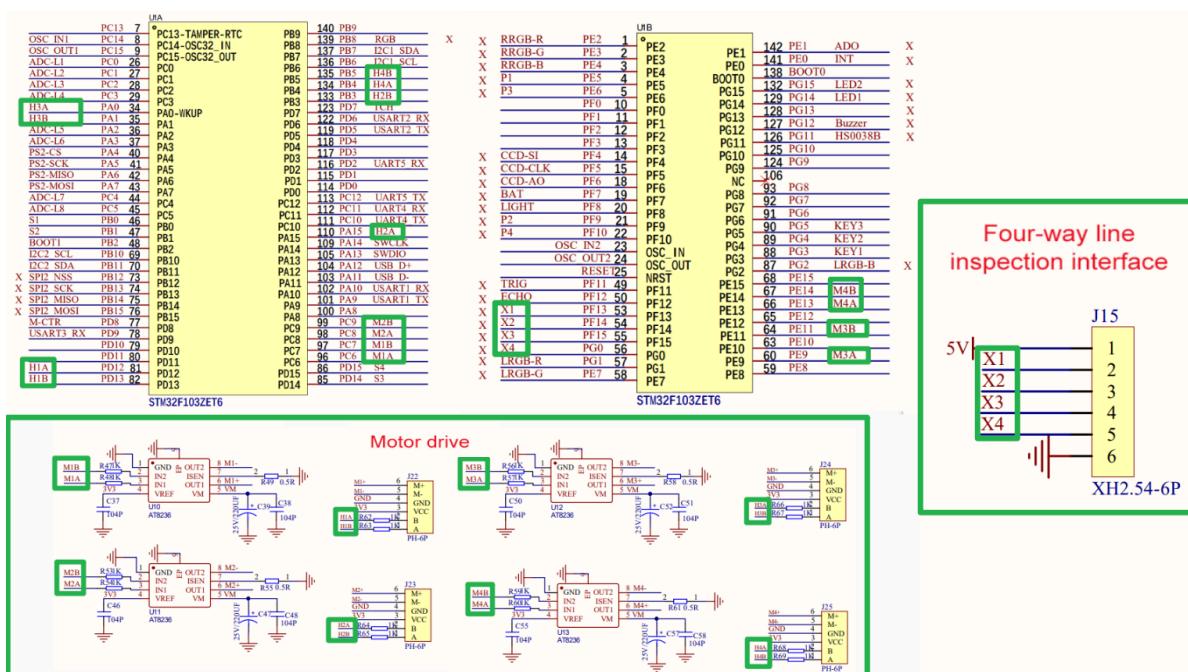
1. Software-Hardware

- STM32F103CubeIDE
 - STM32 Robot Development Board
- Four-way tracking module, 310 motor*4: external
- Type-C data cable or ST-Link

