

Design of Speech Recognition Intelligent Car System Based on Intelligent Network Technology

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Abstract

In this paper, a personal local area network in which automobile users can voice control the automobile is built inside the automobile. By combining voice recognition technology with wireless technology, an intelligent car system with voice recognition function is designed by using single chip microcomputer SPCE061A and personal wireless LAN intelligent network SOC chip CC2530. The system overcomes the defects that the traditional single chip microcomputer chip is in the car body, far away from the sound source and high noise. The single chip microcomputer and the coordinator in the intelligent network form the remote controller, and the nodes of the intelligent network form the transmitting equipment. The voice information is recognized in SPCE061A, translated into control commands, and sent to the terminal equipment through the intelligent network, Realize the control of trolley direction and speed.

Keywords

Intelligent; Single chip; Microcomputer intelligent network; CC2530.

1. Introduction

Speech recognition is an interdisciplinary subject, natural, intuitive and in line with people's cognitive law. It is gradually becoming the key technology of man-machine interface in information technology. It has been widely used in information processing, education and business applications, consumer electronics and other fields. Adding speech recognition technology to cars will make cars more intelligent and humanized. In this paper, a personal LAN for automobile users to control automobile voice is built. Through the combination of voice recognition technology and wireless technology, an intelligent car system with voice recognition function is designed. The system overcomes the defects that the traditional single chip microcomputer chip is in the car body, far away from the sound source and high noise, and has certain practicability.

2. Overall System Design

Due to the limitation of objective conditions, this paper takes a car model instead of a car as the research object. By combining speech recognition technology with wireless technology, that is, using speech recognition chip and personal wireless LAN to form the remote control part. The speech recognition chip adopts the SPCE061A single chip microcomputer with high cost performance, multi-function and low power consumption of Sunplus company, and the wireless chip adopts the high-performance intelligent network SOC chip CC2530 of TI company. The overall design structure of the system is shown in Figure 1.

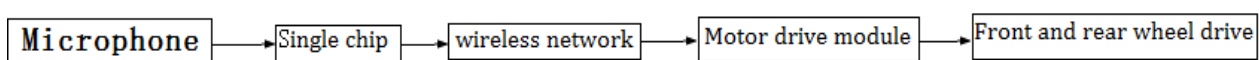


Figure 1. System overall design structure block diagram

3. System Hardware Design

3.1. Sunplus SPCE061A Single Chip Microcomputer

SPCE061A is a 16 bit microcontroller developed by Taiwan Lingyang technology company. Its kernel adopts the latest micro controller and signal processor (μ nsp for short) launched by Lingyang company™) 16 bit microprocessor chip. SPCE061A not only has the characteristics of small volume, high integration and good reliability, but also has strong interrupt processing ability, high cost performance, strong function, high efficiency instruction system, low power consumption and low voltage. Therefore, SPCE061A microcontroller is an economical choice for products in the application field of digital speech recognition.

3.2. CC2530

Intelligent network adopts IEEE802.15.4 standard and uses the global common frequency of 2.4 GHz. When applied to monitoring and control network, it has very significant advantages of low cost, low power consumption, many network nodes and long transmission distance. At present, it is regarded as one of the most promising technologies to replace wired monitoring and control network.

3.3. Hardware Principle Block Diagram

The hardware part mainly includes two parts: control part and terminal (vehicle body).

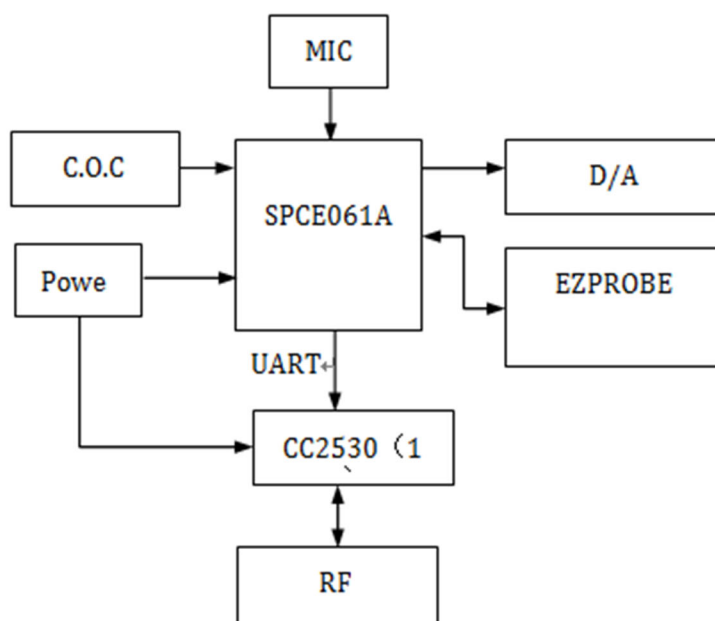


Figure 2. Principle block diagram of control part

The principle block diagram of the control part is shown in Figure 2. The programming interface of SPCE061A single chip microcomputer is ezprobe interface, MIC is audio input, and SPCE061A single chip microcomputer and CC2530 single chip microcomputer are connected by serial port. The SPCE061A MCU of the control part completes the voice processing part and sends the voice information to CC2530 module.

