Bluetooth and Wifi Control Car

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Abstract. The system uses STM32 as the main control SCM, esp8266 as WiFi module, WiFi receives and processes the control signal from mobile phone, transmits the signal through the serial port communication of SCM, so as to realize the mobile phone control motor drive, and LCD module displays the current status of the car. L293N is used as the motor driving module, and Bluetooth is used to send instructions to control the movement track of the car. The system used the modular design, through making and debugging the system, it runs well. The system can be better applied in the wireless communication control, and has a good reference for the unmanned driving and wireless short distance control.

1 Introduction

The rapid development of modern science and technology and electronic equipment has changed the world. The research of wireless communication technology has given birth to Bluetooth technology, which is a short-distance communication technology. Because of its convenience, low cost and low power consumption, it has been used in a variety of electronic devices, and common mobile phones, computers and audio devices are equipped with Bluetooth communication technology. Bluetooth wireless technology greatly facilitates our life. The traditional car is controlled by infrared. Because the infrared control distance is close and can only spread in a straight line, it is insufficient in some occasions. If Bluetooth and WiFi functions are added to the car, the control form of the car can be greatly enriched, not limited to a single infrared communication mode, as long as the mobile phone supports Bluetooth and WiFi functions, it can also overcome the shortcomings of traditional infrared control. In addition, in the case of bad industrial site environment, some places need this kind of car to control instead of manual intervention. We can use Bluetooth and WiFi control, which can effectively avoid unnecessary casualties. In this design, STM32 is used as the control MCU, Bluetooth and WiFi are used to realize the connection between the mobile phone and the car, and the motor drive technology is used to control the rotation of the motor, so as to realize the motion control of the car. The system can be applied in wireless communication control, and it can be used for reference in unmanned driving and wireless short distance control.
2 The overall system design

The system mainly uses the communication principle of Bluetooth and WiFi, sends the instruction to the Bluetooth or WiFi circuit through the mobile phone, the circuit receives the instruction and processes, sends the processed signal to the singlechip STM32, the main control unit receives the instruction, then makes the corresponding feedback to the instruction according to the corresponding program, sends the signal to the motor drive circuit L298N, the different movement of the motor can control the car to move forward, back, left, right and so on.

Motion control of trolley terminal. Turn on the power switch of the car, and the LED power indicator will be on. After starting the system, first initialize the WiFi module, Bluetooth module, motor driver module, etc. If the data sent by the mobile phone is received, the system will execute the operation instructions of the mobile phone, and realize the functions of the car such as forward, backward, left, right and pause through different instructions, and display the current status of the car on the LCD screen.

Mobile terminal motion control. The mobile phone software developed and compiled by Windows system and ea4 is used as the control terminal. Turn on the power switch of the car, the WiFi module of esp8266 sends out a connection server request, and the mobile terminal connects to the IP request of this module, and then log in the prepared software interface to realize the connection between the car and the mobile client. When the mobile terminal presses the instruction once, esp8266 will accept the current instruction, release the instruction after receiving, and execute the corresponding instruction until the user selects the next instruction. The mobile terminal is connected to the car, and enters the interface of the controller system. The corresponding control signal can be sent to the single chip microcomputer by operating the mobile software to realize the car control. The Bluetooth motion control process is similar to this. The whole system is shown in Figure 1.

![Figure 1. The system over structure.](image)

3 System hardware circuit design

3.1 Circuit design of SCM

SCM is the core of the whole control. In order to meet the needs, stm32f103c8t6 is selected here. The single chip microcomputer runs fast and has two A/D conversion. It has powerful communication function and control function. It contains five serial ports for communication. It is very convenient for some users who need to use serial ports for communication. At the same time, it uses RTC crystal oscillator, which belongs to low power consumption; the number of pins is 48; the working frequency is 72MHZ; it has three ordinary timers and one high Level timer.
3.2 Motor drive circuit

In this system, L298N is used as the driving circuit of the motor, and H-bridge circuit is integrated in the system. Here, the mode of two-way DC motor is adopted. When using this drive, firstly, the ENA needs to be high level, and then the internal circuit enables it. Secondly, the PWM pulse is sent out to drive the motor, and the in1 and in2 level states are set to drive the motor forward, reverse, stop and other operations. The working principle of L298N motor drive is shown in Table 1, the schematic diagram is shown in Figure 3.

