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CONTENTS

Application and Research Design of Numerical Control Voltage Source in Practical Production

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***Abstract*-With the rapid development of science and technology, power technology has increasingly become a practical and comprehensive engineering technology, widely used in all walks of life, and the numerical control power supply technology is particularly important. .Microsecond, pulse type numerical control voltage source is controlled by the size of the digital output voltage. The output pulse voltage amplitude, pulse width, frequency can be adjusted. This paper studies the development of numerical control voltage source, introduces the design and implementation of the micro - level, pulse type numerical control voltage source,.The digital control technology of single chip microcomputer is integrated into the design of voltage source, reasonably and effectively .It makes the control of the power supply is more simple and implementation of the power supply of CNC.**

***Key words*-Numerical control; ATmega16 single chip microcomputer; D/A conversion; A/D conversion**

INTRODUCTION

ALONG with the development of science and technology, the modern information technology has provided a more broad development platform for the development of power electronics technology, at the same time, the power supply technology has been put forward more stringent standards and requirements. Power supply is a very important part of the electronic equipment, the traditional power in the work of the error, will have a considerable impact on the accuracy of the whole system, this is a more stringent requirements on the numerical control voltage source. Numerical control voltage source is one of the equipments which is often used in the electronic technology nowadays, and it is widely used in various industries.

The traditional voltage source is usually the band switch and potentiometer to adjust the voltage source, the voltage value of the voltage meter to indicate the size of the voltage value, so that the reading accuracy is not high, and easy to wear. Compared with the traditional voltage source, the numerical control voltage source based on single chip microcomputer control has the characteristics of easy control, high reliability and high accuracy. It is a good solution to the problem of the traditional voltage source.

From the first generation of the 80's in the last century, the first generation of distributed power supply system has been to the beginning of twenty-first Century, more advanced fourth generation distributed power supply structure, the power industry is facing a new challenge, that is, the existing system in the embedded power supply digital control and intelligent systems. The numerical control voltage source is from the last century 80 's only then truly starts to develop. During this period, the entire system of power electronics theory began to gradually establish and continuously improve, in a long time, the numerical control voltage source technology has a long-term development; in the 90's, semiconductor manufacturers to develop a numerical control voltage source management technology, but at that time, this technology has been used in a wide range of simulation control scheme, which is in a inferior position, so this technology can not be widely used.

The research on the numerical control voltage source in China started late, and in the late ninety's of the last century, under the National Natural Science Foundation of China, Zhejiang University, North China Electric Power University and other colleges and universities have launched this aspect of the basic theoretical research.

Numerical control power supply technology has been developed from 1980s to now, but its products still exist in this way or that, such as its high resolution, low reliability, etc.. It can be seen that the development direction of the numerical

control power supply is mainly to improve the above shortcomings, at the same time, on this basis, we must continue to innovate and reform.

1 Overall Scheme Selection

1.1 The overall design scheme of the voltage source of the pulse type numerical control

AC voltage input 100V -- 240V by a switching power supply output 5V DC voltage to the AVR MCU power supply, the output signal to the microcontroller to drive the D/A conversion part, while using the AVR microcontroller internal oscillator provides a clock signal for it, then the output signal for analog signals; then to the amplifying circuit of power supply, make simulation the output voltage signal is amplified by the amplifying circuit as required; and then the amplified voltage through the voltage regulator circuit, you can get a stable output voltage, connected to the dummy load after you can make it work, but this is an open loop structure, which requires the chip outputs a PWM signal output to a MOS pipe, to control the switch tube guided by pulse width modulation on time so as to control the output voltage of the MOS tube, only need to be connected with the dummy load can be completed in a closed-loop system. In the end, through the software programming, the voltage source output pulse voltage amplitude, frequency and pulse width can be reached by the reasonable setting of several soft switch, which can reach the final requirements. The overall structure diagram is shown in Figure 1.

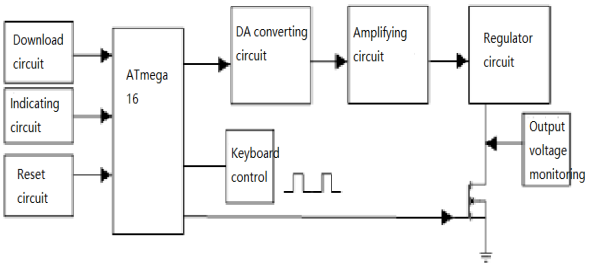

Figure 1 Overall structure diagram

1.2 Generation +2.5V scheme selection

In order to guarantee the normal operation of the circuit, it is needed to provide a +2.5V point voltage to its part of the circuit, and now there are two options to choose from.

Program 1: the high precision reference voltage source AD is produced by AD780 to provide the +2.5V voltage. As long as the AD7802 pin into a 5V voltage, it can be programmed to make its 6 foot output of a 2.5V or 3.0V voltage, its accuracy is 2.5V + 1mV or 3 + 1mV. The specific circuit is shown in Figure 2.

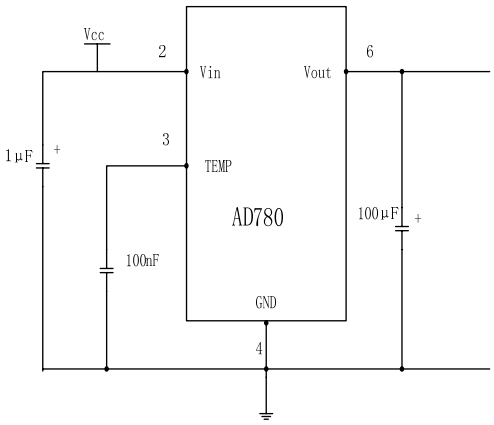

Figure 2 AD780 wiring mode

Scheme two: using linear (linear) lt1460bin8-2.5 chip production company to produce +2.5V voltage. Lt1460bin8-2.5 is a low power, high precision and small package size of the micro power bandgap reference, very suitable for precision voltage regulator. And the lt1460bin8-2.5 does not need to output compensation capacitor, and it is still stable capacitive load. Its specific wiring diagram is shown in Figure 3:

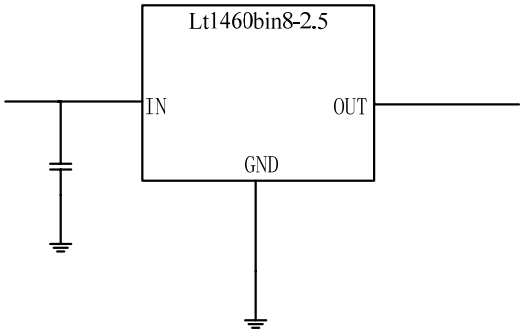

Figure 3 lt1460bin8-2.5 wiring mode

Scheme comparison: the above two schemes can output 2.5V voltage. One of the solutions is to give the AD780 input 5V voltage, and its 8 foot floating, you can output a relatively stable +2.5V voltage. Scheme 2 as long as to lt1460bin8-2.5 provide input voltage of a 3.4V~20V and between the second heel legs connected with a 0.1uF capacitor, you can generate a stable + 2.5V output voltage. Compared with the scheme, the circuit is much simpler and requires only one capacitor, and the output voltage is stable, and the error is small. To sum up, through the comparison program two more in line with the design

requirements, so the choice of scheme two.

1.3 Voltage regulator circuit core chip selection

Scheme one: LM317 adjustable three terminal regulator power supply

LM317 is adjustable 3-terminal voltage regulator power supply, it is possible to continuous uninterrupted output can be 1.2 to 37V ADJUSTABLE DC voltage, but the only fly in the ointment is it can output to a continuous tone adjustable positive voltage, not negative output voltage. LM317 regulator contains an internal Overcurrent protection circuit and overheat protection circuit; the output voltage regulating circuit is composed of a resistor and a sliding rheostat.

Program two: the use of CW78XX series three terminal voltage regulator

78XX series are fixed three terminal voltage stabilized power supply, it is by the output (VO), input pin (VI) and ground anchor (GND) the three tube feet, wherein, the input end is connected to a capacitor can better filtering, waveform in order to achieve a better; output end is connected with the capacitor can improve the load at the instant of impact, also can keep good waveform. And the stability of the circuit using 78XX series is also relatively good, reliable, easy to use, and the price is cheap. The input voltage of the 78XX series voltage regulator module is 36V, and the lowest input voltage is higher than the output voltage 3V~4V.

Scheme comparison: the two schemes can be used as the core chip of the construction of the regulator circuit. LM317 is the three terminal adjustable regulator chip, the output voltage adjustable, adjustable range is 1.2V~37V; the maximum current can be provided for 1.5A. CW78XX series is the three terminal fixed regulator chip, using it to build and the required peripheral components is very little, and the circuit has a flow protection circuit, over temperature protection circuit and adjust the protection circuit, the use is very reliable, convenient, and compared with LM317, it can output negative voltage. But the output voltage of the CW78XX series is a fixed value and is not adjustable. In summary, with the design requirements of this paper, the need for a three adjustable voltage regulator chip, so the program is more in line with the design requirements, so the final choice of a program.

2 WORKING PRINCIPLE OF EACH UNIT CIRCUIT

2.1 Control section

The design of the numerical control part is based on the microcontroller ATmega16 as the core to complete. ATmega16 pin diagram is shown in Figure 4 below. ATmega16 is a high speed, low power, 8 bit CMOS microcontroller based on the enhanced RISC AVR structure designed by ATMEL company. Because of its advanced instruction set and single clock cycle instruction execution time, the contradiction between power consumption and processing speed can be reduced.

In this design, the ATmega16 is used to provide a driving signal for each part of the circuit to ensure that the circuit can drive the normal; secondly, the output of the PWM signal, to drive the MOS tube. Below will introduce some of the ATmega16 information.

ATmega16 is the AVR series microcontroller in a very typical chip, its main features are as follows:

RISC core with advanced LOW architecture and Harvard architecture, it has the 1MIPS / MHz high speed computing execution ability, with independent program bus and data bus, most instruction execution cycle is a single instruction cycle, which contains a large amount of non-volatile memory program and data memory. The chip contains two reset circuit, which includes 32 general-purpose working registers, and it all works as static work. As input, it can be set to three state high impedance input or AVR.

The above is about the characteristics of ATmega16, which can be seen from the comparison with other 8 - MCU Bit, Bit 8 - MC ATmega16 has the ability to have a super - reduced instruction set and high - speed operation, and its peripheral circuits are more simple. Below will be a brief introduction to the ATmega16 several major pins as well as the functions of its pins.

ATmega16 pin diagram is shown in Figure 4 below, and the main function of the pin is analyzed as follows:

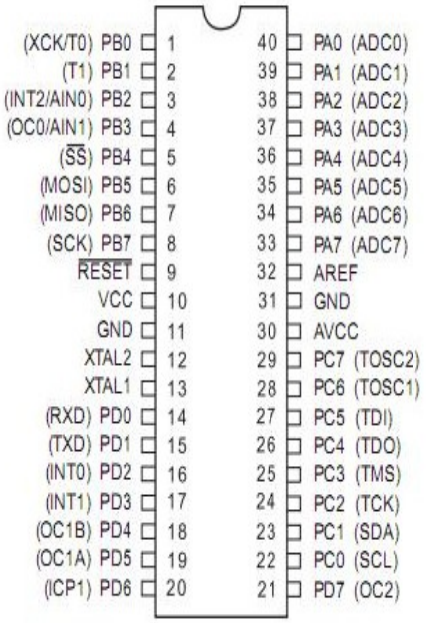

Figure 4 ATmega16

ATmage16 in the main control of the circuit: in the design of this article, the role of ATmega16 is very critical. First of all to use D/A to provide a clock signal with an input signal to ensure that the D/A part of the work; second it to generate a PWM wave, used to control a MOSFET of the guide and turn off; finally to use its port D to complete a keyboard circuit, so as to control the output pulse voltage amplitude, frequency and pulse width, ensure their value can be adjusted.

2.2 Reset circuit

Reset circuit, which is to use it to restore the circuit to the beginning of the state. In the whole circuit work process, the need to reset the microcontroller in the boot, and in many other times are required to use the reset operation, which requires a reset circuit to complete. Reset operation has two forms, one is power on reset, that is in the process of voltage from scratch, in the reset will first in high level for a period of time, then because of the DDT had a pull-down resistor grounding, then the level will gradually by the high level variable to a low level, which makes the MCU reset port level from 1 to 0, completing the MCU reset operation. Another way is to reset the keys. In this article, the key is to use the way to complete the reset operation, the specific circuit diagram shown in Figure 5 below.

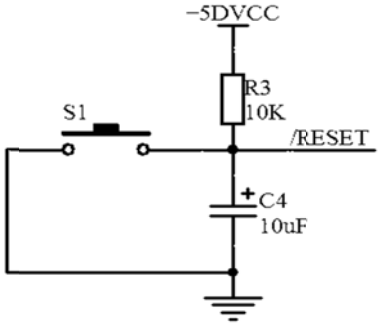

Figure 5 Reset circuit

2.3 Download circuit

In this design, in order to drive the chip so that it can work normally, we need to chip inside the burning process. In order to facilitate the process of downloading the program to the microcontroller, this paper also involves the download circuit, the specific circuit diagram as shown in Figure 6 below.

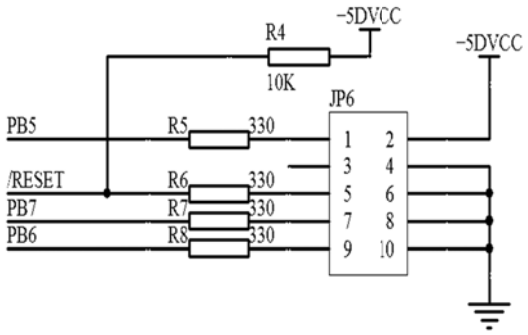

Figure 6 Download circuit

2.4 D/A conversion section

In this design, in addition to the use of single-chip microcomputer control, but also need to be involved in digital / analog (that is, D/A) conversion, the need to convert the single chip digital signal to analog signal. According to the different forms of its output, the general can be divided into voltage output and current output type, etc.. According to the design requirements of this paper, the analog signal output from the single chip microcomputer is required to be converted into a voltage signal, and then output to the next level. In this paper, we take LTC1655 as the core chip of the D/A, and then implement the D/A conversion function by the external circuit. The basic data of LTC1655 are as follows:

LTC1655 is a rail to rail voltage output device (rail to rail, i.e., the input and output voltage range of the device can reach the power supply voltage), it has 16 bit digital to analog converter

(DAC), including an output buffer with a reference, it is the power supply voltage of a single chip computer, are +5V voltage, is a very typical power consumption for 3MW single 5V power supply. And the use of LTC1655 to build the circuit required for the very few components, use very simple and reliable.

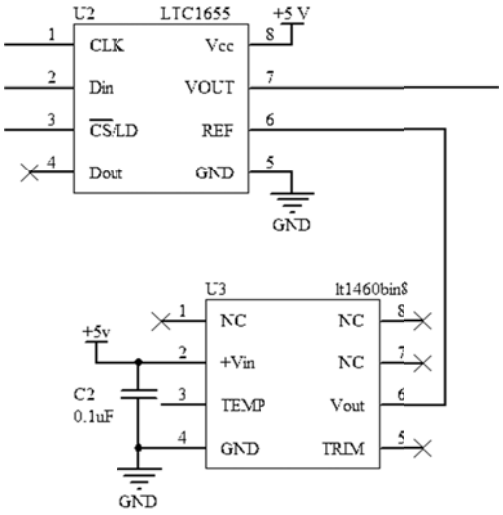

Figure 7 D/A conversion circuit

2.5 Amplifying circuit

In this design, in order to achieve the final output voltage 24V - 0V can be adjusted, the need to use an amplifier circuit D/A conversion of analog voltage signal amplification, in order to achieve the final design requirements. In this paper, the design of the amplifier circuit is built with the integrated circuit OP07 of operational amplifier. OP07 has very low offset voltage, so in the application process, in the vast majority of cases do not need additional zero adjustment measures. Its chip pin diagram is shown in Figure 8 below.

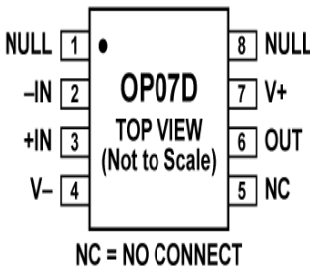

Figure 8 OP07 pinout

From the figure can be seen, OP07, the second foot is a reverse input end, in it through a resistor grounding, Annihilator Tripods is same to the input, the design of it is directly connected to the through D / a conversion from the analog voltage signal. OP07 four ground, seven feet by +25V voltage, to maintain its normal work. Left leg are left vacant. The specific circuit is shown in Figure 9 below:

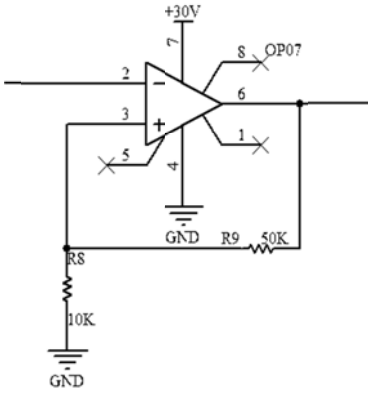

Figure 9 Amplifier circuit

A formula for calculating the magnification of the amplifier (2-1) is shown:

$$P = \frac{R1}{R1 + R2} \qquad \text{Type (2-1)}$$

Type: P for the amplification of the circuit;

R1=R8=10K;

R3=R9=50K;

Can be drawn from the formula, the circuit of the amplification factor is 6 times.

2.6 Voltage regulator circuit

In the front, have more or less mentioned about the relevant content of the regulator circuit. Through the comparison of the scheme, the right voltage regulator chip is LM317, and the specific circuit is shown in Figure 10.

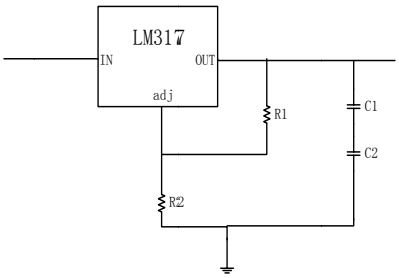

Figure 10 Voltage regulator circuit

In order to guarantee the normal and stable operation of the circuit, the input voltage of 0V~24V must be higher than the output voltage. The output voltage is adjustable, so the input voltage of LM317 must be greater than 24V. Since the +25V voltage has been used for the sake of convenience, we use +25V as the input voltage of LM317. By means of the investigation data, it is known that the voltage difference between the adj terminal (adjustable end) and the output terminal of the LM317 is LM317, which can be derived from the calculation formula of

the output voltage of 1.25V, as shown in the formula (2-2).

$$Uout = 1.25 * (1 + \frac{R2}{R1}) \quad \text{Type (2-2)}$$

Type: Uout for LM317 output voltage;

R1 for the adj end to the output of the resistance, that is, R1;

R2 adj to the ground resistance, that is, the R2 in the picture.

2.7 Keyboard module

As the final design requirement is to make the output pulse voltage waveform amplitude, frequency and pulse width can be adjusted, so in order to facilitate control and the key switch, through software programming, in the software to achieve its numerical value can be adjusted, the keyboard of the specific circuit as shown in Figure11.

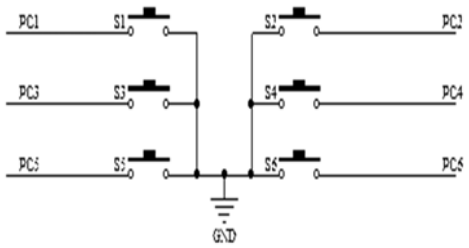

Figure 11 Keyboard circuit

As shown above, due to the single chip ATmega16 its PC port has a built-in programmable pull resistor can be controlled by software programming to pull the resistor is effective or invalid, so there is no connection on the top of the resistor, but directly to the ATmega16 port of the PC port, as long as the software programming to pull the PC port on the pull of the effective. Six key switches are controlled by the output pulse voltage amplitude, frequency, pulse width of the increase or decrease through reasonable programming, you can achieve the above functions.

3 SOFTWARE DESIGN SYSTEM

3.1 Program design

Because it is the numerical control voltage source, so this design, in addition to the need for hardware circuit, but also the need to complete the design of the software to meet the requirements of the final target. In this design, the program design of the micro level, pulse type voltage source includes the following several aspects: first, we must drive the single chip microcomputer, which can output a PWM drive signal. Secondly, the digital signal is converted into analog signal, then the output circuit is set up.

3.2 Program block diagram

The flow chart of the program is shown in Figure 12 below.

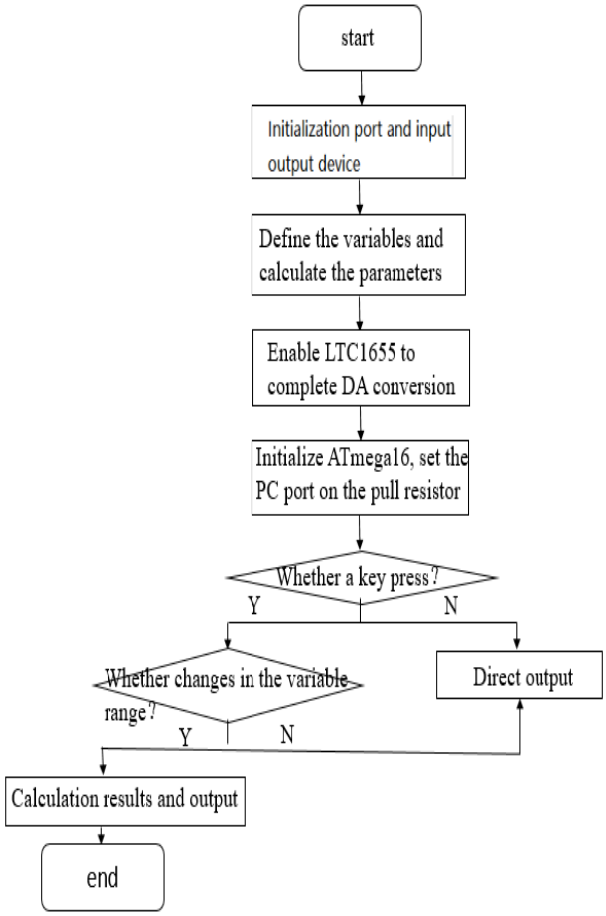

Figure 12 Program flow chart

3.3 Principles of program operation

In this process design tasks, the need to consider the following two aspects of the main issues. The first is to consider the initialization of the various ports and the definition of variables, to ensure that the microcontroller out of the driver signal to normal drive every level of the device, to ensure that each component can work properly, which is the most important basis for programming. The second is to achieve the output pulse voltage amplitude, frequency and pulse width can be adjusted. To achieve this, the first to use an IF statement to determine whether a key is pressed, if no key is pressed is out of the loop, if a key is pressed, the next step of judgment; if a key

is pressed, jitter, after again to determine whether key is pressed. If a key is pressed, key calculation, through a switch statement to determine the press is which one key, after a nested if statements, by reasonable setting the worthy of upper and lower bounds, it can meet the design requirements.

