Research on the Smart Tips of Ultrasound Range Touching Based on Single Chip Microcontroller

Wenling Liu[1,a], Wenqian Qiang[2,b], Ruoxi Ma[3,c] and Xiangcai Zhu[4,d]

[1]School of Information Science and Technology, Taishan University (TSU),Taian, Shandong, China

[a]1002653637@126.com, [b]1055678813@qq.com, [c]1194523051@qq.com, [d]zhuxiangcai @126.com

Abstract. Due to the surge in the number of cars and their drivers, parking spaces are scarce and compact parking spaces impose higher requirements on drivers 'parking technology. In order to assist driver parking, a high-precision car ultrasonic radar auxiliary parking system with voice broadcasting function is developed. The system can monitor the distance between the car body and the obstacles in real time, effectively expand the driver's field of view, help the driver correctly judge the position of the car body, adopt the correct parking operation, and avoid the occurrence of the incident. At the same time, the same principle can be used for modern technology robots, machine transport vehicles, unmanned vehicles, and other places that require distance measurement and feedback.

At the same time, the author analyzes the practicability, demand crowd, application market and user interaction of the sound wave ranging information device from various aspects such as demand, foreground, device selection, effect realization, efficiency, form, information transmission. It is expected that there will be more intelligent technologies in the future that will require such an auxiliary device. This will be the direction that many smart technologies will always explore and study.

Research background

Every day today there are a lot of new hands that have just got their driver's license. Warning char-type display, voice prompt can be effective in stopping or driving obstacles, when the distance reaches a certain range to give a reminder.

Install on the robot to make a judgment based on ultrasonic distance measurement and choose the direction of movement.Install on a machine transporter(logistics) to make the most reasonable road choice based on ultrasonic distance measurement.

Navigation for the blind(voice prompt).Navigation for deaf and blind people(vibration tips).

Characteristics and Innovation

Electronic navigation and communication systems. The information of the driver during driving the car is displayed in three forms. First, the information is displayed in text using an LCD character display. Secondly, the text is then converted into language file information transmitted through the language system, using electronic language to broadcast information. In addition, the direction is indicated by the vibration touch.

For blind navigation, it is possible to use the form of voice broadcast so that it can obtain accurate road information within a certain limit to make judgments. At the same time, our system will also make corresponding hints and directions to users according to the road conditions. function.

For special disabled people such as deaf and deaf, we can use this to trigger tactile feedback. There are many types of tactile feedback, such as long vibrations, short vibrations, intermittent vibrations, and different combinations of these forms, which can be set by the user himself. Different meanings.

For the choice of road conditions during the walking of robots, robot vehicles, and unmanned vehicles, corresponding changes and adjustments will be made according to the distance measurement with obstacles.

Ultrasonic Distance Measurement Principle

Ultrasonic ranging principle as shown in Figure 1, by measuring the return of ultrasonic propagation
Wave time T, calculate the distance between the ultrasonic probe and the obstacle, calculate the formula
As shown in Formula (1).

$$S=1/2*V \tag{1}$$

In the formula: S is the measured distance; T is the echo time of ultrasound; V : For the speed at which the ultrasound travels.
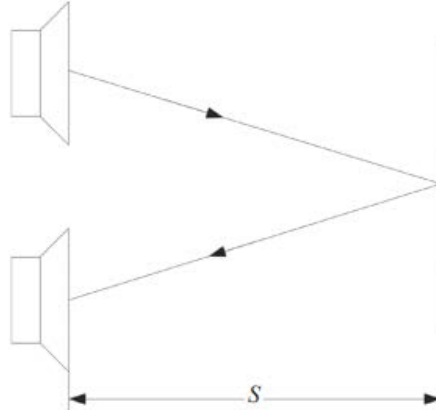

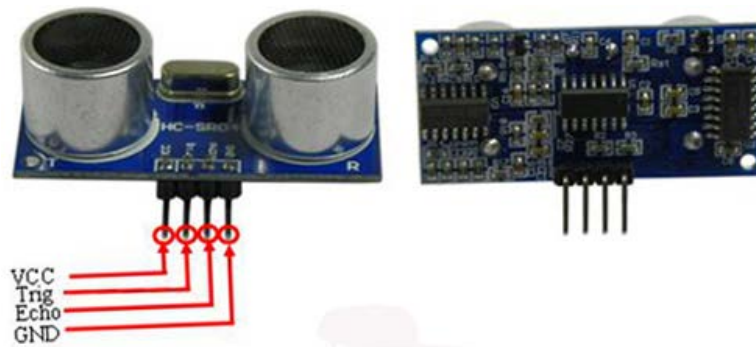Figure 1.Ultrasonic distance measurement principle

Figure 2.   Ultrasonic module diagram

Ultrasonic ranging module is a kind of product used to measure distance. By sending and receiving ultrasonic wave, using time difference and sound propagation speed, the distance between the module and the left and right obstacles is calculated.