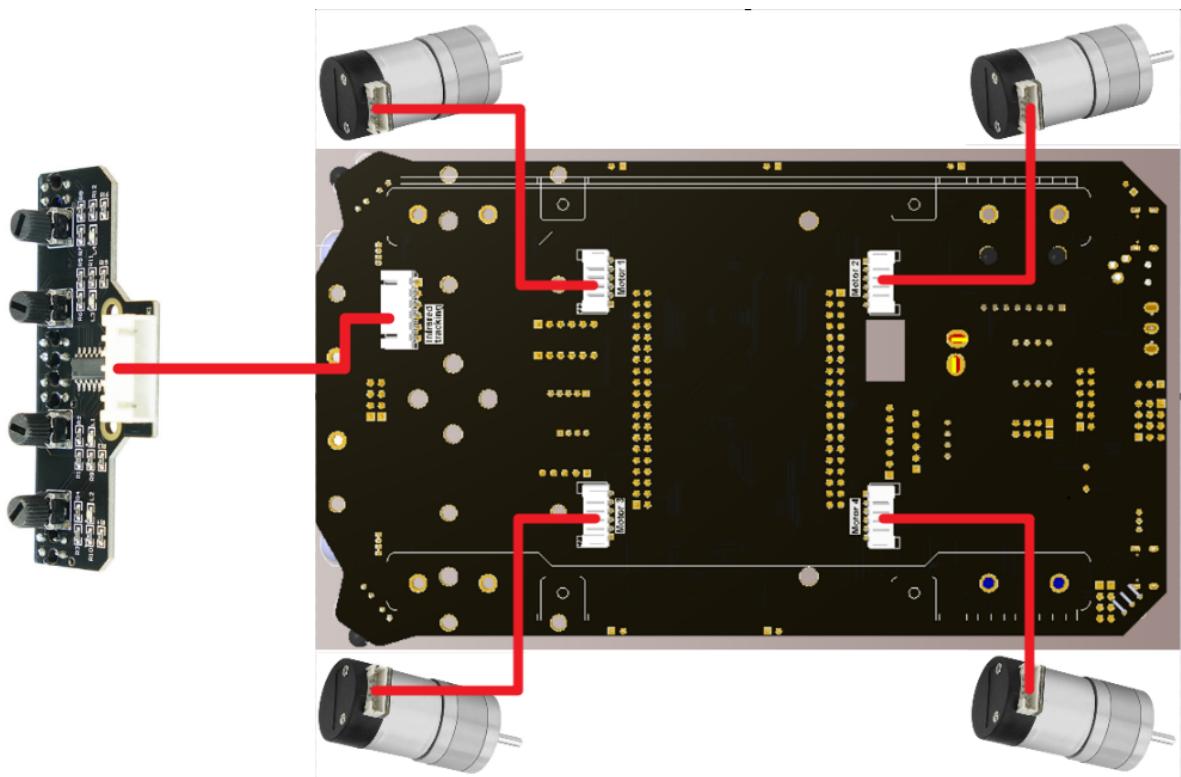
Download programs or simulate the development board