4 RESULT ANALYSIS

4.1 Instruments used in the experiment

1 welding equipment: electric iron, tin suctioner, scissors, pliers, board, wire number;

2 measuring equipment: DC power supply 0~30V, digital storage oscilloscope, digital;

3 required software: DXP, AVR ICC.

4.2 Test method

In this paper, the design requirements of the final output is an amplitude, frequency and pulse width can be adjusted pulse voltage, it is to belong to the AC voltage, in order to ensure the accuracy of the test results, so the choice of oscilloscope to test its output waveform. In the test, only need from across the load leads to two headers, the probe of oscilloscope probe and grounding clamp are respectively connected with two needles are arranged above can be measured the output waveform.

Select the test of DC regulated power supply is Taiwan - Wai Gwinstek company production, model for GPD-3303C, selection of oscilloscope is also Taiwan - Wai Gwinstek company production, model for GDS-2202A. The peak and peak measurement function of oscilloscope is used in the test.

4.3 Detection and analysis of output waveform

Through repeated testing, it is proved that the design scheme is correct and feasible. Figure 13 shows the output of a single chip PWM driver signal (Figure A) with the final output of a voltage pulse waveform (Figure B). Through the image can be seen, the output waveform of the rise / fall along the steep, rise / fall along the time to reach the level of a few of the time, and the frequency is larger, the ripple is smaller, the indicators have reached the design requirements.

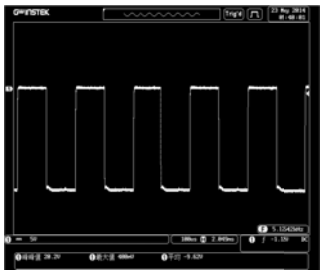

Figure A PWM microcontroller output a wave

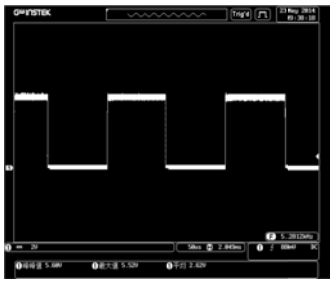

Figure B Peak value of pulse voltage for 20V

Figure 13 Output waveform detection

5 CONLUSION

Through the power of the power of multiple data measurement and debugging experience, we can draw: voltage control voltage output, measured LM317 output voltage change trend, roughly consistent with linear variation, and key press to set the voltage value, measure its output voltage, the error is within 1%, reached the set voltage value, measurement feedback back voltage, can be the voltage stability in the standard value near a range, not to increase or decrease. The power source can be used in a very high accuracy in the laboratory, in order to make the appearance and easy to carry, we increase the design of its appearance, put it into a small box, when necessary, can take out the use, which is not good, it is easy to repair.

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Intelligent anti-theft lock racking system

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***Abstract*-An intelligent anti-theft lock tracking system which can fix position automatically was designed. The single chip microcomputer STC12C5A60S2 is chosen as main controller. And the system is composed of LCD display module, sound -light alarm module, GSM communication module, GPS module, acceleration module and some other function modules. When the bike is moved by stranger , the sound light alarm module will take effect, and the position where the bike was moved will be fixed using GPS module, meanwhile, the location information will be transformed to the owner through short message by GSM module. The test results show that system position error is less than 5 meters and the information updating rate is less than 0.2timers/minute.**

I.INTRODUCTION

WITH the increasing of social material wealth and the people living standard rise, security becomes one of the most concern of the modern people.In all walks of life, anti-theft alarm is essential, especially the anti-theft lock function.The traditional mechanical lock because of its simple structure, single function, security is very low;The electronic lock overcomes the drawback of mechanical lock safety performance is poor, high confidentiality, use flexibility is good.

THIS design increases the GSM module on the basis of electronic lock, GPS positioning module and accelerometer module design smart security lock. Wherein the lock module has a key input display, input error, control alarm, change passwords and other functions; acceleration modules and GPS positioning module can sense when the car is stolen the car to move and achieve positioning; GSM communication module can send text messages to notify the owner to achieve accurate positioning stolen, to ensure the safety of the car.

II. PROCEDURE FOR PAPER SUBMISSION

Intelligent anti-theft lock tracking system[1-2] controller and the functional modules as the core. Realize the functions correctly when password lock is open, all the anti-theft alarm functions are shut down; if password or password input error when the car is moving, the acceleration sensor acceleration module change, this time to obtain location information GPS module via GSM communications module will transmit location information to the owners of the hands, to achieve security objectives. The overall system block diagram and overall flow chart in Figure 1, Figure 2.

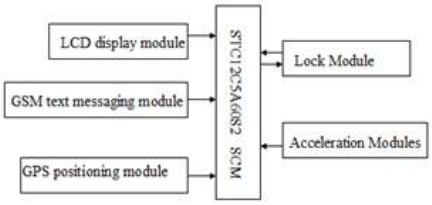

Fig.1 The overall structure of the system

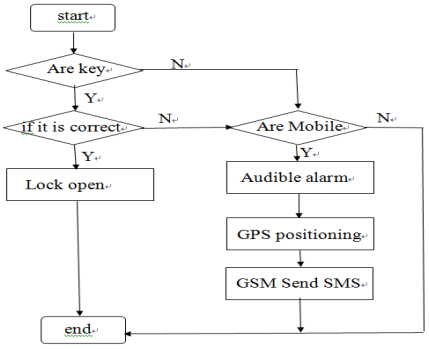

Fig.2 The overall flow chart structure of the system

III MODULE DESIGN

Intelligent anti-theft lock tracking system uses a modular design, the system consists of a control module, lock the module, the acceleration module, GPS positioning module and a GSM module, all modules focused on a circuit board, with each other through various modules together to achieve security alarm function.

A Control Module

This system uses STC12C5A60S2 microcontroller

as the controller, which comes with an internal MCU 60K FLASH ROM, can instantly erase the way electricity, rewrite, support for serial has been programmed, conducive to achieving the program online programming. Meanwhile a high-speed, low power consumption, superior anti-jamming, etc., will help reduce system weight, good stability.

The most important thing is, STC12C5A60S2 microcontroller has two serial ports (RXD, TXD and RXD1, TXD1), GPS module can be implemented simultaneously with the GSM module is connected to the microcontroller. 1 serial connection with the GPS positioning module, serial port 2 is connected with GSM communication modules. After the success of GPS positioning, the location information sent to the microcontroller through the serial port 1, and then sends the location information string to the serial port 2, port 2 interrupt function control use, store the received data, the last data will be sent to the owner of the phone, it can be easily dual serial communication.

B Lock Module

Lock module [3-5] by the STC12C5A60S2 microcontroller as the main chip, 16 keys as input keys, the result via the LCD display. In order to prevent the occurrence of power failure and other unforeseen circumstances, the use of AT24C02 as the power-down protection. When you enter a password using the keys, if the password is correct, then lock open and lights, then you can change the password, press Enter twice in a row after a modifier key to identifying new password, improve safety; in the display if the password is wrong the on-screen prompts for wrong, when consecutive errors after three keys are locked, the buzzer alarm one minute duration. Lock the overall simulation and the overall flow chart shown in Figure 3, Figure 4.

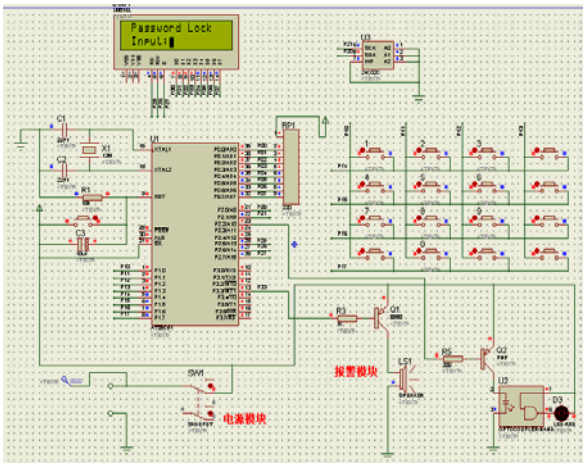

Fig.3 The whole simulation diagram of the Combination lock

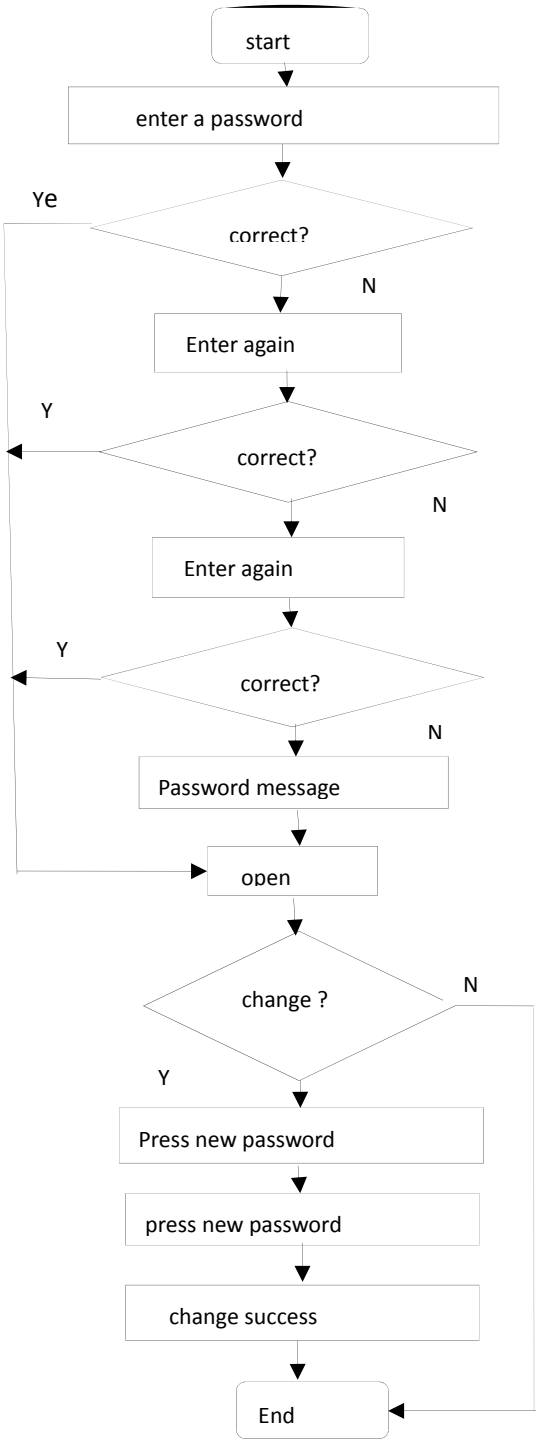

Fig.4 The whole flow chart of the Combination lock

C *Acceleration Modules*

When no password or the wrong password is entered, the system needs to perceive the car was moving before starting GPS positioning module [7]and GSM communication modules. The system uses an acceleration sensor senses the car move.When the car is moving, the acceleration value changes, the acceleration sensor detects changes in the value and spread to the microcontroller, and then start the GPS module for real-time positioning.

Acceleration sensor selection MMA7455, it is a digital output, low power, compact acceleration sensors, no external AD converter, small size, light weight.Also having signal conditioning, temperature compensation function, affected by temperature change is small, good stability.Shown simply VCC, GND, SCL, SDA four pins connected with the microcontroller operation, easy to use, the acceleration module works Fig.5.

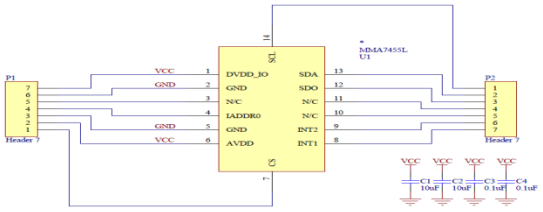

Fig.5 The working principle diagram of the acceleration module

D *GPS positioning module*

After the car is stolen, in order to obtain the exact location of the car, the system adds GPS positioning function[8-9] .Using GPS module to determine the latitude and longitude of the location of the car, complete the positioning and coordinate transformation, the latitude and longitude coordinates into the form, isolated degrees, minutes, seconds, to give the desired N (S), E (W) coordinates, and then through serial TXD, RXD respectively microcontroller RXD, TXD connected to the positioning results to the microcontroller, play a security role in positioning.

The GPS system uses CNP301UA model module, which has a small, compact, light weight, high precision, close star, high sensitivity and flexibility advantages of self-defined user configuration, you can achieve fast, accurate positioning.

During the test, are positioned at different locations, the positioning results shown in Figure 6:

Fig.6 The positioning results in different locations

After find information shows that the difference in the meridian once every latitude, from the difference between the actual 111 kilometers, is a difference of one point is approximately 111 meters from one thousand meters /3600=30.8; in every latitude longitude difference was, the actual distance difference of 111 * cos kilometers (current latitude value), a difference of one point is approximately 111 one thousand meters / 3600 * cos.

Fig.6 shows, measuring the distance between two

anchor points meridian of 1 minute * 30.8 m / min = 30.8 m, measuring the distance on the weft of 1 minute * 30.8 m / min * cos43 °= 22.5 meters and the overall measurement distance meters.The actual distance between the two places is about 36 meters, so the error within five meters, and the difference between the actual distance of 2.1 meters, the error is about 5%.The error depends largely on the model selected GPS module, for higher positioning accuracy, can choose more accurate GPS positioning module.

E GSM communication module

When the car is stolen, if they can accurately informed of the specific location of the car, for the recovery of stolen vehicles have a key role.Therefore, you can use GSM communication module[10-12] GPS positioning information in real time sent to the owner of the phone, so that owners can grasp the orientation of the car lies.The system uses SIM900A communication module to send and receive text messages to communicate with the owners of mobile phones, SIM900A communication module with low power consumption, among other functions and receive calls, GSM module complete with computer data communication via AT commands, you need to set the mode to send short messages Text format and determines that the received number information.Working SIM900A communication module flow chart shown in Fig.7

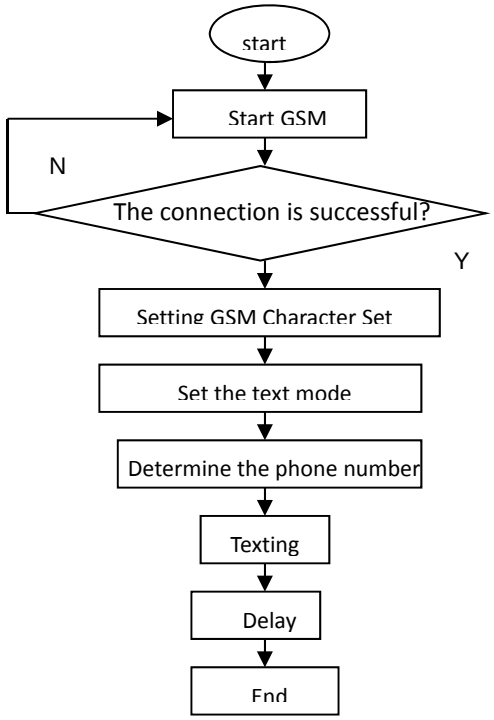

Fig.7 The work flow chart of SIM900A communication modul

IV TEST RESULTS

After the commissioning of each module, the overall system were tested.

Locks can achieve the basic functions, when the correct password is entered open lock indicator lights, have three input opportunities buzzer alarm if the three are wrong, and in the case of lock open can change the password.Enter the password to change the password display shows the results and the results shown in Fig. 8 and 9.

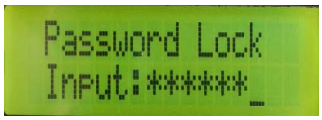

Fig.8 The results when entering the password

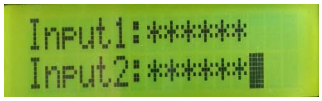

Fig.9 The results when changeing the password

GPS module can locate the current latitude and longitude, when the car began to locate stolen, and the location information sent via GSM module to the owner of the phone,Fig.10.

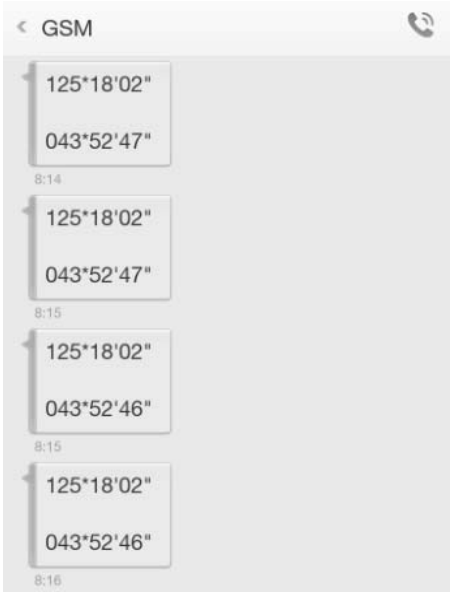

Fig.10 Mobile phone received positioning information

V EPILOGUE

We completed the design and testing of intelligent anti-theft lock tracking system.On the basis of traditional electronic locks, an increase of password protection and real-time positioning, more

intelligent.By entering a password is easy to solve the shortcomings of the traditional key stolen; using the acceleration module, GPS module and a GSM module combined to achieve a real-time location tracking when the car is stolen.Test results show that the positioning accuracy of the system is less than five meters from the car stolen to receive the SMS response time of less than 60 seconds / times.This system is the development of electronic anti-theft locks provide a new design ideas, with high value and development potential.

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Smart Home based on Raspberry Pi

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***Abstract*-A prototype of smart home is established based on Raspberry pi as base-station and relay,By Raspberry pi board, embedded system is used. On Linux system ,we use python and control light ,curtain, GPIO,switch electric kettle and listen to the music on Internet by mobile phone. Temperature measurement, monitoring and alarm system is as well.**

***Key words*-Raspberry Pi Smart Home Linux**

0 FORWARD

THE goal of home automation is to make our home life more fun and efficiency, and the concept of "intelligent" was introduced into home. In this article, we take full advantage of the open source nature of Raspberry Pi, and choose Linux as our underlying system, using open source software to complete intelligent home-control functions that we want to achieve. We use Python language, taking advantage of its convenient language features. In our work, Raspberry Pi is a perfect relay point, because of the use of wireless network technology, we achieve a mobile remote control lights, remote control curtains, remote control switches giving the kettles boil water supply, watercress FM broadcast implementation of a smart home entertainment system and Pyroelectric sensor to achieve the alarm function, and the application of mobile video surveillance reflect smart home security system.

Based on the Raspberry Pi intelligent home systems development is complex and cumbersome abandon Windows systems, make full use of open-source the underlying system to complete the task of every nuance, every nuance of the interactive features into a whole network, to achieve intelligent Claim.

1 INTRODUCTION

Raspberry Pi, the Chinese called "Raspberry Pi" is a charity registered in England "Raspberry Pi Foundation," the development, education for students computer programming and design, only credit card sized card-type computer, the system based on Linux. Although its appearance "petite" inner "core" is very powerful, video, audio and other functions all Jie, is a "small but perfectly formed."

In our development process, we chose the Raspberry Pi of B-type version, it is a miniature ARM-based PC motherboard, on which includes a ARM1176JZF-s 700Mhz processor (can be overclocked to 1Ghz), and a Video Core IV GPU, there are 512M RAM, no built-in board above the long-term storage devices, memory, hard drive to SD card, the card around the motherboard has two USB ports and one Ethernet port can be connected to the power supply, keyboard, mouse, and network cables, and has TV-out connector on the video analog signals and HDMI high definition video output interface, the above parts are all integrated on a motherboard only slightly larger than a credit card, with all the basic functions of a PC simply turn the TV on and keyboard, you can perform such as electronic spreadsheets, word processing, play games, play high-definition video and many other features. Raspberry Pi computer board only, no memory, power supply, keyboard, chassis or connection. Overall, the Raspberry Pi board rich external interface, the processor, the storage device is not strong enough, but its low price, provides us with an ideal platform for embedded development.

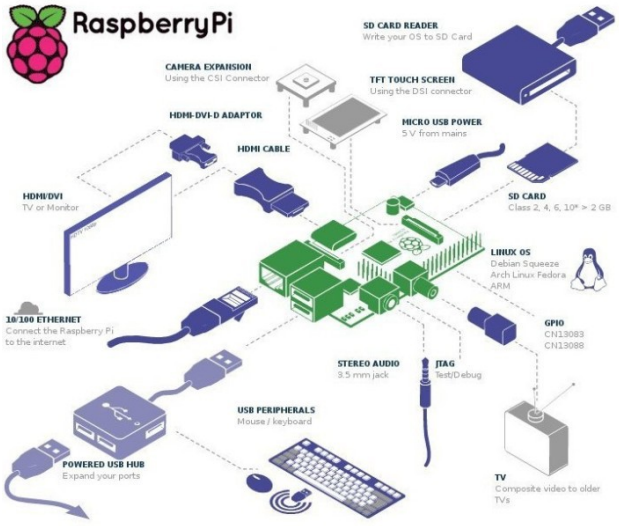

Fig 1 The macro-structure of the Raspberry Pi B plate

2 SMART HOME SYSTEM

The system consists of the light module, curtain module, music module, temperature module, kettle module, alarm module and monitoring module. we have achieved more modules of computer and cell phone remote control. Using putty software can also view the program to facilitate the further development of programming enthusiasts.

The basic principle diagram shown in Figure 2:

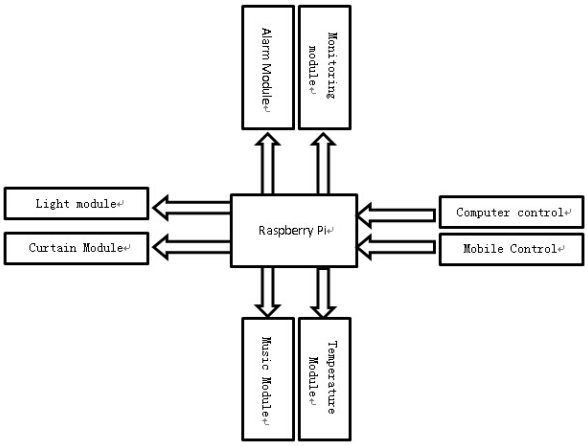

Fig. 2. Block diagram of the smart home system

2.1 Light module

2.1.1 Hardware connection diagram

Connect the light and switch to the Pi Raspberry in figure 3. Here, we control the light bulb by controlling the relay.

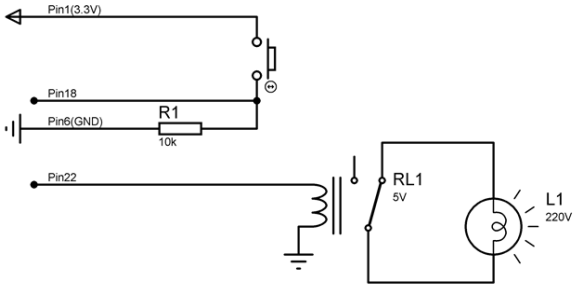

Fig. 3. Light module control circuit

2.1.2 Control mode

2.1.2.1 Ordinary switch control mode

Switch is a input signal to Raspberry Pi, so we need the GPIO input function. When in use, we can use switches control lights blinking. When press the switch, the light is turned on. When press again, the light is turned off .