LCD as an Output Device has the Following Advantages

1.   High quality display
Since each point of the LCD display maintains that color and brightness after receiving the signal, it constantly emits light, unlike the cathode ray tube display(CRT) that needs to constantly refresh new highlights. Therefore, the liquid crystal display is of high quality and does not flicker.
Digital interface
LCD displays are digital, and the interface with the single chip system is more simple and reliable, more convenient to operate.
2.   Small size and light weight

The liquid crystal display achieves the purpose of display by controlling the liquid crystal molecular state through the electrode on the display screen, which is much lighter in weight than the traditional display with the same display area.

3. Low power consumption

In contrast, the power consumption of liquid crystal displays is mainly consumed on its internal electrodes and driving ICs, so it consumes much less power than other displays.
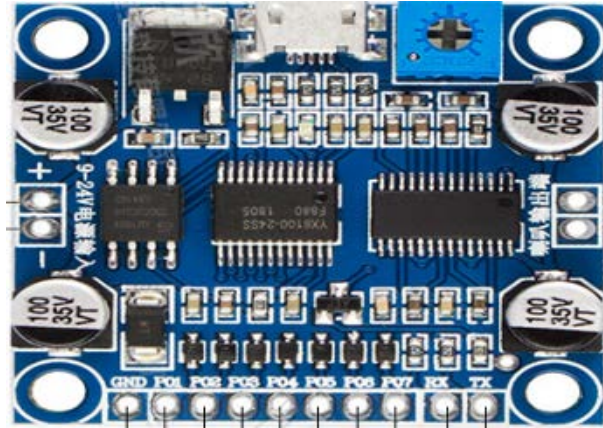

Figure 3.   The voice broadcast module

Programming Part

The control procedures of the car ultrasonic radar auxiliary parking system include the main program,

Ultrasonic transmitting sub-program, ultrasonic receiving interrupt program, temperature compensation sub-program,

LCD display subroutine, speech module driver subroutine and buzzer alarm subroutine

Preface. The initialization of each subprogram is carried out on the single chip. Through the temperature measurement process.The front temperature and find the speed of sound corresponding to the temperature; Initialize timer T0, activate hyperdrive.

Sonic range subroutine, turn on the timer until echo stop is received Time; The minimum distance is calculated using the minimum echo time parameter, and the LCD display is used.

Live distance via voice broadcast. When the measured distance L ≤ set the alarm distance

When the buzzer alarm, remind the driver to brake.

Advantages

Easy to use, stable and reliable. Power power output 15W, with volume adjustment function, directly push the horn. Trigger 7 audio playback directly to GND. Without any software, USB directly changes the sound.

Figure 4.   The vibration motor module of the mobile phone.

The use of high-quality mobile phone vibration motor, vibration effect is obvious. Mos zooming drive can be controlled directly through the digital port. Control the vibration intensity of the motor through PWM. Conveniently complete the conversion of electrical signals to mechanical vibration.

Features and Guidance

a)Sound processing technology.

using the ultrasonic module to touch the interrupt technology of the single-chip microcomputer according to whether the length of the body has entered the initial set range of obstacles, the results are displayed on the LCD LCD display(voice prompt, current stimulation).

b)Data analysis techniques

The length of the acoustic distance measured is the trigger command. The display and sound processor to be miniature, can be easily applied to carry.

Analysis of expected goals and prospects

In the survey, it was found that for driving test candidates, the lack of accurate distance is the most fatal factor that can not make corresponding judgments. Second, novices after obtaining a license are also timid and afraid to go. With such a portable reminder device can effectively help novice drivers adapt and learn as soon as possible.

It can be used in any place where robots, robot cars, etc. need to react to the size of the distance.

Used in disabled people, such as blind navigation voice cues, deaf blind navigation tactile cues, etc.
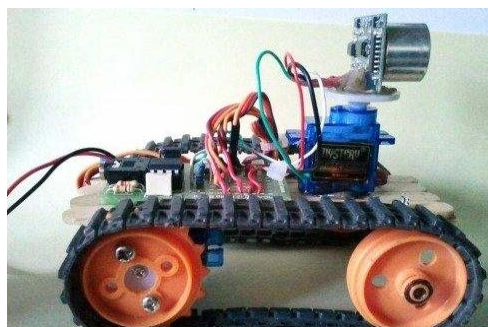
Practical application

Figure 5.   The smart car model

Figure 6.   The blind voice indicator

Conclusion

In recent years, as more people choose to study driver's licenses, more and more novice drivers or female drivers need a convenient intelligent reminder tool to interpret and instruct modern technology robots and machine transport vehicles. Places such as unmanned vehicles that require distance measurement and feedback can be used.

At the same time, the author analyzes the practicability, demand crowd, application market and user interaction of the sound wave ranging information device from various aspects such as demand, foreground, device selection, effect realization, efficiency, form, information transmission. It is expected that there will be more intelligent technologies in the future that will require such an auxiliary device. This will be the direction that many smart technologies will always explore and study.

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