2. Brief principle

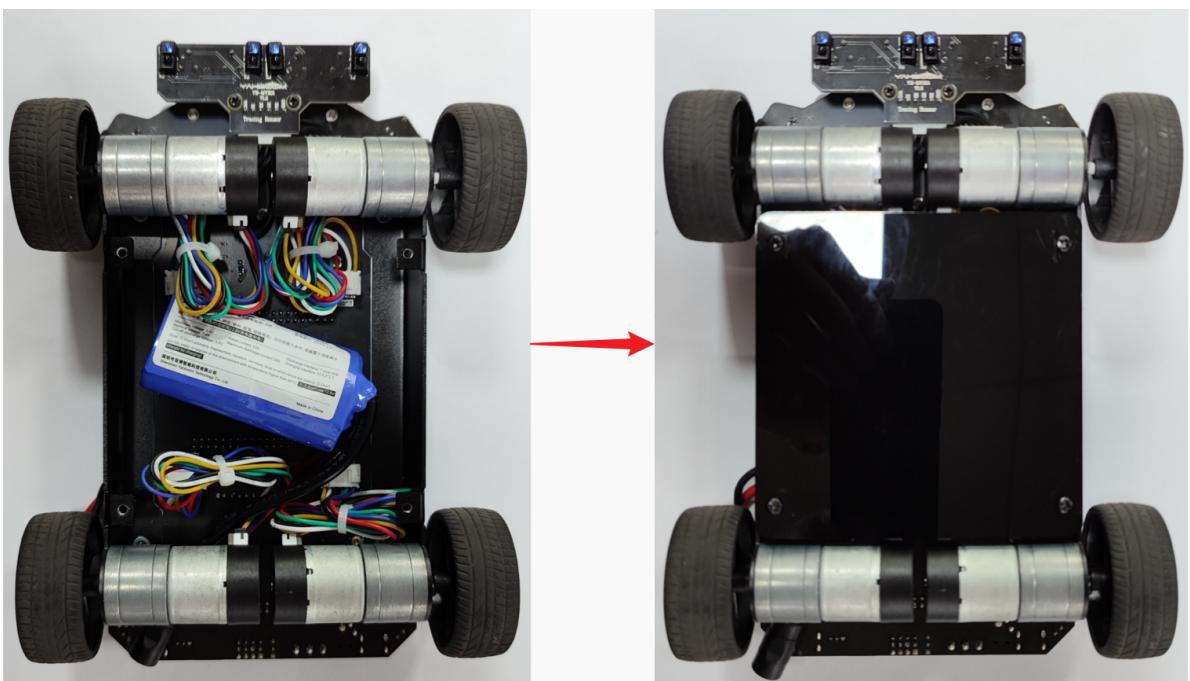
1. Hardware schematic diagram

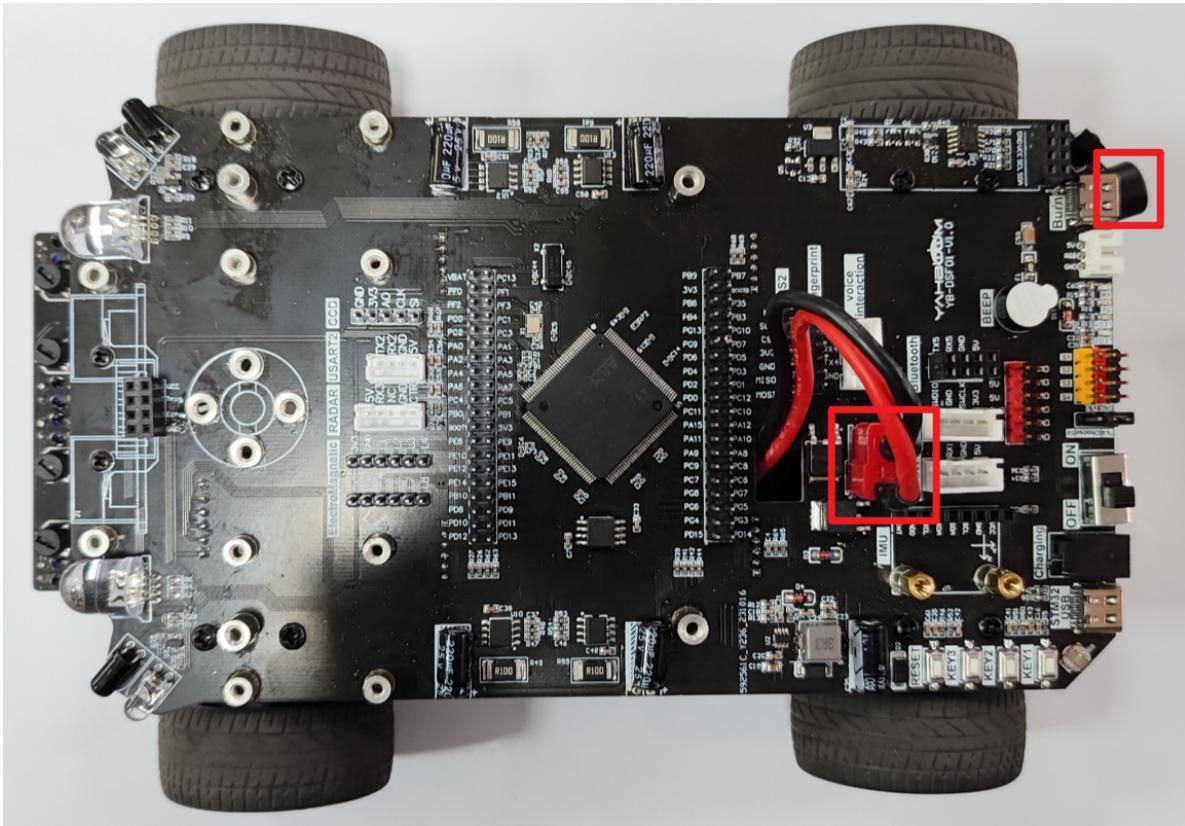


2. Physical connection diagram



- **Battery Pack Installation**





3. Control principle

The real-time position of the car is obtained through the four-way line patrol module, and the motion status of the car is adjusted according to the position.