2.1.2.2 Computer control mode

Run putty and use the command line to change electrical level to control the light.

Operation instruction:

>>>GPIO.setup(25,GPIO.OUT)

Lighting light instruction:

>>>GPIO.output(25,GPIO.HIGH)

Close instructions：

>>>GPIO.output(25,GPIO.LOW)

2.1.2.3 WEBIO Controlling

Open the URL http://192.168.137.200:8000/webiopi/, we will get the following interface.

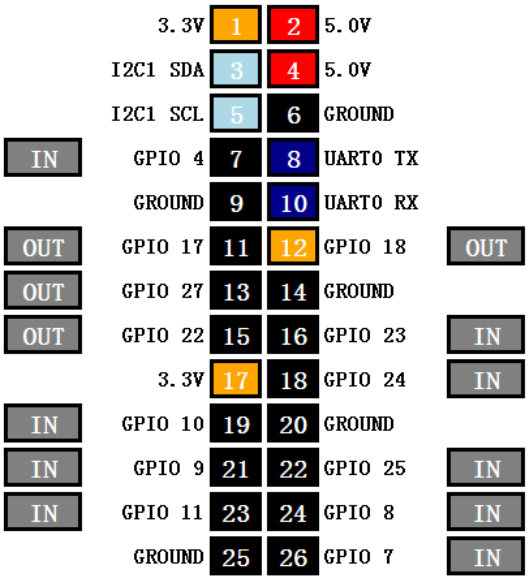

Fig. 4. WEBIO interface

Click on "IN / OUT" to switch operating mode of GPIO. Click the number 25 to control the light.

2.1.2.4 Mobile Terminal Controlling

Control light by phone terminal software.

2.2 Curtain Module

This module contains a stepping motor which placed in curtain rails. Python program control stepper motor rotation direction and speed to control curtains lift.

Driver chip of the stepper motor is ULN2803A. Using Raspberry Pi's four GPIO outputs controls the stepper motor. Concrete realization of the circuit is shown in Figure 5.

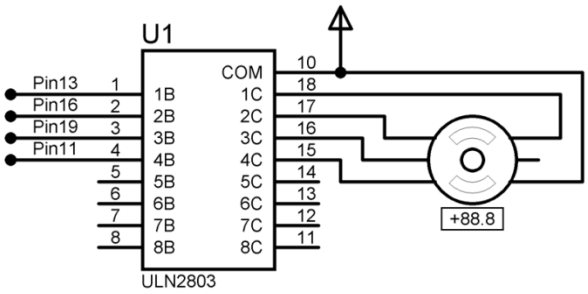

Fig. 5. Stepping motor driving circuit

Run command sent by the terminal to complete action once opened or closed curtains. And the amplitude of curtains also can be adjusted by changing input parameters. So that the design has more degrees of freedom. All of these makes the design more intelligent and humane.

2.3 Kettle Module

GPIO ports control kettle. When GPIO port is high

level, the kettle began to boil water. When temperature reaches 100℃ which is detected by DS18B20, GPIO port is set low. Then kettle is turned off and starts the alarm function to alert the owner of the water has been boiled. When GPIO port is low, water heating function is not performed.

2.4 Music Module

This module is modified from an open source project on GitHub. It is easy to use this module to play music online.

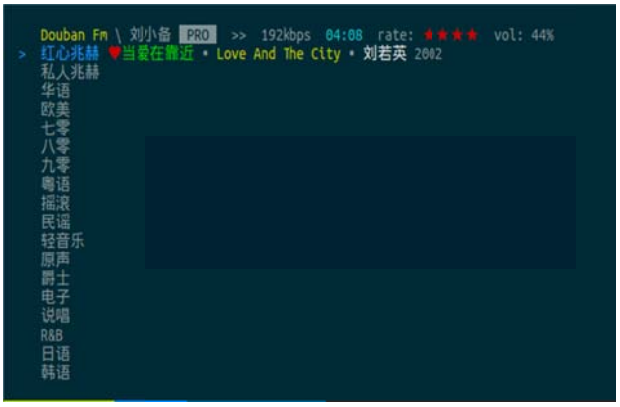

Fig. 6. Player interface

To make home life more intelligent, the player allows the user to choose a different channel, mark and cancel favorite music, and play the next song. You can also set the loop mode.

2.5 Temperature Module

This module uses a temperature sensor DS18S20 sensing indoor temperature. The DS18S20 digital thermometer provides 9-bit Celsius temperature measurements and has an alarm function with nonvolatile user-programmable upper and lower trigger points. The DS18S20 communicates over a 1-Wire bus that by definition requires only one data line (and ground) for communication with a central microprocessor.

When actual measurements, we have found DS18S20 drift 2℃, so we lose 2℃ as temperature compensation.

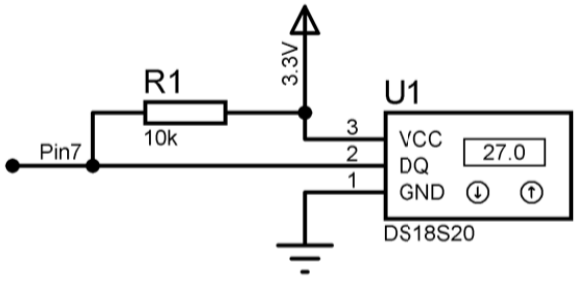

Fig. 7. Temperature Module Circuit

2.6 Alarm Module

This module uses human infrared sensor module HC-SR501. The core of the device is body pyroelectric infrared sensor. Pyroelectric infrared sensor made of a material consisting of a high pyroelectric coefficient. It can measure the range of action of 10 to 20 meters. The pyroelectric infrared sensor and buzzer connected to the circuit shown in Figure 8:

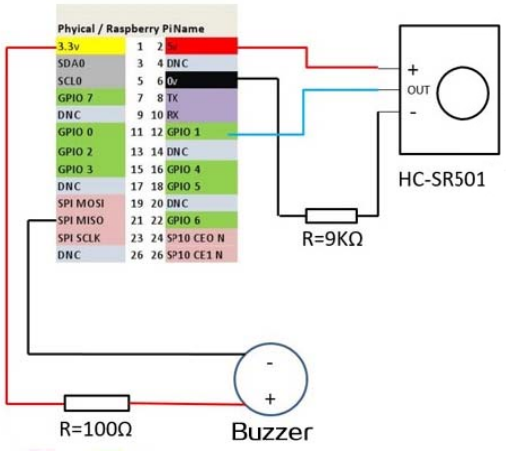

Fig. 8. Alarm circuit

After the python program runs, infrared sensor module detects intervals. If a person close to the buzzer alarm will sound, and print ‘someone close’ on screen. If people leave, it stops chirping, display ‘no one close’ on the screen.

2.7 Monitoring module

This module uses a USB interface webcam. Webcam controlled by Raspberry Pi takes photos. Then these photos are transmitted to internet. So we can see the real-time monitoring videos.

Browser control: Open the browser, in the address bar enter http://192.168.137.200:8081, which, 192.168.137.200 is the IP address of the Raspberry Pi. On the page you can see a 640 * 480 pixel window, which is captured by the webcam.

2.8 Remote Control

By Raspberry Pi Command and RPi_Automation mobile terminal APP, you can easily achieve control of the Raspberry Pi GPIO level and sending an instruction to complete complex tasks.

3 Software Sources

Linux system is an open source system. It can achieve a complete operating system but only uses very little of the program code. It is an operating system suitable for home appliances or electronic appliances, which is known as embedded system. A Linux host allows many people to work on the line, and resource allocation is more equitable, which is just to meet the needs of multi-user and multi-tasking for Raspberry Pi. Linux system is the soul of Raspberry Pi. Raspbian is a linux system, which is the preferred operating system for Raspberry Pi. Python language is completely free, object-

oriented, easy to learn and portability, and it has access to the underlying hardware and control it. So python is an excellent choice to control hardware based on Raspberry Pi.

4 System Test Results

We implemented features are:

Light module: through ordinary switches, computers, mobile phones control lights;

Curtain Module: through mobile phones, computer remote controls the rotation of the stepper motor, stepper motor driven curtains rise or fall;

Kettle modules: through mobile phones and computer remote controing add water and boil kettles;

Music module: using Raspberry Pi autonomous play music;

Temperature module: Raspberry Pi control DS18S20 measure temperature, and view the current temperature value through mobile phones, computers;

Alarm module: Raspberry Pi control pyroelectric infrared sensor detects infrared signals the body, the buzzer alarm will sound when someone close;

PCU: Raspberry Pi control Webcam indoor real-time monitoring monitor screen can be viewed through mobile phones, computers.

The following figure shows the physical map and phone software works we use screenshots:

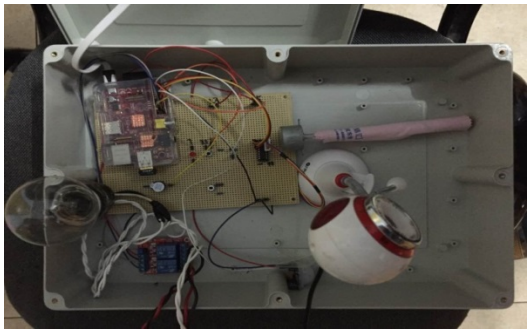

Fig 9 Real Products

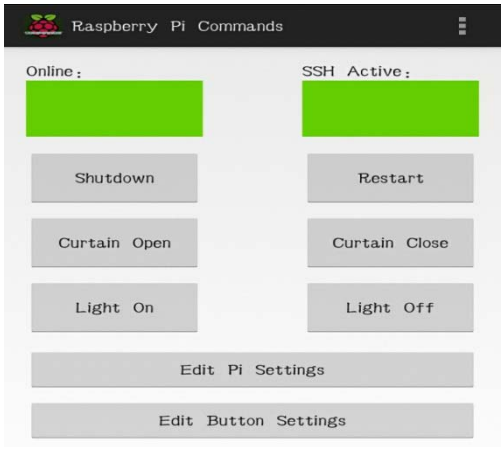

Fig 10 Android APP

5 Conclusion

This paper fully demonstrated the concept of intelligent home. In general, we have successfully built a smart home model and software platform. For hardware, we did it with Raspberry Pi as a controller, and with computer and mobile phone as a terminal. The system has realized controlling the lights, curtains and kettle, and temperature measurement, network audio playback and monitoring alarm, which make the smart home concept come to the reality. As for software, we use python language as a tool, use Linux system and Raspberry Pi as a platform, by writing python program successfully achieved controlling the hardware. Practice has proved our theory is correct and feasible.

Experiences

Through this experiment, we gain a lot of feelings. There are no shortcuts on the road to scientific exploration. Only constant knowledge, exploration, not giving up and delving into every detail can we successfully overcome difficulties and achieve the desired results. During the most difficult period, I fully felt the team's strength is infinite. Everytime we were in trouble, we would discuss with each other. This process facilitated us to complete all tasks we expected and promoted the success of our products.

Acknowledgements

Our work completed with the loving care and guidance from our teacher called Li Zhe. First of all, we will express heartfelt thanks for the teacher's tolerance, for he give us a lot of space to play the best of our creativity. Secondly, everytime we encountered problems we could not solve, teacher Li would give us proper guidance.He showed patience and helped us solve the problems independently.

What's more, we will Show gratitude to Xu Kai, Grant Van Skiver, Lukasz Skalski, GuoYu (turingou) and Mike Haldas for their help. It is in the help of these seniors that our work improve constantly and success step by step. Thanks for the help that provided by the above predecessors.

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Distributed Wirele Monitoring System of Factory Machinery Temperature

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***Abstract*-The paper introduce a design that monitors temperature and humidity for short distance , which is based on low energy consumption and high performance micro controller STC89C52RC and temperature sensor DHT11, and uses wireless module nRF24L01. Because of the large factory environment, the real-time changes and uneven distribution of temperature and humidity is caused. If we adopt the traditional way of the measurement circuit ,it will be very complex, vulnerable to be distracted, and accuracy is not high, does not meet certain harsh industrial environment and some outdoor environment. Therefore, choosing a good digital temperature ,a wireless transmission module and simple to use is particularly important.This design has low power consumption, low cost, simple hardware circuit, high receiving sensitivity, receiving and transmitting distance is about 100 meters, it is a feasible method.**

***Keywords*-NRF24L01; temperature and humidity sensor DHT11; STC89C52RC**

1 .INTRODUCTION

WITH the development of society, Our requirement to the temperature and humidity of environmental is higher and higher, especially in the pharmaceutical, food, aviation, microelectronics and other fields. For the daily management of factory, the temperature and humidity will directly affect the service life and safety reliability of the factory items. Therefore, A system that is capable of accurate, stable, real-time monitoring of temperature and humidity is particularly important. In some cases, we need to monitor a large extent, the wiring is not convenient and not conducive to post-maintenance, then we use wireless modules for temperature acquisition.

Taking into account that there are demands for multi-point temperature monitoring the environment in many factories, so we design a distributed factory wireless temperature monitoring system. We adopt NRF24L01 as wireless communication module and STC89C52RC as the core to control the temperature and humidity to achieve short-range wireless transmission. The whole design of the master and slave modules are connected through wireless communications module NRF24L01. The core of slave is microcontroller STC89C52,and the slave transmits temperature that collected by the temperature sensors to the host via the wireless module NRF24L01, the master receives temperature data via the wireless module NRF24L01, and then the data displays on the liquid crystal LCD1602, so as to achieve the purpose of monitoring. Finally, the temperature and humidity data received by sensor can be sent to the host from two slaves via the wireless module in the range of 5m, the host received the data via the wireless module and the data is displayed on the LCD1602 LCD, so as to achieve the purpose of monitoring the temperature and humidity.

The system is designed with low cost, fast transmission, low power consumption and high reliability,and the software design is simple.

2.HARDWARE SYSTEM DESIGN

The basic block diagram of the system is as

shown in FIG. 1. SCM is mainly used for processing the temperature and humidity signals detected to obtain accurate temperature and humidity values and displays the data through the LCD, also, it sends the data to SCM 10 m (open area) outside .When the temperature and humidity is less than the preset value ,the SCM alarms. MCU-based system, this design receive data of another piece of the microcontroller via the wireless receiver module, and the data is displayed on the LCD.

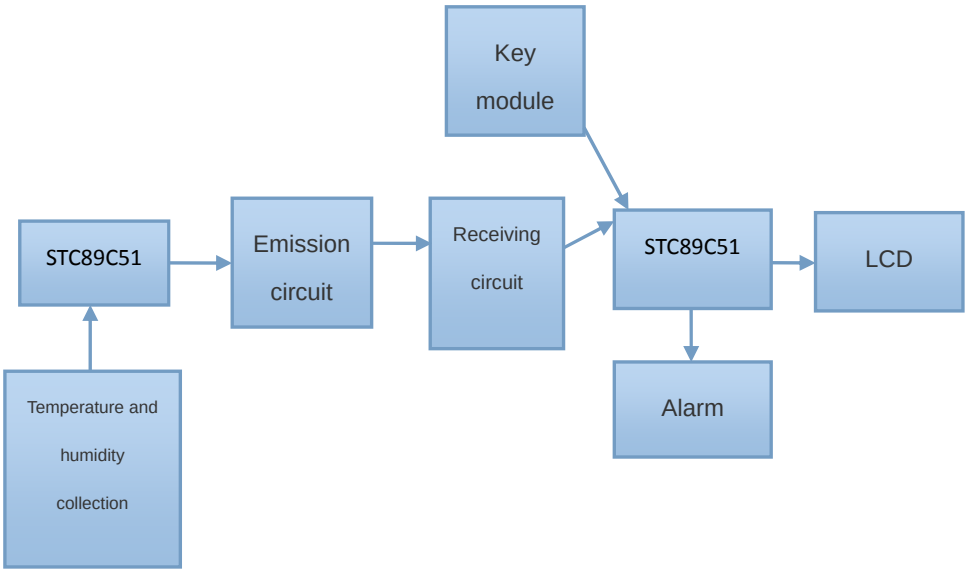

FIG. 1 THE basic block diagram of the system

2.1 STC89C52RC control module design

The module uses double CPU solution whose STC89C52 is the system controller . STC89C52 whose arithmetic function is strong has flexible software programming and large degree of freedom ,also, it can use software programming to implement a variety of algorithms and logic control.Its storage space is relatively consistent with the requirements of this design and the cost is relatively high. Coupled with this design which is due to the precise requirements of the data transmission, we need to use two single-chip respectively for detection and control , both satisfy the design requirements and reduce the burden of a single CPU to improve the stability and efficiency of the system.

2.2 nRF24L01 Wireless Module Design

The module uses wireless RF transceiver chip nRF24L01. nRF24L01 is a new single-chip RF transceiver devices operating at 2.4 GHz ~ 2.5 GHz ISM band. Frequency synthesizer, power amplifier, crystal oscillator, modulator and other functional modules are built in, and enhanced ShockBurst technology are integrated into it, in which the output Power and communication channels can be configured by the program. nRF24L01 has low power consumption, when power of -6 dBm is transmitted, operating current is only 9 mA; when receiving, operating current is only 12.3 mA, a variety of low-power operating modes (power-down mode and idle mode) make more convenient energy-saving design . nRF24L01 can easily set up a wireless network because of ANT protocol, wireless personal area network communication technology of ANT maintain the integrity of the data. nRF24L01 using FSK modulation is a wireless communications chip, which can communicate at a high-speed of point and one pair of n. MCU just provides wireless module nRF24L01 with five ordinary pin and an interrupt pin enables communication functions. So it is very simple for MCU system to set up wireless

communication function with nRF24L01.

Wireless module nRF24L01 circuit diagram is shown in figue2.

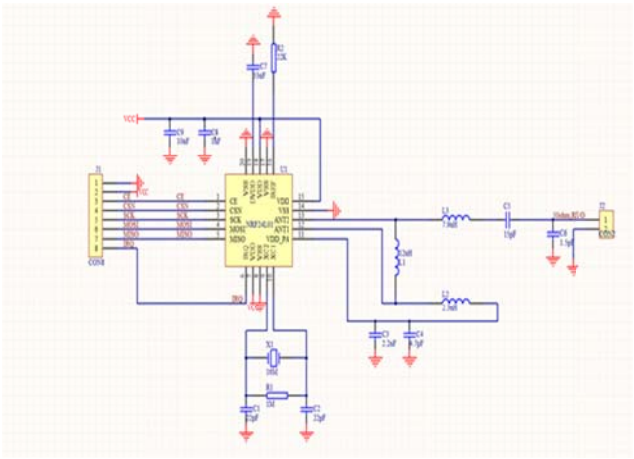

Figure 2： nRF24L01 wireless module circuit diagram

2.3 Temperature and Humidity Sensor Module Design

The module adopts integrated temperature and humidity sensor DHT11. DHT11 is a temperature and humidity sensor with calibrated digital signal output. Accuracy of humidity is + -5% RH and temperature is + -2 ℃, the range of humidity is 20-90% RH and temperature is 0 ~ 50 ℃. Sensor includes a resistive element with a sense of wet and a NTC measuring temperature, and connected with a high-performance 8-bit microcontroller. Therefore, the product has excellent quality, fast response, anti-interference ability, high cost and other advantages. Ultra-small size and low power consumption makes it be the best choice for demanding applications in such applications. Product is 4-pin single row pin package for easy connection. Thesensor output is directly connected to the microcontroller P10 / T, with an external 10K pull-up resistor to the power supply, and it use o + 5v external power as supply.

2.4 Display Circuit Module Design

The module uses LCD to display temperature and humidity. LCD is thinner, brighter, clearer. What's more, LCD has properties of low power consumption and no radiation hazard, it also has advantages in the flat display and stability. And now a lot of LCD character with library and convenient application. 1602 uses a standard 16-pin interface .

2.5. Key Module

The module sets three separate buttons, a set key, a plus key, a minus key.

2.6 Alarm Module

The module uses a buzzer alarm circuit.

3. EACH MODULE SOFTWARE DESIGN

3.1 Data Acquisition and Launch of the Program design

(1)The Main Program

The main function of the main program is responsible for the real-time measurement of temperature, reading out and processing the measured temperature values of DHT11, real-time emission of measured value, temperature measurement conducts once every 1s. The program flow chart is shown in Figure 3.

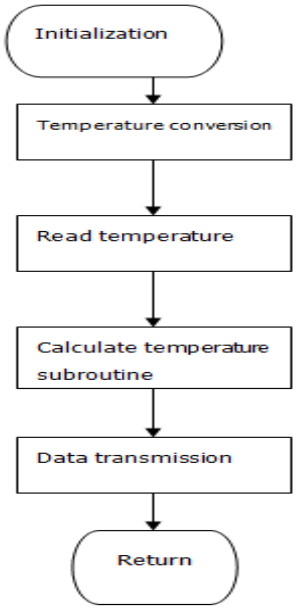

Figure 3: Main program flow chart of data acquisition and emitting

(2) Data Transmission Subroutine

General idea of sending portions: initialize temperature sensor, DHT11 measured temperature, then write the temperature value into data to be

transmitted, then initialize nRF24L01 wireless modules, the temperature is sent to the host, the flow chart shown in Figure 4 below:

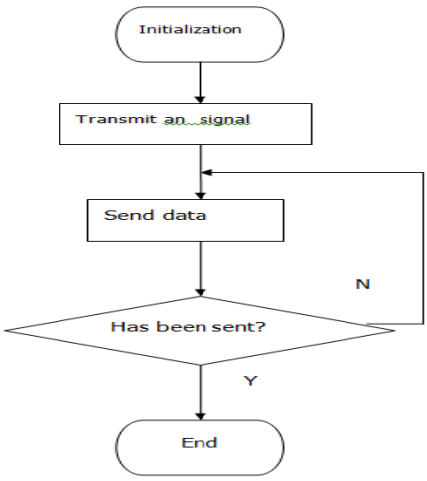

Figure 4: Flow chart of data transmission

3.2 Data Receiving and Displaying Part of the Program Design

(1) The main program

The main function is responsible for receiving and displaying temperature data. After the data is received and decoded correctly, it notifies the microcontroller to begin processe data. The flow chart shown in Figure 5.

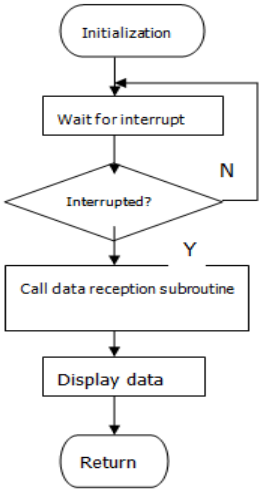

Figure 5: Main flow chart of data receiving and display section.

(2) The data reception subroutine: mainly responsible for the reception and parity of data. After receiving first,then determine whether the received data is OFH, only when received this recognition signal data , the data later came ,the flow chart shown in Figure 6.