3.4. Trolley Model

The voice control trolley is a four-wheel structure, in which the front two wheels are controlled by the front wheel motor. Under the action of connecting rod and fulcrum, the front wheel swings left and right to adjust the forward direction of the trolley. In the natural state, the front

wheel maintains the middle position under the action of spring. The rear two wheels are driven by the rear wheel motor to provide power for the whole trolley. Therefore, it is also called the front wheel as the direction wheel and the rear two wheels as the driving wheel.

3.5. Hardware Connection

The hardware connection of the system includes the following parts:

- (1) Connect the trolley to the control board;
- (2) Fix the control panel to the vehicle body;
- (3) Fix the CC2530 as the terminal node to the control board;
- (4) Connect CC2530 of the network coordinator with SPCE061A development board to form a remote control part.

The remote control part composed of CC2530 and 61A development board.

4. System Software Design

4.1. Implementation Method of Speech Recognition

The speech recognition adopts the person specific recognition method, that is, the recognition accuracy of the voice commands of the trained person is high, and the recognition rate of the voice commands of other people is low or not recognized. The basic principle of the speech recognition system is shown in Figure 6. Firstly, the speech to be recognized is transformed into a speech signal through the microphone and added to the input of the recognition system for preprocessing; Then the speech model is established according to the characteristics of human speech, the input speech signal is analyzed, the required features are extracted, and the template required for speech recognition is established; Then, according to the model of speech recognition, the stored speech template is compared with the characteristics of the input speech signal to find the best template matching the input speech signal; Finally, according to the definition of the template, the speech recognition results are obtained by looking up the table.

4.2. Implementation Method of Wireless Technology

The wireless network technology used in this paper is a new short-range and low-speed wireless network technology called intelligent network in recent years. This technology has the characteristics of power saving, high reliability, short delay, large network capacity and security. Intelligent network is considered as a new wireless technology most likely to be used in industrial monitoring, sensor networks, home monitoring, security systems and other fields. Intelligent network technology is also a layered network technology standard. Each layer provides special services for the upper layer: data entities provide data transmission services; The management entity provides all other services. The protocol layer structure of intelligent network is relatively simple. Unlike Bluetooth and other network structures, these protocols are usually divided into seven layers: physical layer, data link layer, network layer, transport layer, presentation layer, session layer and application layer, that is, the layer structure of open system interconnection reference model (OSI). The intelligent network only has four parts: physical layer, media access layer (subordinate to data link layer), network layer and application layer. The application layer of intelligent network is jointly formulated by intelligent network alliance and equipment terminal manufacturers. It is divided into application support sublayer, intelligent network device configuration layer and user application.

This paper adopts zstack-1.4.3 protocol stack provided by TI company. According to the application requirements, add your own applications to the protocol stack.

4.3. Overall Implementation Method of the System

SPCE061A communicates with the coordinator in the intelligent network through the serial port to realize the function of the remote controller. The nodes of the intelligent network constitute the information transmitting equipment, and the driving circuit and motor on the vehicle body constitute the terminal equipment. The voice message to be recognized is first recognized in SPCE061A and translated into control commands, and then sent to the terminal equipment through the intelligent network. The terminal equipment responds to relevant commands according to the message and controls the front and rear wheels of the trolley through the motor.

5. Conclusion

This paper combines speech recognition technology with wireless technology, and uses speech recognition chip combined with personal wireless LAN to form the remote control part. At present, it has realized voice control of the direction and speed of the car, which can make the car "move forward, backward, turn left, turn right, accelerate and decelerate", which overcomes the problem that the chip is in the car body and is far away from the sound source. The defects of high noise and difficult speech recognition.

The structure of the car model used in this paper needs to be further improved, the speech recognition program still needs to be optimized, and its functions can still be expanded, such as automatic obstacle avoidance, LCD display of speech information and so on. The application of wireless technology to vehicles is also a necessary trend of the development of "Internet of vehicles".

References

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