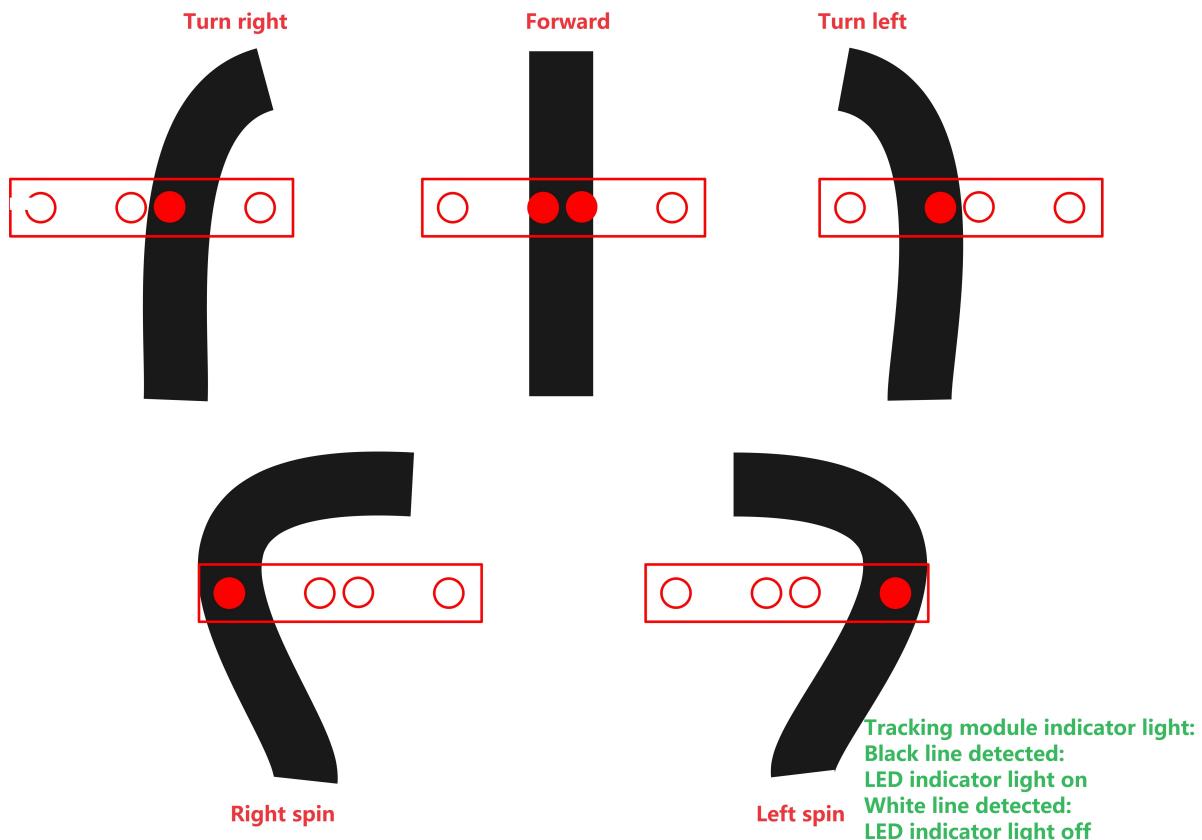
The four-way line patrol module can obtain the position of the car's front on the route. We can read the levels of the four interfaces to determine the position of the car:

If the car deviates to the left relative to the route, we call the function that controls the car to turn right (right rotation) in the function;

If the car veers to the right relative to the route, we call the function that controls the car to turn left (left-hand rotation) in the function;