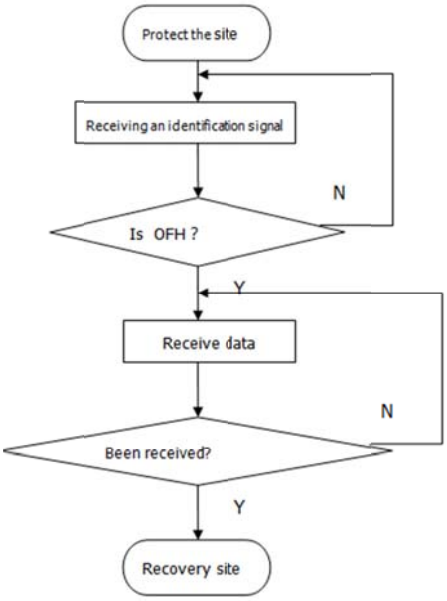

Figure 6: Flow chart of the data reception subroutine

(3) Show the data refresh subroutine: The data refresh subroutine mainly conduct the refresh operation of displayed data in display buffer , when the maximum display the sign bit is 0,it is shifted into the next show. Program flow chart shown in Figure 7

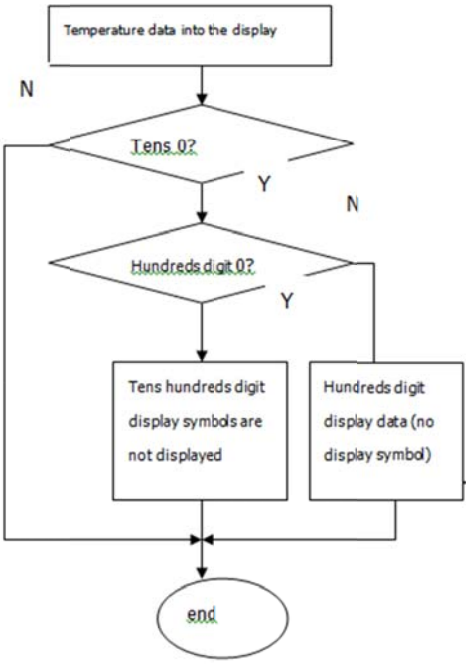

Figure 7: The data refresh subroutine flow chart

(4) Display routines: display routines complete the display and of symbol and digital.

4. Debugging and Experimental Results of System

4.1 Commissioning Procedure

Step 1: Complete welding of hardware circuit.

Step 2: First, write a simple test procedures to test display of LCD1602 whether is no problem.

Step 3: Make microcontroller of the receiving portion connect with a single digital, write the program of the measurement of temperature and humidity . Test hardware and software relating to DHT11.

Step 4: Build a simple wireless communication hardware, write a simple test sequencing , detecte transceiver hardware modules.

Step 5: Write all the sequencing together, build a complete hardware of a master and two slave , also, detect whether the system can display the temperature value measured from two slave on the LCD1602 via the wireless module.

4.2 Experimental Results

The following figure is the master of wireless temperature and humidity test systems, immediately complete LCD1602 initialization when it's powered, and waits for receiving data coming from the transmission side and display it on the LCD1602 in real time.

Figure8:Host of the wireless system of testing temperature and humidity.

The figure is a slave of wireless temperature measurement system. When power is turned on ,it will be completed initialization immediately, Send the temperature and humidity measured from DHT11 to the host via the wireless module .

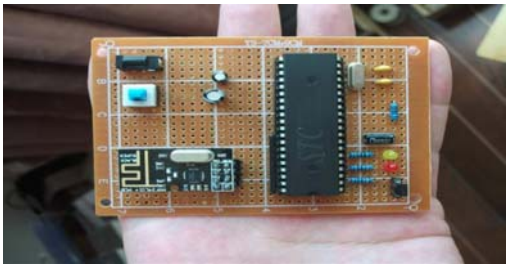

Figure9:Slave of the wireless system of testing temperature and humidity.

5. Conclusions

Distributed wireless monitoring System of factory machinery temperature that is based on STC89C52RC which has a low cost and fast transmission , temperature and humidity sensor DHT11 and wireless module nRF24L01 has a low cost and a low consumption also,its software design is simple and has high reliability . The design has completed that two slaves send the temperature and humidity data recieved from the sensor to the master in the range of 5m , the master display the data on the LCD1602 after receiving it via the wireless module , so as to the purpose of monitoring all the point of temperature and humidity.

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The design of semiconductor laser modulation circuit based on DDS technology

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***Abstract*-The detection method of wavelength modulation based on DFB laser can make the detection sensitivity higher than the direct absorption method even 2 to 3 orders of magnitude .Therefore, there is very important practical value to design DFB Laser driver .**

***Key words*-DFB Laser driver ; gas concentration detection; direct digital frequency synthesis technology; sinusoidal wave signal generator**

Ⅰ.INTRODUCTION

COAL mine gas explosion occurred frequently in China, which has brought great loss to people's life safety and property security.Therefore, it plays an important role in the detection of gas concentration.Gas concentration detection is mostly based on infrared gas analysis method, semiconductor laser is a common source of light.The drive of the traditional laser is the use of analog electronic components to build, but the simulation circuit debugging difficult, not easy to quickly get the need of the driver signal.In recent years, with the development of digital technology, using digital method to drive laser not only can quickly get the driving signal, so that the same laser can be used in different situations.Most of the existing DDS signal generator does not have the ability to drive the DFB laser, so it is necessary to study the DDS signal generator with the ability of driving laser.

Ⅱ.TEXT

2.1 DDS technology

2.1.1 The principle and character of DDS technology

DDS is a high precision clock signal as a reference, by the phase accumulator and register, in the sine look-up table to find corresponding amplitude information, through D / A converter get corresponding digital signal, and then use a low-pass filter, the final output sine signal.As shown in Figure 1, the corresponding relationship between the phase and the amplitude is as follows:

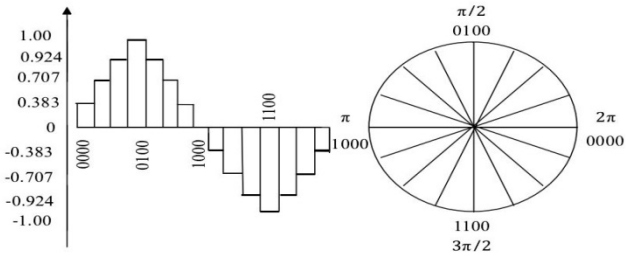

Figure 1:Phase and amplitude map

The sine wave shape can be regarded as a vector of the vector along the phase circle, the phase circle corresponds to a periodic wave of the sine wave.Each sample point in the waveform corresponds to a phase point on a circle.

2.1.2 theory and configuration of DDS

DDS block diagram is shown in Figure 2,contains the phase accumulator, waveform memory, analog-to-digital converter, low pass filter and a reference clock of five parts.Under the control of a reference clock, input frequency control word, the phase accumulator for the frequency control word K were linear superposition, the phase code of waveform memory addressing and magnitude to output the corresponding code, through the digital to analog converter get corresponding ladder wave, the low pass filter by continuous changes in the desired frequency of the waveform.

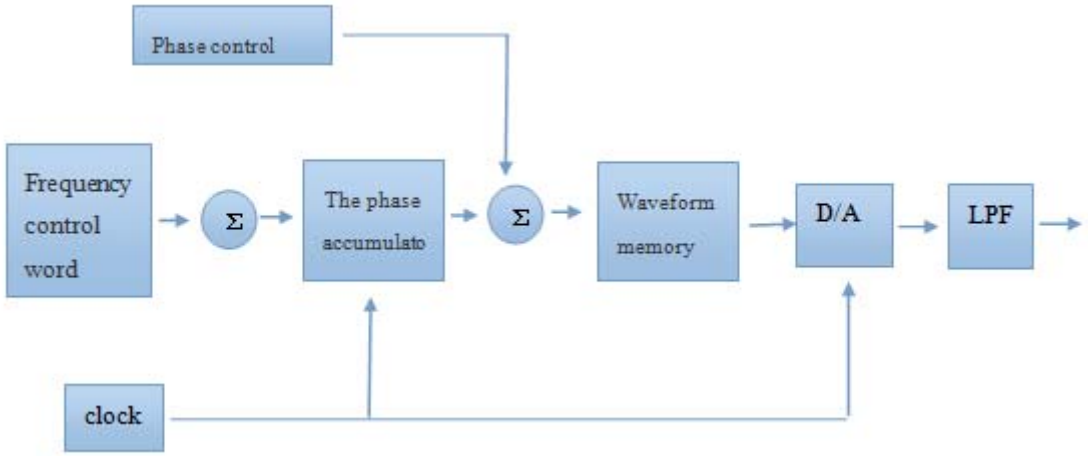

Figure 2:DDS block diagram

2.1.3 DDS device selection

Production of DDS chip manufacturers are mainly AD, Motorola, National Semiconductor Corporation Ns, PHILPS and Fujitsu Corporation in japan.Currently on the market the DDS chip are complete, the commonly used integrated DDS chip AD9850, AD9851. It includes the frequency control word, the phase accumulator, the sine look-up table, a digital to analog converter.With the advantages of low output signal, wide frequency range, low cost, high performance ratio and low cost, the application of DDS chip in frequency synthesis is becoming more and more popular.

Table 1:AD DDS chip selection list

Model	Maximum operating frequency (MHz)	Working voltage (V)	Maximum power consumption (mW)	Remarks
AD9832	25	3.3/5	120	Small package, serial input, built-in D/A converter
AD9831	25	3.3/5	120	Low voltage, economy, built in D/A converter
AD9833	25	2.5~5.5	20	10 pin uSOIC package
AD9834	50	2.5~5.5	25	20 pin TSSOP package, built-in comparator
AD9835	50	5	200	Economy, serial input, built-in D/A converter
AD9830	50	5	300	Economy, parallel input, built-in D/A converter
AD9850	125	3.3/5	480	Built in comparator and D/A converter
AD9853	165	3.3/5	1150	Programmable digital modulator
AD9851	180	3/3.3/5	650	Built in D/A converter and 6 frequency multiplier
AD9852	300	3.3	1200	Built in 12 bit D/A converter, high speed comparator, linear FM and programmable reference clock frequency multiplier
AD9854	300	3.3	1200	Built in 12 bit orthogonal D/A converter, high speed comparator and programmable reference clock frequency multiplier
AD9858	1000	3.3	2000	Built in 10 bit D/A converter, 150MHz phase frequency detector, charge pump and 2GHz mixer

Through the various series of DDS chip from the performance, the price of the comparison, and combined with the requirements of the system, and finally the use of AD9851 as the core chip of the system.AD9851 output frequency is high, can achieve a variety of modulation, phase noise performance is good, the price is moderate, all aspects of performance indicators and functions are to meet the requirements of common signal generator.

2.2 System hardware design

2.2.1 System index

Frequency range：0~1MHz

Frequency resolution：10Hz

Output range：0~5V

Voltage resolution：10mV

Output waveform:sine wave, Square wave

2.2.2Hardware design

As shown in Figure 3，the system hardware is composed of single chip microcomputer control module, DDS signal generating module, DAC module, multiplier module, voltage amplifier module, power amplifier module and human-computer interaction module.Among them, SCM control module is used to realize the control of the whole system, through the key input signal frequency and amplitude value, the microcontroller program to convert the control word to the DDS signal generation module, and the LCD display.The DDS output sine wave signal (or square wave signal) and the DAC output DC signal through multiplier multiply to achieve keying modulation, sine wave signal output frequency and amplitude can be adjusted and occupies emptiescompared adjustable square wave signal, amplified by a voltage amplifier and power, and ultimately the laser driver.

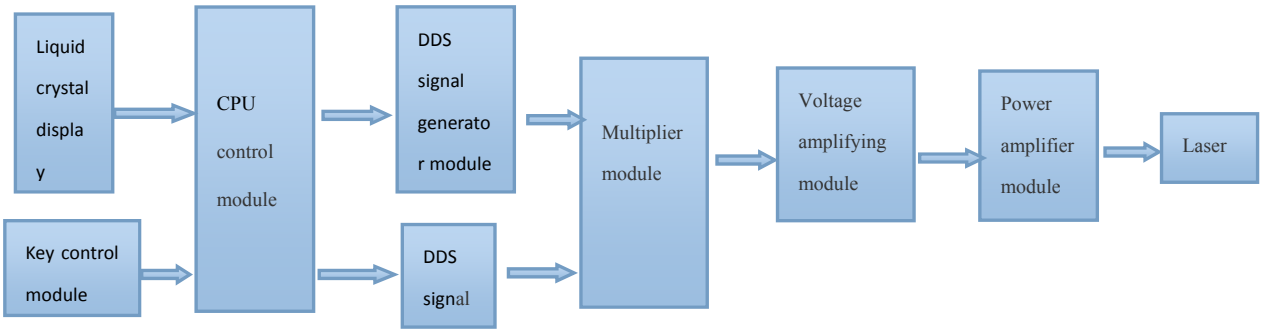

Figure 3 ： system block diagram

2.2.2.1 CPUcontrol module

The central controller selects the ATmega16 chip of ATMEL company.ATmega16 microcontroller is a high performance, low power 8 bit AVR microprocessor, with 16K bytes of the system can be programmed Flash, can be used for the storage of the system;EEPROM's storage capacity is 512 Byte.It is a Harvard structure, with a pipeline, to achieve a single clock cycle of instruction. Powerful ATmega16 single chip is suitable for many of the more complex control applications, is an industrial control machine micro controller.Main performance parameters:

1、EEPROM：512 Byte

2、Flash：16K Byte

3、SRAM：1K Byte

4、16 bit timer / counter: with a pre frequency divider, with the capture function, the comparison function;

5、8 two bit timer / counter: with an independent pre frequency divider, a comparator;

6、32 programmable I/O port line, four channel PWM;

7、21 interrupt sources, 8 Channel 10 Bit analog to digital converter, with UART channel, SPI serial interface hardware structure.

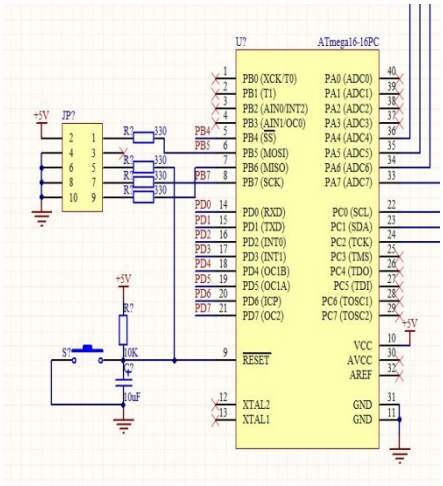

Figure 5： minimum system

2.2.2.2 DDS signal generator module

AD9851 output frequency is high, can achieve a variety of modulation, phase noise performance is good, the price is moderate, all aspects of performance indicators and functions are to meet the requirements of common signal generator.The main characteristics of AD9851 are as follows:

1、single supply operation, working voltage between +2.7～+5.25V;

2、Working temperature range from -45 to 85;

3、Low power consumption, under the 180MHz system clock, the power is 555mW. Power supply is provided with a dormant state, in which the power is 4mW;

4、The interface circuit is simple and can be used in 8 bit parallel port or serial port directly input frequency and phase control word;

5、It can avoid the requirement of the external high speed reference clock oscillator, and reduce the phase noise caused by high external frequency source, which can avoid the requirement of the external high speed reference clock;

6、Band width, the normal output frequency range should be 0 ~ 72MHz;

7、With high frequency resolution, the new high speed DDS code can receive 32 bits of the word frequency, which makes the accuracy of the output frequency of the 180MHz system can be up to 0.04Hz;

8、The phase can be adjusted, can receive 5 bit frequency control word from the single chip microcomputer;

9、Built in high performance digital to analog converter;

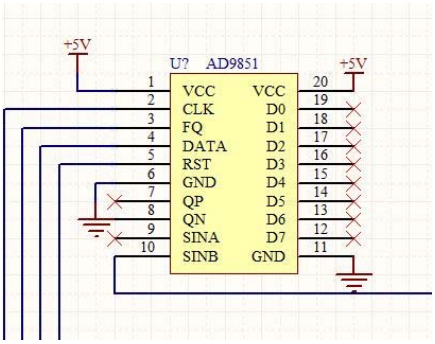

Figure6 ： Signal generating module

2.2.2.3 DAC module

The main consideration in the design is the resolution, interface mode, power consumption of D/A converter.The 16 bit mode converter LTC1655 and 8 bit DAC0832, compared with the obvious advantages of LTC1655.First, LTC1655 is the 16 bit DAC, and the resolution of DAC0832 is only 8, lower accuracy; secondly, LTC1655 uses three line serial interface mode and single chip microcomputer, which saves the I/O port resources, and DAC0832 uses eight bit parallel mode and single chip microcomputer, which takes up too much I/O port, and the power consumption of LTC1655 is 20mW, and the power consumption is 5V. The integrated resolution, power consumption, and the interface mode of single chip microcomputer and other factors are considered, LTC1655 is the most suitable for this design.Using AD780 to do the DAC benchmark, the principle diagram is as follows:

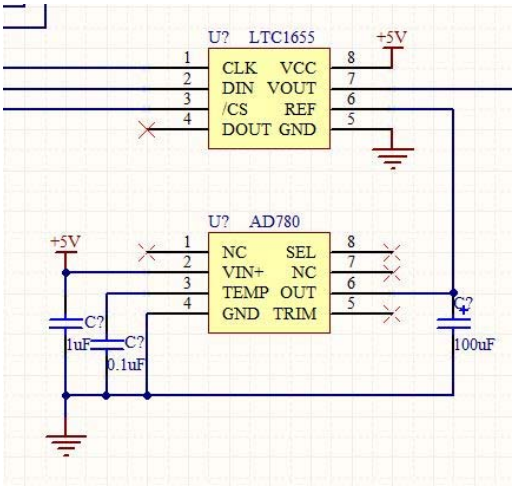

Figure 7：DAC module

Data transmission process: CS first set to low level, the clock is falling edge, the microcontroller controls the incoming data, the clock is set to a high level, sixteen times after the clock is set to a low level, CS set to high.LTC1655 timing diagram shown in Figure 8：

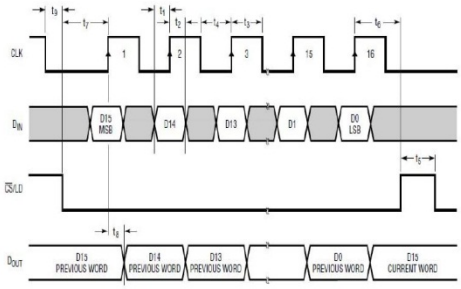

Figure 8：LTC1655 timing diagram

2.2.2.4Multiplier module

The AD835 chip of AD is used to realize the numerical control of the amplitude of the output signal.The ad835 is a first single chip 250 MHz, four quadrant voltage output analog multiplier, the working bandwidth meet system requirements, full scale (- 1 V to + V) rise to fall time is 2.5 ns (using 150 ohm standard RL), 0.1% settling time is typically 20 ns.As shown, the AD835 can generate a linear product of X and Y input. The basic function is W = XY + Z, W is the output signal; X is the input signal; Y is the control signal of DA output; Z is a fixed voltage input signal.The amplitude of the output sine wave signal generated by the DDS signal is fixed at 1V, and it contains about 0.5V. The Z can be adjusted to eliminate the DC component of the sine wave signal, and the DA's DC signal is changed by 0 to Y, and the amplitude of the 1V is multiplied by X.

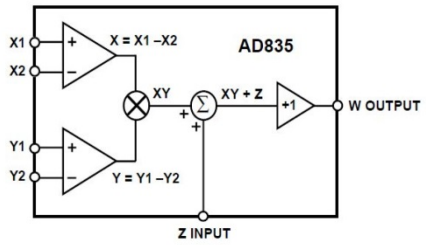

Figure 9：multiplier function block diagram

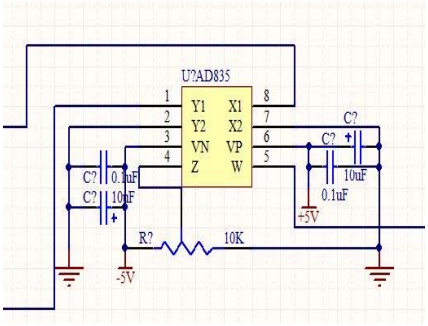

Fig. 10：multiplier module

2.2.2.5 Voltage amplifying module

Voltage amplifier Technology Linear LT1226 chip. LT1226 is a low noise high speed operational amplifier with low input offset voltage and high DC gain.It has the following characteristics:

1GHz working bandwidth

400V / mS conversion rate

1mV maximum input offset voltage

2.5V to + 15V wide supply voltage range

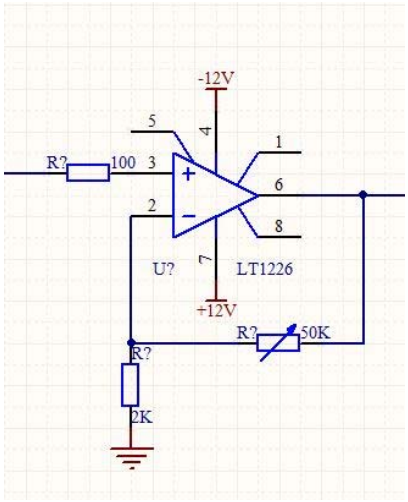

Figure 11：voltage amplifier module

2.2.2.6Power amplifier module

The power amplifier of the LH0002. company of the United States of America calogic the chip is a high current driven high-speed unit gain buffer, with the following characteristics:

High input impedance 400kW

Low output impedance 3W

High power efficiency, low harmonic distortion

Working bandwidth 50MHz

Output voltage swing close to the supply voltage

Output current 400mA

Conversion rate 200V/us

5V to + 20V wide supply voltage range

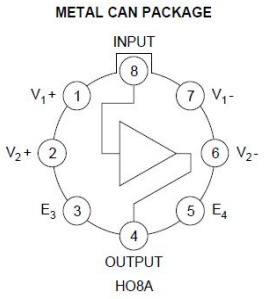

Figure 12：LH0002 pin diagram

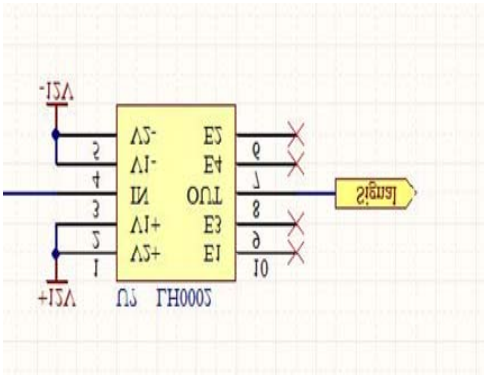

Figure 13：power amplifier module

3 System software design

The control software is very important in the system. It not only drives the DDS signal generating module and DAC module, but also realizes the scanning recognition of matrix keyboard and LCD display control, so the system software will directly determine the stability of the system.

System using ATmega16 microcontroller AVR as the control core, the program through the keyboard input information processing, and then send the command to the DDS AD9851 chip and DAC LTC1655 chip, and can be used to send the frequency and amplitude information to the LCD display. Achieve frequency and amplitude key control, to meet the system requirements of the signal.