Table 1. Motor drive principle table.

| ENA | IN1 | IN2 | DC motor status |
|-----|-----|-----|-----------------|
| 0   | X   | X   | stop            |
| 1   | 0   | 0   | braking         |
| 1   | 0   | 1   | Positive rotation |
| 1   | 1   | 0   | reversal        |
| 1   | 1   | 1   | braking         |

Figure 2. The motor drive schematic diagram.

3.3 Bluetooth and WiFi circuit design

In this design, Bluetooth is installed on the car and sends instructions to the Bluetooth circuit module through the mobile phone. The car can make corresponding action after receiving the order. The Bluetooth module used is hc-05, which is a Bluetooth to serial converter. It can connect other microcontroller devices, allow them to communicate wirelessly, and adopt the international standard band 2.4GHz ism. It has a LED light, which is convenient for users to judge the connection status of Bluetooth. It supports at instruction and can modify the name of serial port and rate device.

Esp8266 is a wireless WiFi module, which has built-in protocol stack, supports UDP / TCP protocol, has low power consumption and high integrated density serial wireless module chip, and is a complete self-contained system module, commonly used in the wireless WiFi network communication solution designed for smart home and smart car. Esp8266 is started directly from the built-in flash memory, which reduces the memory
requirements and supports the station mode, AP mode and station + AP mode. Through these three modes, we can realize the function of data transmission in wireless network and self-organizing network communication. The esp8266 WiFi module used in this design is integrated into the car circuit through the serial port to AP connection. After the connection with the main controller STM32, the AT command sent by the mobile phone is transmitted to the SCM, and after the SCM operation, the command is sent to control the movement of the car.

4 System software design

4.1 System software general process

The system is powered on, and then initialized. Here, it mainly initializes the serial port and interrupt function. WiFi and Bluetooth module send connection instructions, set the baud rate, and realize the preparation before the connection of self-organized network communication, Set the initial baud rate value as 9600, then start TI and TR1 bits, store the command sent by the mobile terminal into the serial port register, the serial port receives the command and analyzes the operation of the command, and finally control the rotation of the motor. The car achieves the effect of forward, backward, left, right and parking. The software flow is shown in Figure 4.

![Software flow chart.](image)

4.2 Motor drive program design

When the WiFi module receives the operation instruction sent by the mobile phone, it is transmitted to the serial port of the SCM. After the program processing, the SCM outputs the PWM control signal, then judges the preset selection process of PWM, enters the corresponding motion mode of the car under the signal mode, until the next control signal is received, and then judges the status of the car. After the if else condition judgment statement, the signal selects the working mode of the driving motor, and then controls the motion state of the car. The core procedure of the car forward is as follows:

```c
if(flagmode==1)
{ if(pwmflag<pwmv)PWM1=1;
  else PWM1=0; PWM2=0;
  if(pwmflag<pwmv)PWM3=1;
  else PWM3=0; PWM4=0 
}
```
4.3 WiFi drive program design

The SCM WiFi car first detects whether the control software at the mobile terminal is connected. If it is connected, set the motor to stop state, and then detect whether there is a signal sent by the mobile phone. If the signal is detected, output the corresponding control signal to make the car motor rotate accordingly. The core program is designed as follows:

```c
if(RI)
    {1dat=SBUF; RI=0; K[f]=1dat; f++; 
    if(1dat=="T") {e=0;}}
```

After hardware debugging, the system ensures the normal operation of each module, and then connects all modules and components as a whole. In this process, check the circuit for faulty soldering, short circuit and open circuit for many times; then carry out Bluetooth and WiFi functions; after debugging for many times, the system operates normally, and the final system is shown in Figure 5.

![Final system effect.](image)

Figure 4. Final system effect.

References

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