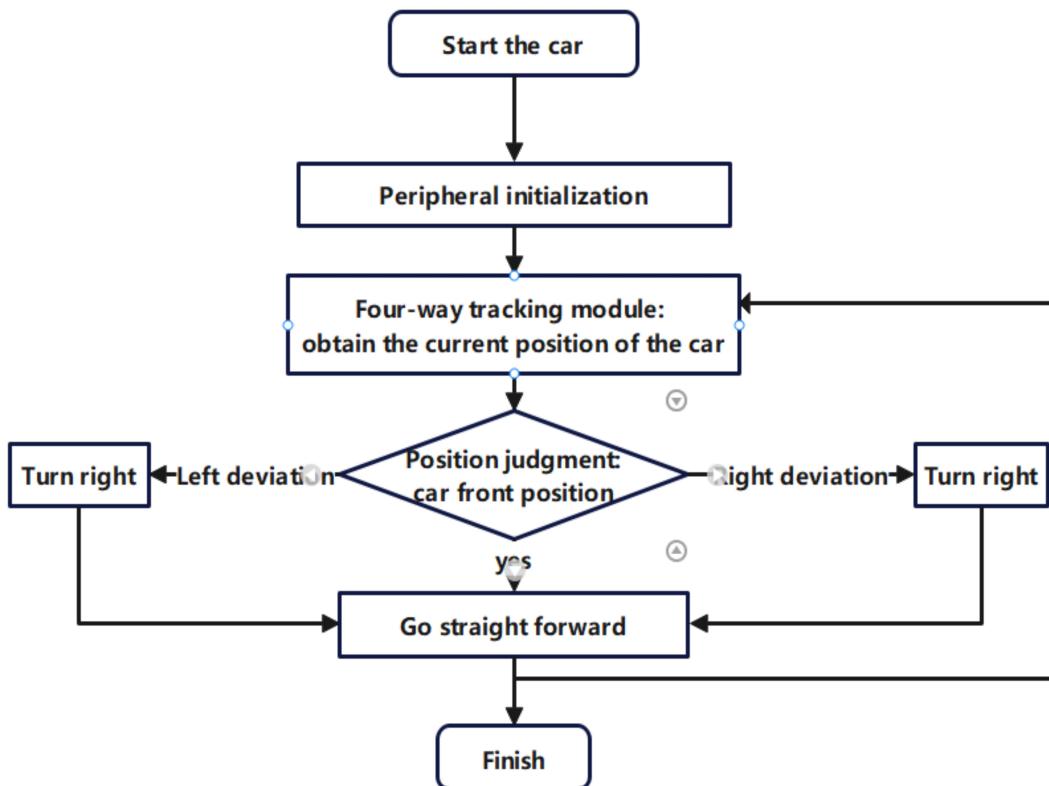
If the car is in the middle of the line following module, we control the car to move forward.

The following figure shows the common detection situation of the four-channel tracking module:



The following only lists some situations. Users can write their own logic code according to the actual situation.

- Program flow chart



According to the information fed back by the four-way tracking module, we can combine four motors to realize the line-following car:

External modules	Functions
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External modules	Functions
Four-way line patrol module	External information collection: detect the position of the line patrol module on the route
Motor	Motion Control

- Four-channel line patrol module detects black and white lines and feeds back information

Four-way line patrol module	Indicator light	Output level
Black line detected	Light on	Low level
White line detected	Light off	High level

3. Main functions

This tutorial does not use PID to control the movement of the car

Function: car_irtrack

Function prototype	void car_irtrack(void)
Function description	Control the steering of the car based on the line patrol module information
Input parameters	None
Return value	None

Function: Motion_Set_Speed

Function prototype	void Motion_Set_Speed (int16_t speed_m1, int16_t speed_m2, int16_t speed_m3, int16_t speed_m4)
Function description	Control the steering and speed of the four motors of the car
Input parameter 1	speed_m1 : Motor1 steering and speed
Input parameter 2	speed_m2 : Motor2 steering and speed
Input parameter 3	speed_m3 : Motor3 steering and speed
Input parameter 4	speed_m4 : Motor4 steering and speed
Return value	None

Function: PID_Set_Motor_Target

Function prototype	void PID_Set_Motor_Target(uint8_t motor_id, float target)
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Function prototype	void PID_Set_Motor_Target(uint8_t motor_id, float target)
Function description	Use PID to control the car speed
Input parameter 1	motor_id: motor number
Input parameter 2	target: target speed
Return value	None

For the underlying driver, you can refer to the tutorials in Chapter 3 and Chapter 4.

For the application layer, you can read the source code in the project file yourself

4. Experimental Phenomenon

After successfully downloading the program, press the RESET button on the development board to observe the effect of the car!

For program download, please refer to [2. Development environment construction and use: program download and simulation]

Phenomenon:

The car follows the route on the map (the code we provide can only follow simple routes).

Because the code only analyzes common line following situations, the demonstration is straight line and turning situations; Users can add line patrol judgment situations by themselves to make line patrol more accurate!