As shown in the diagram, the system is reset, the system initialization, which includes the initialization of the ATmega16 external interrupt pin, DDS signal generator module initialization and DAC module initialization, LCD screen, interface initialization, etc.. Then enter the matrix keyboard scan program to scan

the input state. When a keyboard button is pressed, the keys according to judge the function keys or the numeric keys, and enter the corresponding key processing procedure, and simultaneously displayed on the LCD screen. The input frequency and amplitude of the information into the control word write AD9851 chip and LTC1655 chip, get the expected sine wave drive signal, complete a basic operation.

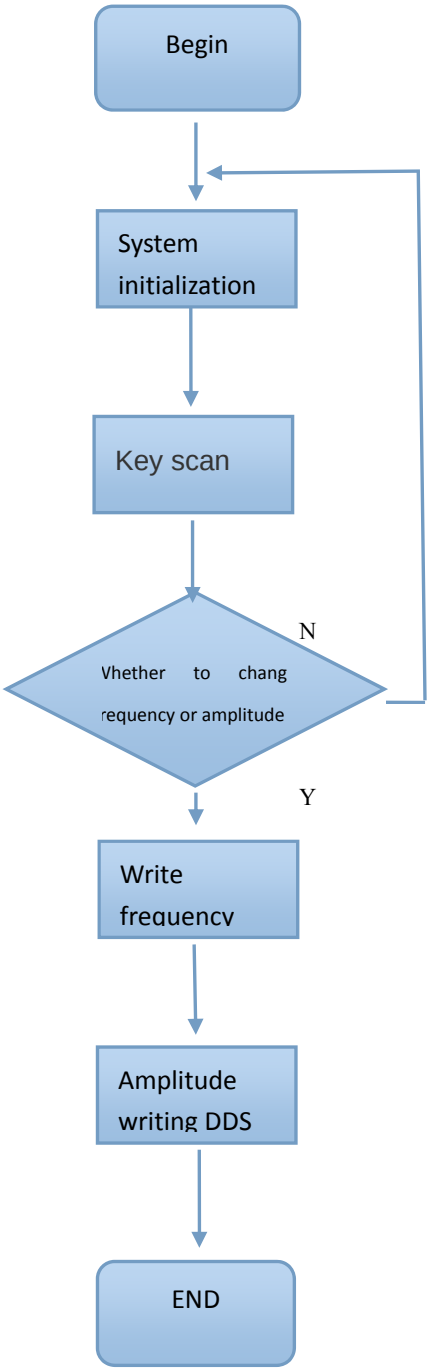

Figure 13：overall program flow chart

III TEST ANALYSIS

The following are the results of the test of the sine wave signal of 1Hz, 10Hz,, 10KHz, 100KHz, 500 1KHz, KHz, 1MHz:

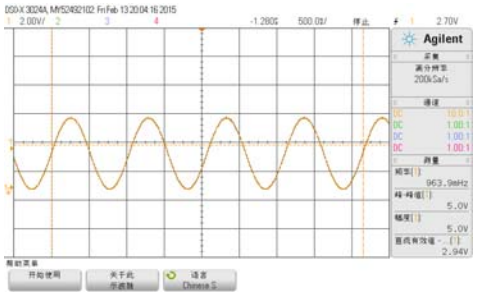

Figure 14： 1Hz sine wave

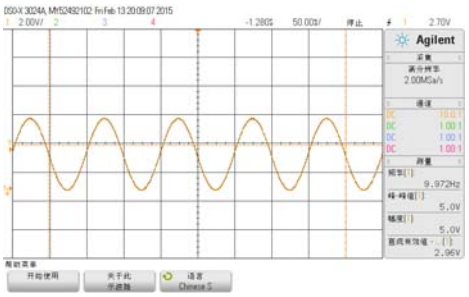

Figure 15： 10Hz sine wave

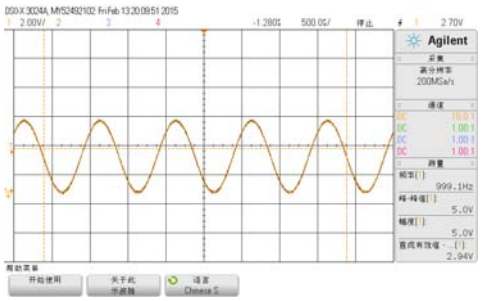

Figure 16 ： 1KHz sine wave

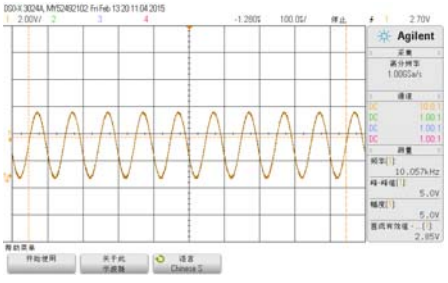

Figure 17 ： 10KHz sine wave

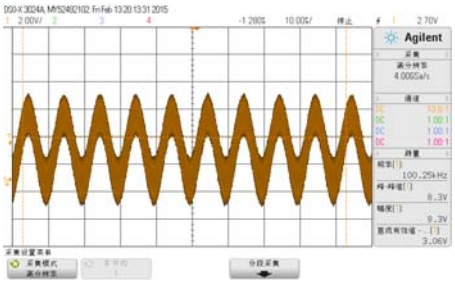

Figure 18 ： 100KHz sine wave

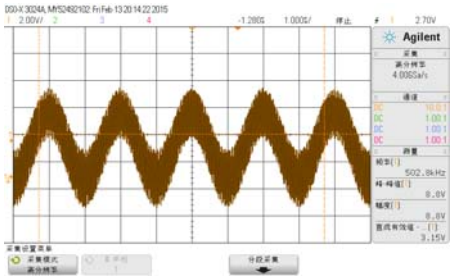

Figure 19 500KHz sine wave

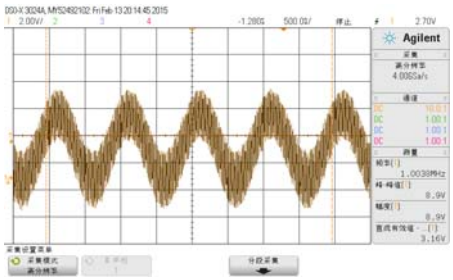

Figure 20 1MHz sine wave

From the oscilloscope test results can be seen that the system output waveform is stable, high frequency accuracy, can achieve the output of different frequency waveforms, although the frequency is high, but has met the requirements of different lasers on the driving signal.

Ⅳ CONCLUDING REMARKS

After testing, the design and completion of the semiconductor laser driver circuit based on DDS technology has achieved the expected design target and can make the same laser based on the need to work in different situations, but also can use the same digital signal generator to drive different types of laser.

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Life rescue system based on CC1101

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***Abstract*-In recent years, earthquakes, landslides and other natural disasters occur frequently, followed by the collapse of houses, people are buried under the rubble, people's lives and safety are seriously threatened, many times the actual experience shows that understanding of the trapped people and the trapped personnel information to help rescue workers quickly and effectively rescue work. So it is very important for us to study the location of the buried pressure staff and access to the information. At present, our country is lack of practical and effective rescue equipment in the field of natural disaster relief system. Based on audio life detection environmental requirements absolutely quiet so that the utility are limited, life detector based on radar and infrared cannot distinguish between people and animals and the detection distance is limited, the video life detector is totally enclosed environment of powerless. The existing life detector can be classified as a "passive" life detector, namely by rescuers launched and to rescue personnel as the center, is stranded the personnel to do not take the initiative to take measures. The design scheme of the CC1101 based search and rescue system is designed. Elaborated the system principle of work and the hardware circuit design, through the design of RF circuit and control circuit of two parts to achieve the sender's identity of the lock and distance measurement. Facilitate the implementation of the rescue workers further rescue work. Plan design simple, ordinary citizens only need to be equipped with low cost of life search Save the card, you can get the ability to search and search in the affected environment.**

***Key words*-Life search and rescue CC1101 STC89C52**

I. INTRODUCTION

SINCE Wenchuan earthquake in 2008 4.14,earthquake in 2010, Yushu Qinghai earthquake, as well as the June 2010 Cenxi Guangxi, Guanling and other places in Guizhou and other places, in recent years, China earthquake,debris flow,landslides and other geological disasters, but due to the current technology is relatively backward, and can not accurately achieve the early warning of sudden geological disasters. The once the disaster occurs, often leading to houses collapsed, people were buried and other major casualties and property losses. When the disaster occurs, the key to the implementation of the rescue of the trapped persons is the key to reducing the mortality. Existing life search and rescue system or life detector are mainly audio life detector, infrared life detector and radar life detector, are based on the capture trapped personnel of the sound signal, human thermal infrared radiation signal and heart beat the ultra low frequency electric field signal, detecting trapped personnel for signs of life, to search and rescue trapped personnel. But they all have some drawbacks: Audio life detector in the search process to find ruins and rubble gap to the operation of related equipment, heavily influenced by the surrounding environment and complicated to operate, search speed is slow; infrared life detector complicated operation, also need to find space for exploration and discovery, and the price is expensive; radar life detector heavy equipment,can not distinguish between human and animal, the implementation of the rescue prone to error signal acquisition. In conclusion, the existing life search and rescue system or life detector are used passive search, by affecting the surrounding environment are larger, the operation is complex and expensive.

This paper intends to research and development and industrialization of the life rescue system different to existing life search and rescue system or life detector, take the initiative to launch a distress signal model with carrier. The small, low cost, easy to carry on the life rescue card, which is used to carry out the life search and search, increase the time of rescue workers, and improve the probability of searching to the trapped personnel, which has the urgent practical significance and broad application prospect.

Ⅱ. OVER ALL SYSTEM DESIGN

The purpose of the study is to create a set of CC1101, STC89C52 search and rescue card, search and rescue system. The hardware system is composed of the search and rescue equipment carried by the search and rescue personnel and the radio frequency device carried by the search and rescue personnel. Search and rescue mode is in search of the FSK radio frequency signal sent to carry the identity information, search and rescue mode search and rescue card to receive this signal, and the identity of the lock. In accordance with the relative energy value of the signal to determine the size of the identification card and the range of the search and rescue apparatus, through continuous mobile search and rescue equipment, can determine the direction of the identity card can be determined by the above two points to identify the location information, so as to achieve the purpose of search and rescue.

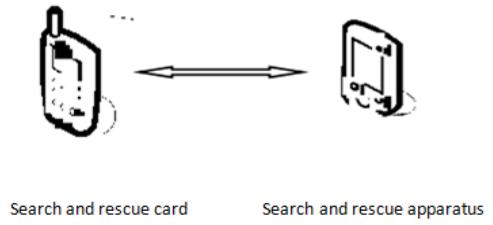

Fig.2.1 scheme of the system

2.1 Search and rescue card scheme design

Collect cards include: power module, wireless module, MCU module.

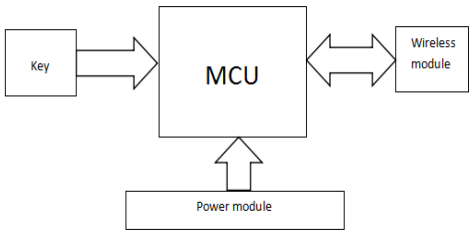

Fig.2.2 search and rescue card system block diagram

Power supply module: micro controller with 5V power supply, while the wireless module uses 3.3V power supply, so the use of ASM1117 module for voltage conversion, and provide a stable power supply for search and rescue cards.

Wireless module: the transceiver module will be transmitted to transmit information to become a radio frequency signal and transmitted to the receiving end of the antenna, and the receiving end.

MCU module: the system by a low power MCU according to the corresponding storage send information processing information to be sent, framing, in accordance with the established access codes for network, positioning, and other related operations. At the same time, the micro controller is responsible for sending and receiving modules related configuration.

2.2 Rescue plan design

The search and rescue apparatus includes: power module, wireless module, MCU module, LCD display module.

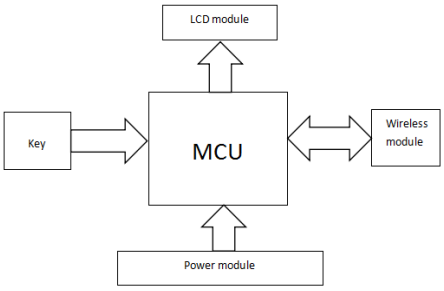

Fig.2.3 block diagram of the search and rescue apparatus

Power supply module: micro controller with 5V power supply, while the wireless module uses 3.3V power supply, so the use of ASM1117 module for voltage conversion, and provide a stable power supply for search and rescue cards.

Wireless module: sending and receiving data. It mainly receives information from the life rescue card and other search and rescue equipment.

MCU module: as the main control unit from the host computer receives the control command, receiving and positioning algorithm, receiving information from the wireless transmission module and finish unpacking, from the self localization module receiving accurate positioning information.

Liquid crystal display module: information and location information received.

III. SYSTEM HARDWARE DESIGN

The CC1101 module which is produced by TI company is used as the core of communication and location. The STC89C52 is used as the core of the main control, and the communication requirement of RSSI ranging from the hardware circuit can be realized. Mainly divided into search and rescue card and the two part of the search and rescue apparatus.

MCU master control module using STC89C52, not too high requirements. STC89C52 is a low power, high performance CMOS8 bit micro controller, with

8K in system programmable Flash memory. STC89C52 uses the classic MCS-51 kernel, but made a lot of improvements to make the chip with the traditional 51 micro controller does not have the function. On one chip, 8 bit CPU and Flash are available in the system, which makes STC89C52 provide high flexibility and super efficient solution for many embedded control applications.

The performance of RF chip directly affects the communication performance of the whole system, and the choice of the RF chip is very important to the whole system. The following factors should be taken into account when selecting a wireless transceiver chip: power consumption, distance, transmit power, receive sensitivity, the number of peripheral components required by the transmitter and receiver, and the cost of the chip. The communication module of this scheme is based on the work of the American TI company in the CC1101 module of wireless data transmission chip which is lower than the 1GHz frequency band. CC1100 is a low cost truly monolithic UHF transceiver designed for low power wireless applications. Circuits are set at 315, 433, 868, and ISM of 915MHz (industrial, scientific and medical) and SRD (short range devices) frequency bands, and can also be easily set to 300-348MHz, MHz 800-928 and MHz 400-464 of the other frequency. The RF transceiver is integrated with a highly configurable modem. The modem supports different modulation formats, and its data transmission rate is 500kbps. The performance can be improved by opening the forward error correction option on the modem.

3.1 Hardware circuit design of search and rescue card

Search and rescue card is made up of three parts: the main chip, power module circuit and wireless transmission module. The main chip is STC89C51, wireless module uses CC1101 wireless module.

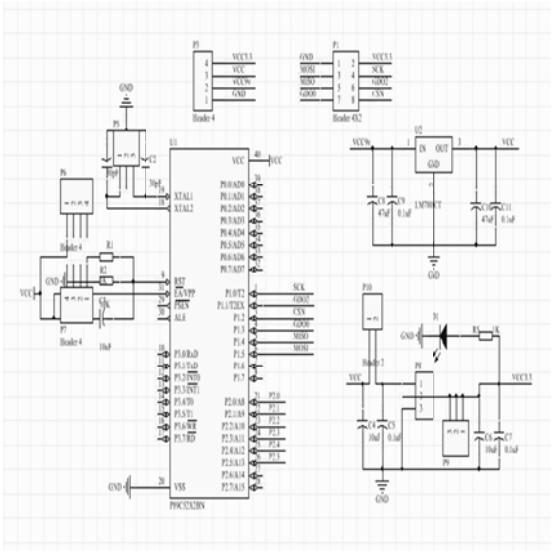

Fig.3.1 search and rescue card schematic diagram

A set of data is fixed by the search and rescue card to carry out the identification and rescue instrument for the RSSI evaluation. Mainly by CC1101 module and STC89C52 composition.

3.2 Hardware circuit design of search and rescue apparatus

The search and rescue apparatus is made up of four parts: the main chip, the power module, the wireless transmission module and the display module. The main chip is STC89C51, wireless module uses CC1101 wireless module. Display module is LCD12864.

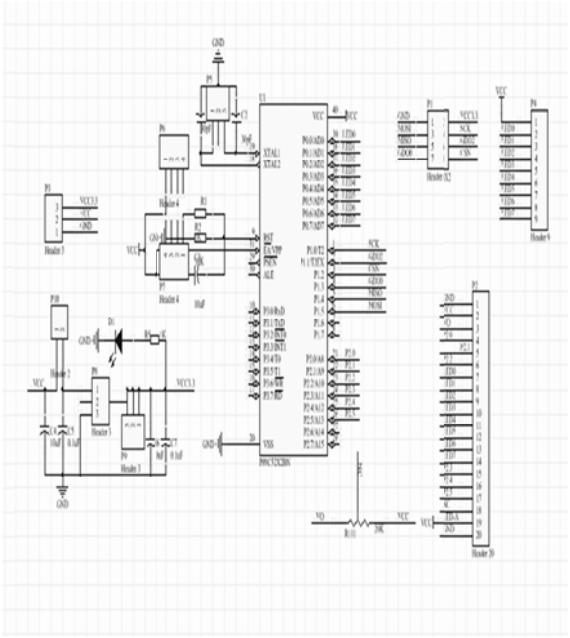

Fig.3.2 search and rescue hardware circuit

The search and rescue instrument is partly responsible for receiving the data from the rescue card, and the RSSI value of the channel is read, and the

corresponding software is converted into a distance, which is displayed in 12864.

Ⅳ. POSITIONING SYSTEM DESIGN

In wireless sensor networks, location information is critical to the monitoring of sensor networks, the location of the event or the location of the information is the important information contained in the sensor network node monitoring information.GPS, infrared and ultrasonic ranging require additional hardware, the hardware cost and size of the nodes, the GPS and infrared range error, and the use of ultrasonic ranging error is 1cm, but the temperature and humidity, etc., based on RSSI, it can not be used to calculate the received wireless signal intensity, which is based on RSSI. The method is based on RSSI.

4.1 Distance measurement based on RSSI

The principle of distance measurement is to reflect the distance between a person and a person by the intensity of the received signal. Here the RSSI function to achieve through the C1101 RF chip. The RSSI value is an assessment of the signal level in the current channel. This value is based on the current gain setting in the RX chain and the measured signal levels in the channel. RSSI is to determine the intensity of the received signal to get the distance between the transmission point, and then according to the corresponding data to locate the technology. This scheme uses this method to obtain the distance estimation, and the different intensity of the RSSI signal is converted into different distance values. Search and rescue according to the distance between the location and the final search to the search and rescue. Working principle is shown in figure 2.

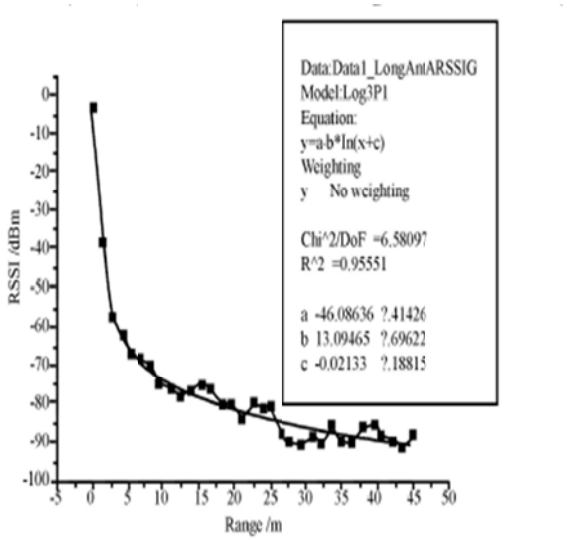

Fig.4.1 RSSI and distance fitting curve

It can be seen that the value of RSSI changes with the change of distance, there is a certain relationship between the distance and the RSSI value.

Ⅴ. SYSTEM TEST

5.1 Environmental impact on RSSI ranging

The actual tests were carried out in the open square in front of the open square in front of the building, which was not disturbed by the grass, the narrow aisle and the strong electromagnetic interference.

On the grass:

Table 5.1. The variation of RSSI with distance from the surface of the grass.

Distance (m)	Number / RSSI (dbm)	1	2	3	4
1		-29	-30	-27	-31
2		-34	-33	-30	-35
3		-41	-42	-37	-42
4		-48	-44	-38	-43
5		-42	-41	-38	-38
6		-43	-44	-38	-40
7		-44	-44	-38	-42
8		-50	-44	-40	-44
9		-50	-43	-41	-50
10		-50	-43	-43	-49
11		-50	-44	-43	-50

It can be seen that the change of the distance between the grass on the RSSI value will change, there is a certain relationship between the distance and the

RSSI value.

Narrow aisle:

Table5.2 narrow aisle RSSI vary with distance

Distance（m）	Number / RSSI（dbm）	1	2	3
1		-32	-32	-32
2		-34	-36	-34
3		-44	-48	-48
4		-49	-50	-50
5		-42	-48	-49
6		-40	-41	-50
7		-41	-42	-50
8		-41	-44	-50
9		-42	-43	-56
10		-43	-44	-55
11		-50	-49	-58

In the narrow aisle, because of the reflection of obstacles and other factors, the RSSI value of the change has occurred in the chaos, the law is not very obvious.

Strong electromagnetic interference in the front of the palace of the geological Palace square:

Table5.3 The RSSI varies with distance from the front of the house

Distance（m）	Number / RSSI（dbm）	1	2
1		-38	-40
2		-36	-50
3		-41	-49
4		-54	-57
5		-43	-50
6		-43	-62
7		-44	-56
8		-44	-54
9		-44	-59
10		-42	-59

In front of the geological palace due to strong electromagnetic interference RSSI value has been very serious confusion, it is difficult to see the law.

After the actual test, it can be seen that the interference in the narrow aisle and the front of the palace is very serious, especially in front of the geological palace. According to the measured values in the grassland, 1M, 2m, 3M, 10m four nodes are fixed.

Node selection:

Table 5.4 the change of RSSI with distance in front of grassland

Distance (m)	Number / RSSI（dbm）	1	2	3	4	5
1		-32	-30	-28	-28	-26
2		-35	-33	-31	-30	-30
3		-39	-40	-37	-38	-36
10		-48	-49	-43	-42	-41

According to the experimental results, the range of the RSSI value of the appropriate node is selected to complete the ranging work.

Ⅵ. CONCLUSION

In this paper, a set of life search and rescue system based on CC1101 chip is designed. The system mainly includes two parts, search and rescue card and rescue instrument. The hardware system is based on the STC89C52 micro controller, wireless RF transceiver chip CC1101 as the core component. After many experiments, the results show that the design system has good working performance, which is beneficial to the search and rescue people clearly the identity information and the specific location of the trapped people. Although the environmental interference is relatively large, but can be determined by constantly moving roughly the location of the search and rescue, can play a role in the rescue. In the future work, we can do further research on the environmental factors under complex conditions.

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Design of intelligent guide rod based on the infrared alarm

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***Abstract*-Based on triangle ranging principle of infrared detector and photoelectric sensing technology, design a new kind of intelligent guide system. This guide system with the mega32 controller as the core, three directions of infrared distance sensors to collect all round the distance of the obstacle information, through a certain algorithm program, the system reads around the distance and the direction of the obstacles making a judgment to alarm the user or not. The double voice alarm system control buzzer and MP3 module,which helps the users determine the direction of walking. This design improves the infrared alarm timeliness and accuracy, so as to guide the blind avoid obstacles and guarantee the safety of walking.**

***Key words*-Infrared detector Mega32 controller Guide rod Voice alarm**

I.INTRODUCTION

NOW there are about 5000000 blind people in China, the world's total number of blind 18%. The blind walking alone in with great difficulty, now guide blind methods mainly the following three: (1) the traditional blind guiding walking stick; (2) using blind guide, (3) using a guide dog guide. The traditional blind guiding walking stick guide blind by hitting the ground to judge whether the can pass in front of, but can not let the blind on around the barrier distribution and and obstacles of distance [1] make judgment; guided in the guide, there are some limitations of the blind; guide dog training cycle is very long, and the cost is relatively high [2].Therefore, this paper presents a guide a blind person walking improved scheme, simultaneous measurement of the front, the left and right-hand obstacle distance information by using three infrared sensors, microcontroller using specific algorithm to judge the preliminary treatment and safety of income data. After using MP3 voice module issued prompt tone and buzzer buzzing alarm to notify the blind around the obstacle distance, through this method expanded the sensing range of the blind, to improve the security of the blind to walk alone.

1 SYSTEM WORKING PRINCIPLE

1.1 Infrared detector ranging principle

The guide system, to measure its distance and obstacle using infrared sensor. The infrared sensor is using triangulation principle to measure the distance between itself and the obstacle, the measured barriers should be reflector with a diffuse reflectance properties, such as paper, walls and other [3][4][5]. The basic principle of triangulation method is the use of plane triangulation. The three vertices of the triangle are obstacles, infrared emission end and an infrared receiver, an infrared transmitting end to a certain angle theta emitted infrared light, when faced with obstacles, the light will be reflected back, the reflected light will exposure to infrared receiving end of CCD detection device, CCD detector relative to the center position will have an offset x, offset size will change d with the distance between infrared detector and obstacles and change. After using the trigonometric function, using infrared emission angle theta, offset x, filter the focal length f, moment D, through the geometric relationship can be the obstacle sensors and the distance D calculated [6], figure 1.1 is schematic diagram of planar triangulation principle.

Common infrared sensor structure is fixed, infrared emission angle theta, lens focal length f, center matrix D is constant, so obstacle sensors and the distance d only by reflecting light in the infrared receiving end of CCD detector offset x [7]. There is a certain proportional relationship between the analog output voltage signal and the offset X of the infrared sensor, which is a function relationship

between the analog output voltage signal and the distance D.

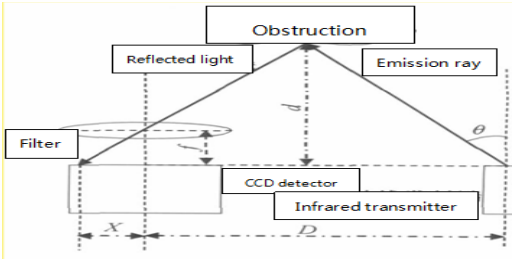

Fig.1.1 The principle diagram of the triangulation ranging

1.2 Sensor simulation output is transformed to the distance output function fitting

In the actual measurement, the infrared sensor output is analog voltage, but in practical programming need to know is the actual distance, so to get the actual distance and the corresponding relationship between the analog voltage. Using infrared sensor to measure the distance between the obstacles and the distance of the fixed distance, the output of the analog voltage and the distance of the obstacle distance, the proportion of the relationship between the two, the function relationship between the [7]. Figure 1.2 describes the corresponding relationship between the analog voltage U and the D of the distance measured by the infrared sensor output. Assuming that the actual obstacle distance and the output analog voltage in accordance with the following relations:

$$D = \frac{m}{U+b} - k \quad (1),$$

type (1), m, B, K are constants, and the deformation is obtained:

$$\frac{1}{D+\mathrm{k}} = \frac{U}{m} + \frac{b}{m} \quad (2),$$

$\frac{1}{D+k}$ and U with a positive ratio, figure 1.3 depicts a functional relationship of $\frac{1}{D+k}$ and U (order $m = 1/4$).

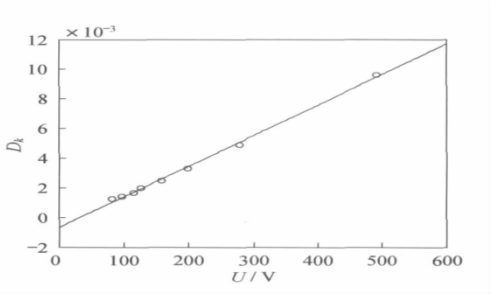

Fig.1.2 Actual obstacle distance and the detector output analog voltage value corresponding curve

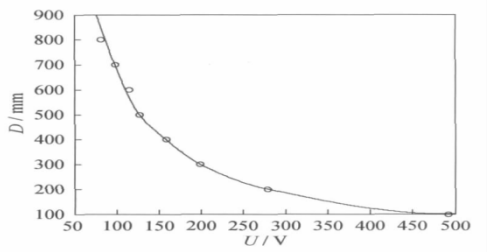

Fig.1.3 The Fitting curve of $\frac{1}{D+k}$ and U

The Slope calculated by MATLAB is $\frac{1}{m} = 0.1472 \times 10^{-3}$,intercept $\frac{b}{m} = -0.412 \times 10^{-3}$,we can calculate $m = 6793$, $b = -2.8$ .Finally, the function relationship of D and U is $D = \frac{6793}{U-2.8} - 4$ .After comparison, the results of this study are basically consistent with the calculation of the calculated results.

2 SYSTEM HARDWARE DESIGN

The guide system mainly consists of three modules, respectively, for infrared ranging module, the signal processing control module, a voice alarm module, as shown in Figure 2.1. Mega32 microcontroller as the control core of the system, SHARP GP2Y0A02YK0F sensor as the infrared distance sensor, MP3-VS1003B voice chip as the main chip of voice alarm module.

2.1 Infrared ranging module

Infrared distance measuring module of SHARP GP2Y0A02YK0F infrared distance sensor, the

measurement range is 20~150cm. SHARP GP2Y0A02YK0F infrared distance sensor is mainly composed of the infrared emission, infrared receiver and corresponding processing calculation circuit. The infrared transmitting and receiving end of the infrared receiving end and the obstacle which is measured constitute a plane triangle, as shown in figure 2.2. The distance between the original and the human is calculated by the triangle method which is introduced above.

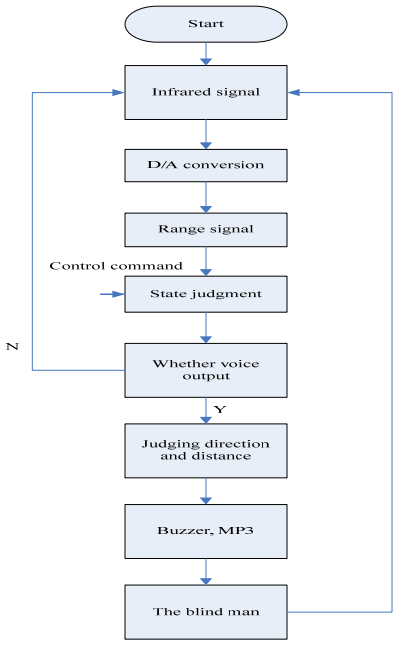

Fig.2.1 The overall design of the system

2.2 Signal processing control module

The signal processing control module flow is shown in Figure 2.3, the mega32 microcontroller as the control system of the main control chip, which has a digital port and analog port, which is used to receive infrared detector analog output voltage value, the input to the A/D link conversion to digital quantity, that is converted to actual obstacle distance, and then according to the actual obstacle distance to determine whether it is in the safe range, then voice alarm chip will generate the corresponding alarm.

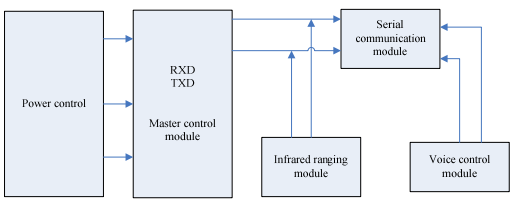

Fig.2.2 The infrared transmitting and receiving

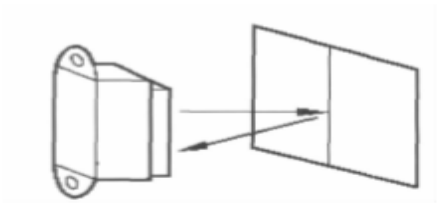

Fig.2.3 The control system work flow chart

2.3 Voice alarm module

Using the VS1003B chip as a voice alarm decoder, VS1003B can support the audio data required to read from the external RAM.

The recorded audio clips are converted into 16 binary code, the code is stored in the external memory, the current distance is less than the default security distance, the software controls the voice decoding, the voice through the headset to play out, to achieve the alarm.

2.4 vibration alarm module

Using the micro vibration motor as vibration alarm unit, using the single chip pin to control, using NPN tube 9013 to drive, vibration motor in the left and right sides of the walking stick, representing different directions, when the distance is less than the default security distance, the vibration alarm.

3 SYSTEM SOFTWARE DESIGN

3.1 Instrument software design

The system uses mega32 microcontroller C language programming, the need for SHARP GP2Y0A02YK0F infrared distance sensor, AD0809, 1602 LCD, etc.. The overall program consists of infrared ranging module, signal processing control module and voice alarm module, as shown in figure 3.1.

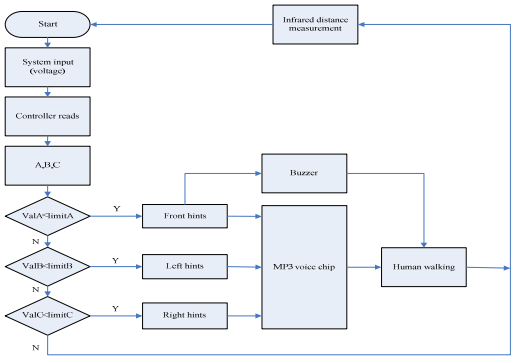

Fig.3.1 The overall program flow chart

3.2 Optimal operation method

Mega32 controller to complete the front, left and right three direction of the infrared detector to control, to the three direction of priority setting, because in front of the blind is the obstacle to the safety of the blind, it should first determine whether there are obstacles in front, and then determine whether there are obstacles in the left and right direction, the priority of the process as shown in figure 3.2.

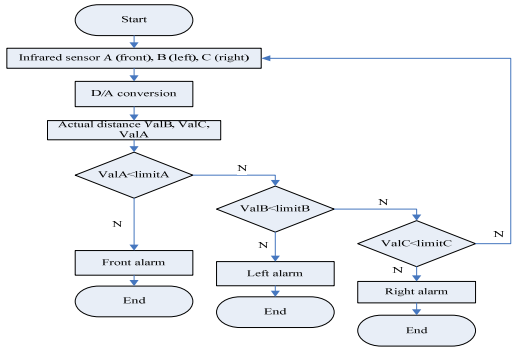

Fig.3.2 Infrared distance sensors in three directions of priority judging flow chart

4 System function test

Indoor test, in front, the left and right-hand sides were placed obstacles, moving obstacle, the distance change, when the distance is less than a setting in the program of safe distance, front, the left and the right correspond, respectively, to the voice alarm, vibration alarm and can alarm simultaneously, confusion does not occur. Set alarm distance is 60cm, the actual alarm distance 58cm, error 2cm.

Outdoor test, by a classmate will be blindfolded, use blind guiding walking stick can be safely forward, test distance of 50m, 20s, and can safely avoid obstacles.

5 Conclusions

The guide rod using singlechip to collect and deal with three infrared distance sensors to collect information, determine the distance between the obstacle and the blind, alarm by vibrating motor and speech decoding chip and set by outdoor simulation experiment, verifies the and practice guide rod control. It is proved that the the guide rod can effectively lead the blind obstacle avoidance, fast walk safely.

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Design and implementation of a movement monitoring system based on the human body sensor and android technology

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***Abstract*-In order to avoid the damages to the body that owing to the incorrect postures and excess exercises in the process of movement and race, the article proposes the design of a movement monitoring system based on the human body sensor and android technology to monitor the real-time parameters and postures of the human body in the process of movement. Using the android platform to calculate calories consume and evaluate modeling of the movement posture in order to avoid sports injury and physical overdraft. Adoption msp430 microprocessor as controller of the monitoring system, three axis (X, Y, Z) acceleration of the human body can be measured by using mpu6050 three-axis acceleration sensor.Moreover, motion parameters of acceleration, speed, mileage and consumption of calories in the movement can be detected. The trajectory of the human body can be tracked and positioned.Through the identification algorithm of human body posture, it can evaluate human body motion and prejudge dangerous action. Experimental results show, system can realize real-time motion monitoring and tracking, protect of health of exercisers.**

I. INTRODUCTION

EXCESSIVE exercise and uncorrected athletic stance in athletic and healthy exercise cause that the physical agility and balances of human are on the decline,in severe cases they can lead to muscle atrophy, cartilage damage and other permanent injuries.pretrial acceleration sensor combines the Android platform, which can build sports model and reflect the situation of human movement effectively and fully.It can also correct the non-standard athletic stance of athlete effectively, optimize sports training, improve efficiency, prevent sports injuries and excessive exercise.Applies to exercise, it can prevent the elder from falling down effectively, and provide a method to evaluate exercise of their own for the patients with chronic diseases and obesity.

II . THE MATHEMATICAL MODELING ANALYSIS OF MOTION INFORMATION

A. Modeling about consuming energy

The steps per second n:the body speed at the end of one second $v_1 = v_0 + a_1 \times t_1 (m/s)$,mileage in one second $x_1 = v_0 \times t_1 + \frac{1}{2} \times a_1 \times t_1^2$ （m）,A step size for adults is about 0.35m,so steps per second: $n = \frac{x_1}{0.35}$.

Average speed in movement $\overline{V}$:Average speed in one second is obtained by $\overline{V}$ = steps per second × step length .The relationship between stride length and the steps per second is shown in Table 1.

n	1	2	3	4	5	6	>6
m	h*5	h*4	h*3	h*2	h*2	h*1	h*0.5

TABLE 1 THE RELATIONSHIP BETWEEN STRIDE LENGTH AND THE STEPS PER SECOND

Energy consumption W :Derived from table 2 the total calories consumed in N is: $W = \sum_{i=1}^{n} 4.5 \times w_1 \times \overline{V}_i \div 1800$,w1 (Kg) for the individual weight.

Average speed	8	12	16	20
waster of energy (C.Kg.h)	10	15	20	25

TABLE 2 RELATIONSHIP BETWEEN AVERAGE SPEED AND ENERGY CONSUMPTION

B. identification of human motion model

Based on three axis accelerometer calibration of

human body attitude angle calculation.

The human body is divided into the human body coordinate system as the basis, the human body posture is determined mainly by the pitch angle and the roll angle, G is the gravity acceleration G_X, G_Y, G_Z. The measuring value of the three orthogonal axis of the acceleration sensor is located in the pitch angle. θ Roll angle λ, θ Formula (2) is available.

$$\theta = -\arcsin(\frac{G_Y}{g}) \tag{1}$$

$$\gamma = \begin{cases} \arcsin(\frac{G_X}{g\cos\theta}), G_Z < 0 \\ \pi - \arcsin(\frac{G_X}{g\cos\theta}), G_Z > 0 \,\&\, G_X > 0 \\ -\arcsin(\frac{G_X}{g\cos\theta}) - \pi, G_Z > 0 \,\&\, G_X < 0 \end{cases} \tag{2}$$

Recognition of motion pattern of 1.2.2 based on three axis acceleration sensor The human body motion model can be viewed as an organic combination of several basic moving elements such as turning, walking, jumping, squatting and so on. Human movement pattern recognition is the important feature of human body posture.

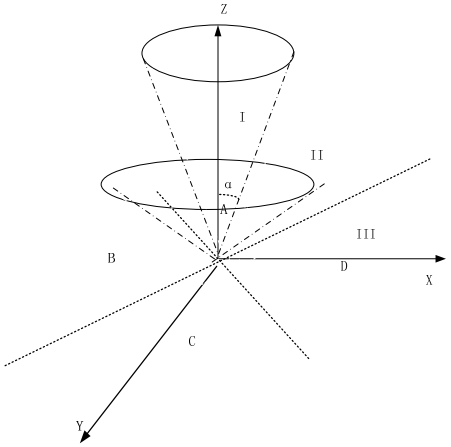

Figure 1 horizontal, vertical partitioning method

More emphasis on the vertical direction, region of space around the body in the XY plane is divided into four regions, a, B, C and D respectively for human body front, left, back, right. Standing / duck / stand, stand / sit / stand, and forward running a wide range of motion in a region. Supine, supine to sit action occurs in the C area. Lateral or falling action occurs in the B, D area. The vertical axis to horizontal surface a total of 90 degrees of space is divided into three zones from the vertical axis angle judging method, see Table 3. Division of the human body in a direction of movement of the strong.

θ	AREA	State
$0^\circ < \alpha < 20^\circ$	I	Upright state
$20^\circ \le \alpha \le 40^\circ$	II	Transition state
$40^\circ < \alpha < 90^\circ$	II	Horizontal state

TABLE 3 TABLE OF VERTICAL SPACE

Comprehensive level and vertical two classification scheme, the space around the human body re partition. Original zone I numbered 1, original II region according to the order of the partition in the horizontal direction is divided into four partitions, followed by the number is 2,3,4,5. III region of the partition number followed by 6,7,8,9. set a time body pitching angle is , roll angle for , heading angle is . At this time between the human body and vertical axis angle available $\alpha = \arccos(\cos\theta\cos\gamma)$ Obtained.

The position of the human body in the horizontal direction is judged as, when $|\sin\gamma| < |-\sin\theta\cos\gamma|$且$-\sin\theta\cos\gamma > 0$ Located in the A area;when $|\sin\gamma| > |-\sin\theta\cos\gamma|$且$\sin\gamma < 0$,B area;when $|\sin\gamma| < |-\sin\theta\cos\gamma|$且$-\sin\theta\cos\gamma < 0$,C area; when $|\sin\gamma| > |-\sin\theta\cos\gamma|$且$\sin\gamma > 0$, D area;Using the 3D vector [X1, X2, X3] represent the initial state, intermediate state and the final state, and obtain the human body posture sequence, thus further determine the process of the movement of the trunk part of the change.

III SYSTEM ARCHITECTURE DESIGN

System by measuring the pretrial acceleration (G_X, G_Y, G_Z), complete calorie consumption calculated using the motion pattern recognition algorithm to determine the body posture and falling alarm anticipation, the use of GPS technology to achieve human motion tracking. Comprehensive calculation,

in order to meet the state's monitoring of human movement.

The overall system architecture flow chart shown in Figure 2.

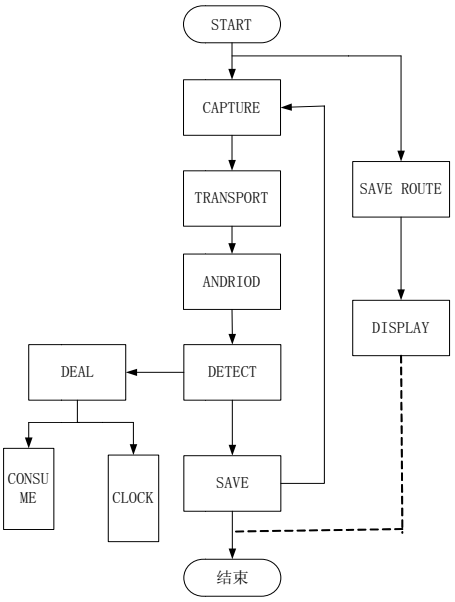

Figure 2. The system flow chart

A. Hardware Systems

The hardware consists of three-axis acceleration sensor mpu6050 monitoring body movement, micro SD card, temperature sensor DS18B20, organic light emitting diode OLED display, microprocessor msp430 data processing, as well as Bluetooth module hc05 and other components, systems, and information flows as shown in the frame Figure 3.

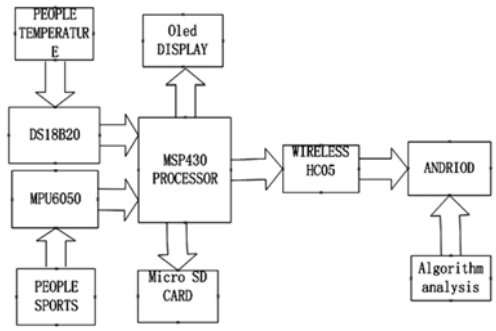

Figure 3. The system framework and information flow

Figure 3 shows, the microprocessor parameter obtaining human body temperature by the temperature sensor, the ambient temperature to obtain the human body in which the three-axis acceleration and motion in different states by pretrial acceleration sensor. The microprocessor on the one hand these data are displayed by the display, on the other hand turn into the SD card to store these data in order for the acquired data for offline analysis; microprocessor while the data is transferred to the phone via Bluetooth module Android platform, Android phones through algorithm analysis and program will be integrated three-axis acceleration to calculate the speed of the human body in different state of motion, distance, calories burned and athletic stance, and to show up on the phone.

B Design Software System

System software flow chart shown in Figure 4.

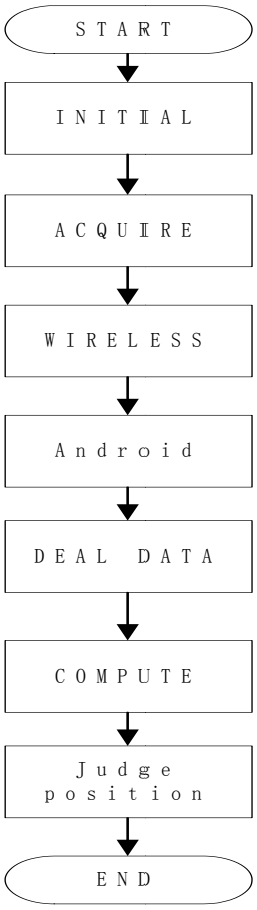

Figure 4.System software flow chart

C. Create Android platform

Android platform server using Struts2 + Hibernate framework architecture, data storage using the Mys database. Server architecture shown in Figure 5.

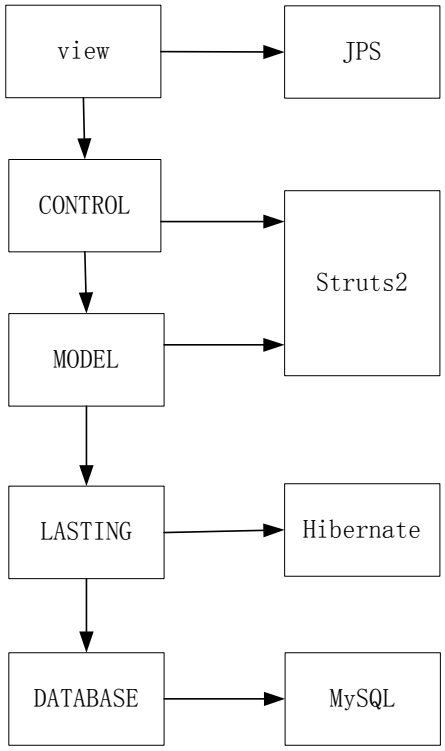

Figure 5.Server architecture diagram

Entire server mufti-level structure, from top to bottom is the controller layer, the Model layer, persistence layer and database layer. Struts2 serve as the control layer and the model layer, Hibernate act as a persistence layer. The Struts2 framework Birdwatcher as the controller, it acts as a filter Selves receiving user requests, filtering and forwarding. Struts2 in Action as a model layer, used to call the business logic to process the request, can also be used to transfer data.

D. GPS positioning technology

GPS positioning projection method commonly used Gaussian ellipsoid geodetic coordinates of each point according to certain rules projection onto a plane, and a corresponding Cartesian coordinates. Known reference points in the heart of the earth earth latitude coordinates and geodetic longitude (B, L), reference ellipsoid long axis of a, a first eccentricity e, the calculation Gauss projection Cartesian coordinates (x, y) of see method shown in Equation (3) (4).

$$x = X_0^B + \frac{1}{2}Nm_0^2 + \frac{1}{24}(5-t^2+9\eta^2+4\eta^4)Ntm_0^4 + \frac{1}{720}(61-58t^2+t^4)Ntm_0^6$$

$$y = Nm_0 + \frac{1}{6}(1-t^2+\eta^2)Nm_0 + \frac{1}{120}(5-18t^2+t^4+14\eta^2-58\eta^2t^2)Nm_0^5 \quad (3)$$

$$x_e^B = C_0B - \cos B(C_1\sin B + C_2\sin^2 B + C_3\sin^5 B)$$

$$t = \tan B$$

$$l = L - L_0$$

$$m_0 = l\cos B$$

$$\eta^2 = \frac{e^2}{1-e^2}\cos^2 B \quad (4)$$

$$N = \frac{e}{\sqrt{1-C^2\sin^2 B}}$$

Where L, B before the conversion of latitude and longitude coordinates, x, y coordinates for the Gauss converted, L0 projection coordinates for the central meridian strip, C0, C1, C2, C3 is nothing to do with the point but only with the ellipsoid parameters constant.

IV. EXPERIMENTAL RESULTS AND ANALYSIS

Design experimental samples of human motion sensing and Android technology monitoring system for the 10 health and height of 160cm ~ 180cm, weighing 50Kg ~ 60Kg volunteers, experimental distance of 50m, experimental approach to upright walking, jogging, falls three kinds of motion, the collected experimental data as shown in Table 4.

Motio	t(s)	a_x (m	a (m	A_Z (m	a (m/s	S(m)	T(°C)	Calorie consumption
Norm	1	2.3	0.6	1.1	2.62	2.62	23.1	396.57
	2	3.	0.	1.	3.51	6.1	23	531.66
	3	2.	0.	0.	2.81	8.9	23.	424.76
	4	2.	0.	1.	3.01	11.	23.	455.99
Fast	5	4.6	1.7	3.2	5.86	17.8	23.3	886.62
	6	5.	2.	4.	7.28	25.	23	1101.66
	7	5.	1.	3.	6.66	31.	23.	1008.21
	8	4.	2.	4.	6.78	38.	23.	1026.24
Fal	9	3.	2.	5.	6.91	45.	23.	1046.04
	10	1.	2.	5.	6.16	46.	23.	932.62
	11	2.	1.	6.	7.05	46.	23.	1067.41
	12	2.	2.	7.	8	50	23	1210.62

TABLE 4.EXPERIMENTAL DATA

A. Analysis of experimental accuracy

Volunteers wearing sports monitoring system and Brother WL-195 sports treadmill comparison test, the test result data are shown in Table 5, Table 6, Table 7 below.

Speed	1.2 Steps per	1.4 Steps per	1.6 Steps per	1.8 Steps per
Normal walking	89%	93%	85%	73%

TABLE 5. PERSONAL SAME DATA ACCURACY NORMAL WALKING AT DIFFERENT SPEEDS MEASURED

Speed	2.2 Steps per	2.4 Steps per	2.6 Steps per	2.8 Steps per
Running accuracy	89%	93%	85%	73%

TABLE 6. THE SAME PERSON AT DIFFERENT SPEEDS WHEN RUNNING THE MEASURED DATA ACCURACY

Serial	1	2	3	4	5	6	7	8	9	10
Accurac	89%	92%	84%	87%	96%	88%	95%	92%	81%	89%

TABLE 7. DIFFERENT PEOPLE WALKING AT THE SAME SPEED MEASURED DATA ACCURACY

B. Analysis of experimental data

X, Y, Z-axis acceleration of the average 10 testers in the same state of motion, and the synthetic acceleration pretrial acceleration vector $\vec{a}_x$ 、 $\vec{a}_y$ 、 $\vec{a}_z$ synthesis, synthesis by the vector equation: $\vec{a} = \sqrt{\vec{a}_x^2 + \vec{a}_y^2 + \vec{a}_z^2}$ Get. At the same time by the formula (1) and (2) can be obtained, when the body's normal walking, the average α is 13.32 °, is in an upright state, and $|\sin\gamma| < |-\sin\theta\cos\gamma|$且$-\sin\theta\cos\gamma > 0$, is located in Area A, in line with the body's normal walking time attitude; When the body jogging average α is 37.64 °, in a transitional state, and $|\sin\gamma| < |-\sin\theta\cos\gamma|$且$-\sin\theta\cos\gamma > 0$, located in Area A, in line with the movement posture of the body while jogging; when the body falls, the average α was 67.39 °, in a horizontal state, while meeting the $|\sin\gamma| > |-\sin\theta\cos\gamma|$且$\sin\gamma > 0$, in the D area, in line with human fall when athletic stance. The measured within three minutes of real time three-axis acceleration of human movement, thereby to obtain the body's normal walking, jogging, when fall acceleration curve as separately Figures 6, 7 and 8 below.

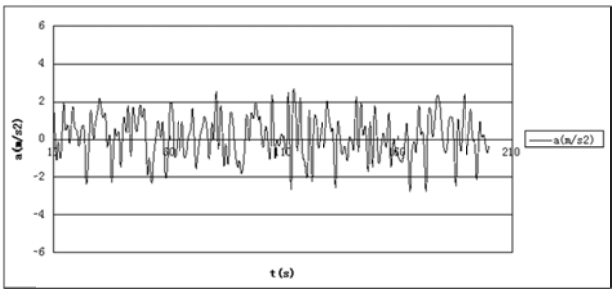

Figure 6. normal walking acceleration curve

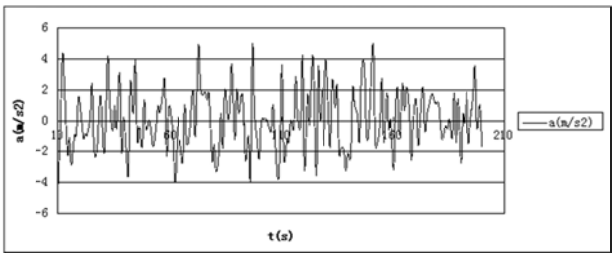

Figure 7. Running the acceleration curve

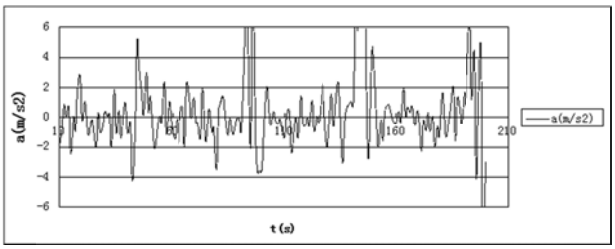

Figure 8. Running the acceleration curve

It will be apparent from the above data and graphs, when the body's normal walking and running, X-axis acceleration is significantly greater than the acceleration Y-axis and Z-axis, and when the body of running pretrial acceleration higher than normal when walking in three axis acceleration. When the human body in weightlessness fall, due to the influence of gravity, then Z-axis acceleration significantly less than the acceleration due to gravity. The human body has a different attitude when you fall, so pretrial acceleration vary when human fall, in addition to human fall when larger range of motion, so that the data obtained is larger than the three-axis acceleration of the body's normal walking three graph visual display pretrial acceleration changes.

V. CONCLUSION

This paper presents a portable motion monitoring system design, realization of human motion axis acceleration, speed, mileage and other parameters measuring binding Android mobile phone platform by msp430 controlled, and through the movement pattern recognition algorithm to judge human motion gestures and issue falls alarm, and the use of GPS technology

for real-time tracking of the movement route. System of motion parameters motion analysis process available calories burned, physical activity assessment body in order to prevent excessive exercise and sports injuries pose a threat to health.

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Design and implementation of speech presenter microphone based on LD3320

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***Abstract*-In order to facilitate the needs of pointer and microphone simultaneous users, the design of combining the two into one. This paper introduces the structure of speaker independent speech pen flip LD3320 voice chip and realization method based on. The voice flip pen microphone using stc12le5a60s2 MCU as the main controller, control ld3320 on speech recognition and processing. Then according to voice commands to produce the corresponding infrared pulse sequence, the key type infrared pen page replacement, the realization of PPT speech remote control and receiver function.**

***Key words*- LD3320; speech pointer; single chip**

I. INTRODUCTION

INFRARED remote control with small size, power consumption and low cost, strong features, is widely used in various home appliances communication and remote control equipment design [1-3]. Infrared remote control need through the keys to realize the control function, while the teacher in class often needs to write on the blackboard, hold the microphone and take a teaching rod pointing on the screen. Therefore, flip pen infrared remote control greatly limit scope of activities of the hands, causing unnecessary for the teacher teaching. Voice has a simple, fast and flexible characteristics, speech recognition technology has a good development prospects. At this point, to take voice control becomes a necessary choice. This paper introduces chip ld3320 characteristics and design of control circuit and program design, the realization of a voice flip pen microphone. The voice flip pen microphone through voice control flip pen send commands, without voice button control pages of ppt turning function and can join the microphone function in greatly facilitate the users.

II.SPEECH RECONGNITION TECHNOLOGY

Speech recognition is an interdisciplinary. Areas involved in speech recognition technology include: Signal Processing, Pattern Recognition, Probability theory and information theory, Vocal mechanism and auditory mechanism, Artificial intelligence, etc. Voice communication with the machine, so that machines understand what you say, this is what people dream of a long time. Speech recognition technology is a high technology which makes the machine transform the speech signal into the corresponding text or command through the process of the recognition and understanding. Speech recognition technology mainly includes feature extraction technique, pattern matching criterion and model training technique, as in Fig.1.

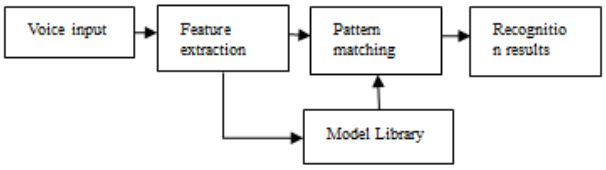

Fig.1 Realization of speech recognition

Speech recognition process consists of two stages: Training phase and the recognition phase [4-8]. In these two stages, the input speech needs to be pre-processed and feature extraction. In training phase, by saying the required identification of the contents successively, after pre-processing and feature extraction, the feature parameters are obtained, and the characteristic parameters are stored in the reference model. In the recognition phase, comparing of the similarity measure between the characteristic parameters of the input speech and the reference model of the reference model, then the highest similarity of the input feature vector is used as the output of the recognition result, so as to achieve the purpose of speech recognition. The working diagram is shown in Fig.2.

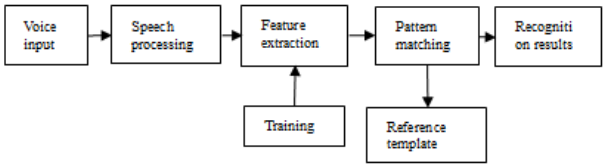

Fig.2 Steps for speech recognition

III. THE SYSTEM STRUCTURE

The whole system consists of voice input module, voice processing module, control module and a wireless signal output module, System structure block diagram is shown in Figure 3.

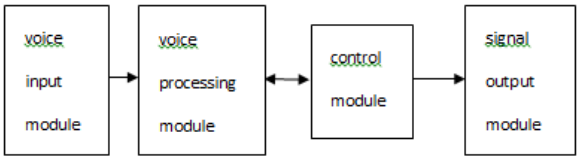

Fig.3 System structure block diagram

At first, the user gives the system speech input signal, then the speech signal will be recognized by voice processing module after pretreatment, and the result of speech recognition will be sent to the control module. Finally, the output signal will control the system working.

IV. STRUCTURE MODULE

A.The Voice Input Module

The voice input module gets user speech mainly through the MIC, then puts it to pin 9, pin 10 and MICN of voice processing module. To improve the system noise immunity, the sound signal can be processed to reduce noise before using. ADC gain can be adjusted by changing the value of the 35 register of LD3320, and the user will achieve the effect he want, The larger value will bring the greater MIC volume and the more sensitive identification starting, but it may bring more erroneous identification; The smaller the value, the smaller the MIC volume is, the recognition function will be started only when you speak closely, the benefit is that the system will not react to the distant voice interference.

B. The Voice Processing Module

The function of voice processing module is mainly completed by the LD3320 chip.LD3320 chip is a voice recognition ASIC [9-10].The chip integrates a speech recognition processor and a number of external circuits，which include ADC、DAC、a microphone interface and voice output interface etc. This chip focus on energy conservation and efficiency in chip design and it does not require any external auxiliary chip such as Flash or RAM and so on. Speech recognition, acoustic control, interactive function can also be achieved, moreover, you can dynamically edit the list of identified key words.

Its features include some points as follows:

- Highly accurate and practical speech recognition effect.
- Keyword list which can be dynamically edited: you just need to transfer the key word that need identified into the chip as a string, then it can take effect immediately in the next recognition. For example, when you are programming using a single chip, the chip can recognize this setting keyword simply by setting the chip register, just like put identification keyword such as "hello" into the chip.

Allows users to edit 50 keywords freely：at the same time, it can identify during at most 50 keywords. Users can edit and update the contents of this 50 key words at any time according to different requirement. Its chip block diagram is shown in Figure 4. The circuit diagram is shown in Figure 5.

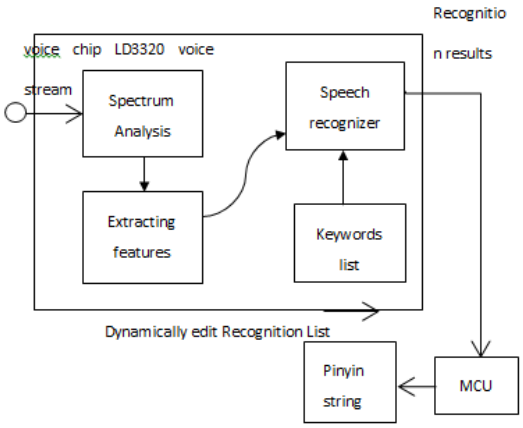

Fig.4 Chip principle block diagram

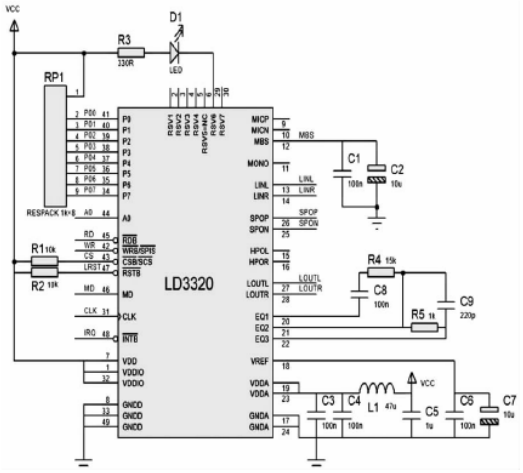

Fig.5 LD3320 application circuit diagram

The chip LD3320 uses parallel bus 。C51_AD0~C51_AD7 connect to P0~P7 of chip LD3320。C51_A8（P2.0）connects to A0 of chip LD3320, A0 is used to distinguish the data segment and addresses segment。Control signal CSB、WRB and RDB are connected to C51_A14（P2.6）、C51_WR（P3.6）、C51_RD（P3.7） separately.

C. Master Control Module

The master control module of voice remote control mainly composed by the single chip STC12LE5A60S2. Its working voltage is 3.3V,it has a 8K flash memory and a 512 bits SRAM memory, it also has asynchronous serial interface and 40 I/O interfaces, therefore, this single chip is sufficient to meet the needs of master control system[11]。The master chip circuit diagram is shown in Figure 6.

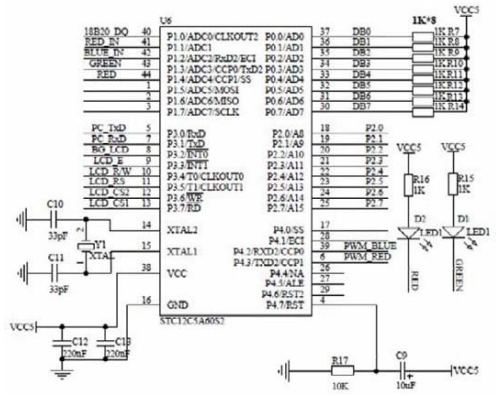

Fig.6 The master chip circuit diagram

Additionally, by using a wireless remote control circuit to control a switch combination consists of two relays，you can switch between speaker function and speech recognition，so the two working ways run independently, which improves the work efficiency.

V. SOFTWARE PROGRAMMING

The system's speech recognition process is shown in figure 7.

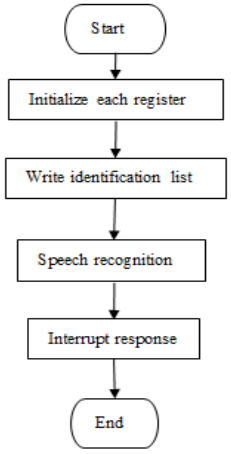

Fig.7 Speech recognition flow chart

First initialize the registers. Mainly complete soft reset, mode setting, clock frequency setting and FIFO setting. Resetting chip is transmitting low level to the chip of the 47 feet (RSTB), then needing to do one time low to high with a chip select CS, to activate the internal DSP.

Second write identification list. Each identification item corresponds to a specific number (1 bytes), and different identification number can be the same, and not continuous. The chip supports up to 50 identification entries, each of which is a standard Mandarin Chinese Pinyin (lowercase), each with a space between 2 words (Chinese Pinyin).

Then recognize speech r. and set the value of the register associated with FIFO, MIC, and then carrying out voice recognition.

Finally interrupt response. When the microphone is collected to the sound, regardless of whether the results are normal or not, it will produce an interrupt, which needs to be analyzed. Read the value of the C5 register, the highest score is likely to be the most accurate results. As shown in figure 8.

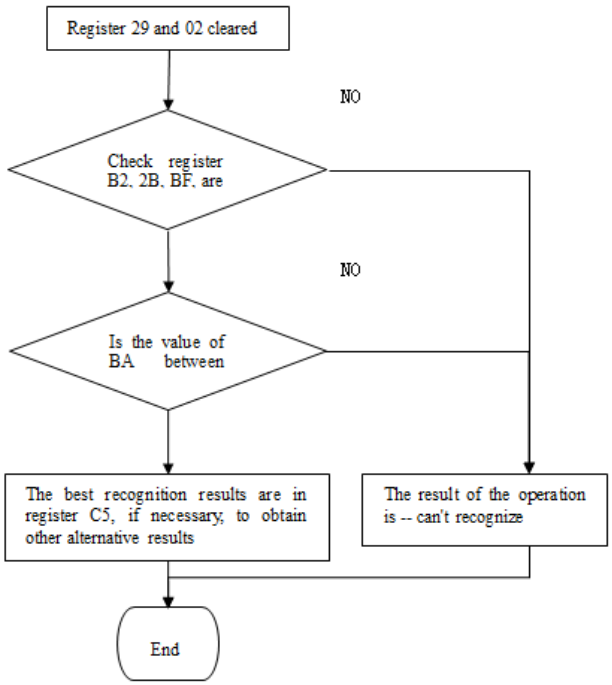

Fig.8 Response interrupt flow chart

(Note: FIFO: The abbreviation of first in first out, a kind of advanced first out data buffer, the difference between it and ordinary memory is no external read and write address lines, so it is very simple to use; DSP: Voice recognition and voice broadcast algorithm; Register 02: FIFO interrupt allowed; Register 29: Interrupt enable; Register 2B: Interrupt request number; Register B2: ASR, DSP, digital signal processor busy idle state; Register BA: Interrupt auxiliary information; Register BF: ASR reports on the state register; Register C5: Read the best ASR results).

VI. FUNCTIONAL TESTING AND APPLICATION

The design of the system for voice control page pen, for better speech recognition test results, the experiments choose different test of different words. Test results are shown in table 1:

Table 1 Test table

	Non-specific person 1	Non-specific person 2	Non-specific person 3
Turn on the light （correct/test）	29/30	28/30	30/30
Turn off the light （correct/test）	28/30	29/30	30/30
Up （correct/test）	30/30	28/30	29/30
Down （correct/test）	29/30	29/30	28/30

Table 1 shows the experimental results: the accuracy rate can reach above 93%, that speech presenter can basically meet the design requirements. And there are reasons for the possibility of identifying errors: 1.the environmental noise in the experiment. 2. the people of the test speaks unclearly enough.

VII. CONCLUSION

Speech recognition is the key technology to realize speech control. It can be through the use of speech recognition techniques for pointer improvement. The LD3320 can well realize the function of the human computer interaction, so the design of this design combines with the non - specific human speech recognition chip LD3320, the hardware and software design of the speech recognition module is accomplished. The experimental results show that the recognition rate of the non - specific human speech recognition rate is 93%, which achieves a good experimental result. The sound control system has small volume, low power consumption and general characteristics, so it has a broad application prospect.

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Portable positioning device for field wiring of electromagnetic field

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***Abstract*-This project aims at solving the problem of single GPS positioning information when the researchers working in the field. As is known to all, when researchers were operating in the unknown field (such as large scale, wiring in complex terrain conditions),they usually do it with a group, in most cases thephone signal is weak and the general terrain is complex and it difficult to identify the direction.It is difficult to confirm the location of the other members of the group once something unexpected happened, it will cause a lot of trouble unnecessary. In this case, GPS navigation is essential, but even if there is still a problem with the GPS scientific research staff, that is difficult to determine the geometric relationship between each other. This project put the GPS module, wireless transmission module and LCD screen display module together organically, a GPS module receives the latitude and longitude, and the wireless data transmission module receives the other longitude and latitude showed on the LCD screen, to calculate the relative distance, and depict the trajectory, so as to determine the relative position of each other, greatly facilitate the staff who work in the field.**

***Key words*-GPS Wireless data transmission Portable positioning**

0 INTRODUCTION

As we all know, scientific personnel in the field operations (such as large scale, complex terrain conditions) usually form a group for research, in most cases the mobile phone signal is weak or not, and generally it is difficult to identify the terrain. Once it is difficult to confirm the location of the other members of the group, it will cause a lot of trouble. In this case, GPS navigation is essential, but even though,there is still a problem with the GPS scientific research staff, that is difficult to determine the geometric relationship between each other.

GPS navigation can be global positioning, passive location, security and concealment, unlimited service, can simultaneously provide positioning information for an unlimited number of receivers. But hand-held GPS receiver is a complicated process, and can only be determined for the position of the individual, the need of satellite is large, the cost is too high, communications receiver can not communicate with each other unless using the wireless communication device. If the remote communication needs another communications satellite, it is unable to limit users (unless you turn it off); Beidou navigation need less satellite, even if the future expansion to global positioning satellite, so the cost is low, if the system service is opened, receiver can directly make navigation satellite communication, selective service can decide locate objects at any time. But the shortcoming of the current satellite is it not covered by the world, it is not possible to achieve global positioning, proactive positioning, it need to send information to the client, so it is easy to expose information, satellite need to receive information and response to the client to locate, if too many user may cause blocked.

After this project is completed, it can solve the problems of GPS and Beidou navigation, which greatly facilitates the use of users.

1 PROJECT ANALYSIS

GPS navigator is a instrument to help users to locate the current position, guide the user to the destination, based on it ,we transfer GPS information of each other’s through wireless data transmission, and graphics displayed in their respective instruments, so as to facilitate group members to know people's real-time position information, achieve positioning and communication work of many people, compared to the GPS navigation system on the market, this study is a certain extent complements and is more targeted.
This project is based on the GPS module, in the same time, to explore how to transmit information through

wireless transmission and to reflect the different position information of different people to other devices. Therefore, we should study how to extract the information from GPS, and then transmit the information to other device and then show positioning picture.

This project uses the method of system theory, control theory and information theory, which is the combination of system science method, normative research and empirical research, qualitative analysis and quantitative analysis method, comprehensive use of scientific exploration and electrical engineering knowledge, by looking up the literature search and technology learning, integrated GPS technology and wireless communication module, collocate complete hardware system, local measurement, summarized the rule of experience, complete research design.

Through the understanding and use of the single chip microcomputer's various modules, the field portable positioning device can be used to complete the positioning and mutual position. This project is the creation of the study, first learn how to use the microcontroller and the module to achieve the purpose of the completion, and then in the laboratory, outdoor research and investigation,then debugging in the familiar with the function and mechanism of production .

This project focuses on the field location and information exchange, and extracts the positioning function of GPS in the present market. On this basis, we have developed the new function of the exchange of information between the parties, and avoid the one way of GPS position information. Features and Innovation: the design of the field construction design, reduce the complexity of the use of the instrument, make the instrument more easy to operate, make the work more convenient and fast; the positioning device can exchange their GPS coordinates information and display the information in real time.

2.PROJECT DEVELOPMENT

2.1 wireless data transmission module

This project uses WSN-02 wireless data transmission module, WSN-02 wireless data transmission module is a wireless micro power transparent data transceiver module of high stability, high performance ratio, low power consumption. The module has the characteristics of small size, high sensitivity, high transmission distance, high communication rate, and the internal auto complete communication protocol conversion and data transceiver control. The module uses a multi band and multi channel to reduce the interference in the transmission process in order to improve the transmission performance. The module uses the interleaving whitening algorithm, forward error correction and cyclic redundancy check method, which greatly improves the anti-interference and sensitivity. Users can through the PC serial port, serial port and remote wireless configuration mode, set the serial rate, working channel, transmit power, wireless communication rate and other parameters.

2.1.1 Pin definition

Table1 Module pin definition

Pin	name	directions	illustrate
1	3.3V	-	3.3V - module 3.3V power supply
2	GND	-	GND - module
3	5V	-	5V - module 5V power supply
4	RXD/A	INPUT	INPUT RXD/A module receiver
5	TXD/B	OUTPUT	OUTPUT TXD/B module send
6	NRST	INPUT	INPUT NRST reset control
7	SET	INPUT	INPUT SET setting module parameters
8	SLP	INPUT	INPUT SLP dormancy contro

Note: pin 1 is the input / output port for the module 3.3V/3V power supply, the user can directly pass through the tubeFoot to the module power supply (at this time the pin 3 must be left vacant); pin 3 for the module 5V power input, when the customer through the pin to the module power supply, pin 1 will output 3.3V/3V power.

Table2 Module TTL interface mode

WSN-02	user equipment
3.3V	floating
GND	GND
5V	5V
RXD	TXD
TXD	RXD
NRST	I/O（which can be left floating）
SET	I/O（which can be left floating）
SLP	I/O（which can be left floating）

2.1.3 parameter configuration

There are 3 methods to configure the parameters of the configuration module: (1) configure parameters,

(2) configure parameters online, (3) remote configuration parameters. (1) and (2) the configuration , the configuration state is controlled by the SET pin (pin 7), which is a high level when in the normal state. when the SET pin is low (>50ms), the module enters the configuration mode. Under these two modes, the serial port is fixed to 9600bps, 8 data bits, 1 stop bit, no parity check. After the configuration is complete, the SET pin is set to the high level of the ring (>10ms), then the configuration mode (no reset module) is required to enter the normal working state. (3) a configuration method is a parameter of a computer by connecting a wireless transmission module and remote configuration of a remote wireless module. Under this method, the state of the SET pin is not required, and the module can be modified by the remote modifying parameters in the normal working condition. But the premise is: the configuration module must start with the remote configuration parameter function". When the module is manufactured, the remote configuration function is turned off. If the user wants to enable the remote configuration of the module, the remote configuration function of the module (1) is to be used for the remote configuration of the module (2).

2.1.4 WSN-02configuration tool parameter description

Communication port: serial number of modules and computer connections

Remote configuration: enable the ring to close the module's remote configuration function;

Wireless channel: 1-256 channel (default 1 channel) (1-64 channel) is recommended.

Wireless rate:

1200/2400/4800/9600/19200/38400/57600/115200bps (default 9600)

Wireless power: 1 (minimum) - 8 (maximum), the higher the transmission power is, the smaller the transmit power is.

Serial baud rate:

1200/2400/4800/9600/19200/38400/57600/115200bps (default 9600)

Serial data bits: 8-9 bit (default 8)

Serial port: no check / even parity check (default).

Serial port: 1/1.5/2 (default 1)

2.1.5Online parameter configuration of module

WSN-02 wireless module can be set the parameters online, the SET pin is set to a low level, it will send online parameters-configurating command after 100ms, the format is as follows:

Table3 Module online parameter command format

2	1	6	1	1	7	2
0xx 55	leng th	destinati on	comma nd	comma nd	comma nd	CRC 16

CRC16 computing range: 0x55 to command content;

CRC16 is sent in the order of the low byte in the front;

The value of the length byte: the destination address field to the number of bytes of CRC16;

Command word command options list is as follows:

Table4 Module command options

Command identification	command options	illustration
0x00	0x00	confirmation frame
0x95	0x00	Query through the transfer module parameters
0x96	0x00	query through the transfer module parameters
0x97	0x00	Configuration parameters of transmission module
other	0x00	reservations

2.1.6module sleep configuration

WSN-02 wireless module has three power saving mode: Hardware wake-up mode, serial wake mode, air wake mode, the three power saving mode can be customized according to customer demand, the default is the hardware wake-up mode.

WSN-02 wireless module is controlled by the SLP pin (pin 8), which is a high level when the SLP pin is low (>50ms). The resting state current is less than 5 uA (TTL module).

When the module is in a dormant state, a high level of (SLP), a low level (>1ms) at the foot of the NRST (>10ms) can be made to reset the module and reset the module.

The sleep current of the module is less than 10uA. When using the serial port to wake up, the user only needs to send the data to the module of serial data interface. The data can be awakened module. The module receives data from 10ms, which is in the normal working condition. When the module's serial port is not in the 30s, the module will enter the sleep state.

When the air wake mode is in the module, the sleep

current is less than 20uA. In the wake of the use of the work mode, the module is in a discontinuous mode of operation, the module is entered into the state of the air, when the air received a certain length of wake-up data, the 10ms module into the normal receiving state. When the module is in the receiving state of the work 30s, there is no data in the air, then enter the sleep state.

2.2 GPS module

This project uses the GPS module of the ATK-NEO-6M-V2.3 model. ATK-NEO-6M-V2.3 (V2.3 is the version number) is a high performance GPS positioning module. The module uses the NEO-6M U-BLOX module, the module comes with MAXIM high gain (20.5dB) LNA chip with high performance ceramic antenna, the antenna is composed of antenna, which is equivalent to integrated active antenna (without the need to buy expensive active antenna), of course, in order to have better results, the module also provides IPX interface, for everyone to connect active antenna \, so as to form a double antenna".

Module has EEPROM, all configuration information can be saved in the EEPROM, to meet your various configuration needs, the module also comes with rechargeable backup battery (to support the warm start or hot start, backup battery can be maintained for about half an hour to receive data storage after the main power supply), GPS NEO-6M-V2.3 module features are as follows:

1,use NEO-6M U-BLOX module, compact size, excellent performance.

2, comes with ceramic antenna and 20.5dB MAXIM high gain LNA chip,excellent search ability.

3, can carry out various parameters setbe by the serial port, and can be saved in the EEPROM, convenient to use.

4, comes with IPX interface, can connect all kinds of active antenna, adaptive ability.

5, compatible with the 3.3V/5V level, convenient to connect a variety kinds of single-chip microcomputer system.

6, built-in rechargeable battery back-up, can keep the ephemeris after data power down .

2.2.1 module performance parameters

item	illustrate
Receiving characteristics	50 enterclose,GPS L1(1757.42Mhz) C/A code,SBAS:WAAS//EGNOS/MSAS
positioning accuracy	2.5Mcep (SBAS: 2.0mCEP)
update rate	5HZ at most
capture time	cold start:27s warm start:27s hot start:1s
capture tracking sensitivity	-164dbm
communication protocol	NMEA(default)/UBX Binary
serial communication baud rate	4800,9600,19200,38400(default),57600,115200,230400
working temperature	-40~85centigrade
module size	25.5mm*31mm
interface characteristic	TTL,compatible3.3v/5v single chip microcomputer system

Fig.1 Module performance parameters

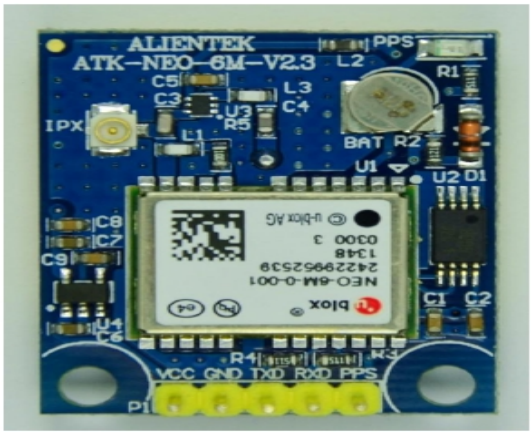

Fig.2 Module appearance diagram

Table5 Function description of ATK-NEO-6M module

serial number	name Description	Illustration
1	PPS	clock pulse output pin
2	RXD	module serial port
3	TXD	module serial port
4	GND	ground
5	VCC	power supply (3.3V-5.0V)

The PPS pin is connected to the PPS port of the UBLOXNEO-6M module which is connected to the TIMEPULSE port of the module. PPS indicator (that

is, the PPS pin), in the default condition (without the program settings), there are 2 states:

1, often bright, said the module has begun to work, but it has not yet achieved positioning.

2, flashing (100ms, 900ms), said the module has been positioned to succeed.

In this way, through the PPS indicator, we can easily determine the current state of the module, to facilitate the use of everyone.

In addition, figure 1.1, the upper left corner of the IPX interface, can be used to connect an active antenna, which further improve the receiving ability of the module, through the external active antenna, we can put the module into the indoor, antenna, indoor positioning.

Of course, it can also connect to the computer, use computer software to achieve positioning. The schematic diagram of the GPS ATK-NEO-6M-V12 module is shown in fig.:

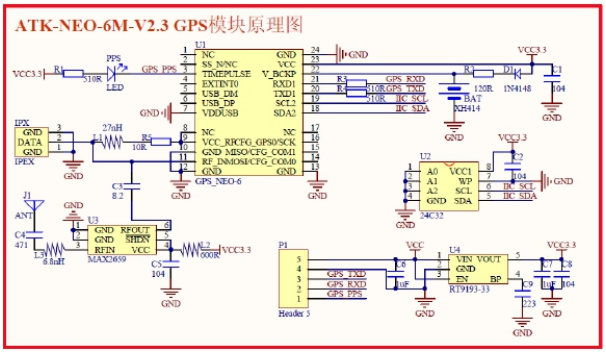

Fig.3 Module principle diagram

2.3 display screen module

2.3.1 display performance parameters

This project uses the MT48270A050_01NN type LCD module

Interface mode: FFC 10pin_1.00mm

Serial mode: 3.3VCMOS/232

Power consumption: 260mA@5V

Working temperature: -10/+60

Working voltage: 3.3-6V

Brightness: 250nit

ESD capability: 8KV

Machine size chart:

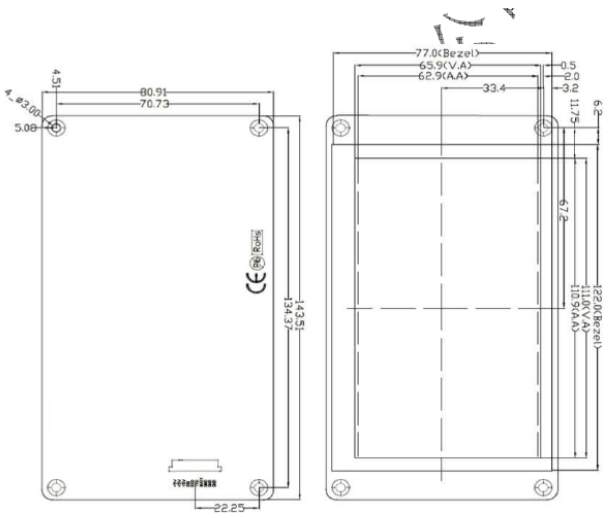

Fig.4 Module machine size chart

Note: 1 positioning reference for display center

2 no tolerance is +/-0.3mm

Table6 Pin definition

Pin name	pin number	type	description
VCC	1、2、3	P	power input
I/O	4	IN	IN VCC
RXD	5	IN	serial input
TXD	6	OUT	serial output
BUSY	7	OUT	Not definend
GND	8、9、10	P	public

3 PROJECT RESULTS

Project works as shown in figure 5:

Fig.5 Project work

Works show details such as shown in Figure 6, screen shows the distance between I and the other side of the longitude and latitude information in the form of text and numbers ,use a small circle and a bigger circle express I and the other relative position relationship, with the two moving, then circle around the spot moves along, clearly shows the position relationship, real-time refresh the information. The reset button can be used to correct its position, so that

its position is reset to the center of the screen, and it will not change the relative position relationship between the two, so that it is not restricted by geographical position.

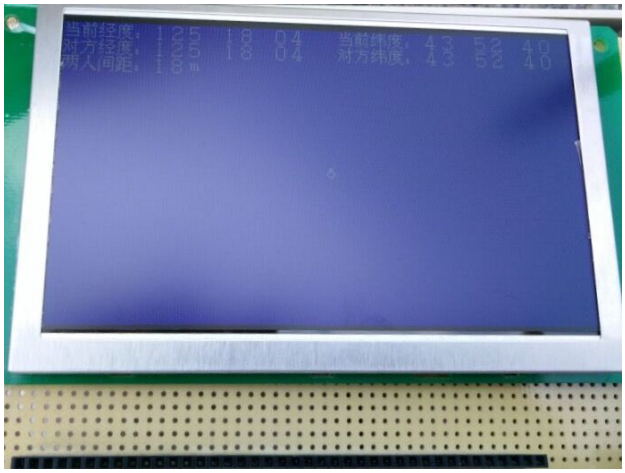

Fig.6 Work detail display

This project through the microcontroller GPS module, wireless data transmission module and LCD screen display module organically combined.A GPS module receive the latitude and longitude and displayed on the LCD screen with another latitude and longitude ,then calculate the relative distance.and show the relative position in the form of the text and graphics image in real time.the project complete the project's expected target.

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Design and Implementation of Micro-quality PVDF-based Weighing System

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***Abstract*-The main design principle using a piezoelectric sensor, with special piezoelectric material polyvinylidene fluoride (PVDF) good piezoelectric properties, excellent stability, etc., place it on a cantilever, when placed on an object generates a signal, the first signal through the amplifier circuit, and through the microcontroller analog to digital conversion processing, to achieve the quality of measurement of small objects.**

***Key words*-PVDF Small mass Cantilever SCM**

I. INTRODUCTION

SMALL mass weighing systems mostly in the form of micro-mass sensor reflected. The micro-mass sensor is a tiny mass sensor into a frequency signal. It is being increasingly used in the chemical and biological environment for performing composition analysis of gases and liquids, micro quality measurements, film thickness measurements and pressure testing. And polyvinylidene fluoride (PVDF) as an organic piezoelectric material, the more widely used in underwater acoustic ultrasonic measurement, pressure sensors and other fields. We have now achieved using PVDF piezoelectric sensors to measure power flow and displacement[1] , with high value and broad space for development. The quality measurement also has a unique role.

II. DESIGN OF MICRO-QUALITY WEIGHING SYSTEM

A. Scheme Selection

To complete the design and implementation of small quality weighing system, we have chose two options: One is with the use of quartz crystal resonator resonance characteristics; the other is with the use of PVDF piezoelectric film to achieve. Currently known Quartz Crystal Microbalance (referred QCM) is a typical micro-mass sensor, in different areas and have a wide range of its applications. This sensor is the use of resonance characteristics of quartz crystal resonator, quartz crystal resonator will change the quality of the electrode surface is converted into frequency of quartz crystal oscillator circuit output electrical signal. The disadvantage is that due to the quartz crystal can not be made thin, so its working base frequency is generally in the tens of megahertz or less, its piezoelectricity weak, a low dielectric constant is very limited. Thus, the measurement of small quality have great difficulties.

The characteristics of PVDF piezoelectric thin film including the high piezoelectric voltage constant, good stability, low density, etc., in the piezoelectric sensor signal aspects, which greatly improved the accuracy of the frequency of the signal on the acquisition and transmission. And then have a major impact on small measurement sensitivity requirements and implementation aspects of difficulty degree of reduction, in addition it has a low impedance, high voltage coefficient, high dielectric strength, high stability and other advantages, rapid development, can significantly improve the measurement accuracy and can simultaneously measure multiple parameters, has great development space and special influence in quality measurement, has a great use of space[4].

Comparing advantages with disadvantages of the above two programs, the final decision is to choose PVDF piezoelectric film to complete the design and implementation of micro-quality weighing systems.

B. The design of piezoelectric cantilever sensors[3]

Sensor uses a piezoelectric cantilever beam structure. The mechanism of piezoelectric cantilever sensors is when the sensor surface adsorption material, the resonant frequency of the sensor is changed, by measuring the change in frequency derived qualitative and quantitative analysis of the results of the test substance. The piezoelectric cantilever sensor as compared with conventional piezoelectric sensor has a small size, simple structure, fast response, high integration, and easy to implement an array of tests and so on. Thus, the design of the sensor cantilever structure decided to adopt in order to effectively enhance the piezoelectric properties. At the same time, the operating mode of the sensor cantilever, the use of dynamic work. Which is also known as resonant work, mainly using cantilever beam after additional small

mass resonance frequency shift to the sensor. According to the relevant literature and Izod mechanics knowledge we learned the following conclusions: For all additional mass, we are extending the total length of the beam length 1/3, piezoelectric cantilever sensor for additional small quality with optimal sensitivity; With extension length of beam body sensitivity is much better than the equal length of the beam; The vibration of the equal strength beam has better frequency deviation[5] .

As shown in figure 1, which is the single layer with extension of piezoelectric cantilever beam sensor model, superstructure is PVDF film, lower is stainless steel equal strength beam.

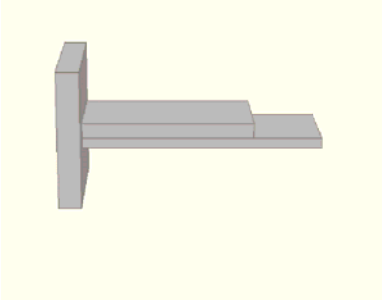

Fig.1 a cantilever with extended portion

C. Tiny mass weighing system design overview

The project is mainly using of high-performance piezoelectric material polyvinylidene fluoride (PVDF) which has a high piezoelectric constant, high dielectric strength characteristics, and the analysis by a piezoelectric PVDF film cantilever sensor attached thereto for the quality of the produce tiny electrical process signals, the observed spectra characteristic of the measurement signal, and the signal in the experimental design of the platform on the basis of independent calculation and finishing quality obtained with the measurement signal frequency offset relationship, for small weighing and display quality .

III. SOFTWARE DESIGN

Project is designed and implemented to a collection system for small quality test data. The system uses a piezoelectric cantilever sensor to collect data to be tested, and the combined single-chip analog to digital conversion immediately after sending first bit machine systems for data analysis and processing electrical signals in order to get the final frequency offset - quality relationship[3]. Among them, the oscilloscope is used to visually display the stability of the test signal. Main system block diagram shown in Figure 2.

Specifically, it is first generated by the piezoelectric cantilever sensor for weak charge signal, what the Integrated Operational Amplifier AD620 and other chips amplifies and ripples to take shape was attenuated form of the signal waveform with the oscilloscope can be clearly observed[2]. Signal at this time is directly as a single-chip analog to digital conversion of the input signal, then sent to the upper computer via serial communications. PC part by the Matlab software Graphical User Interface (GUI) for real-time display and control. Including the use of serial communication interface GUI design and spectral analysis, statistics and computing interface. Through the GUI interface can be programmed to call the collected data text document, and then implement the spectral analysis of the collected data and the overall statistics, calculated and analyzed the frequency of each data sample, then to organize data to draw a graph showing the relationship.

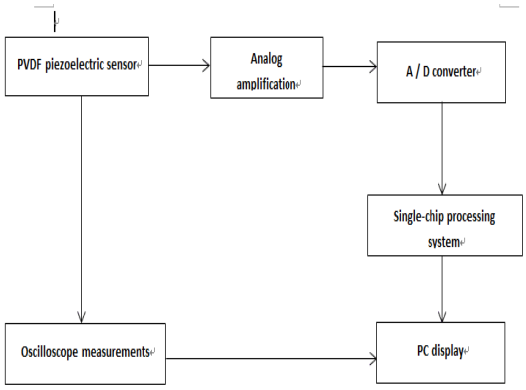

Fig.2 system diagram items

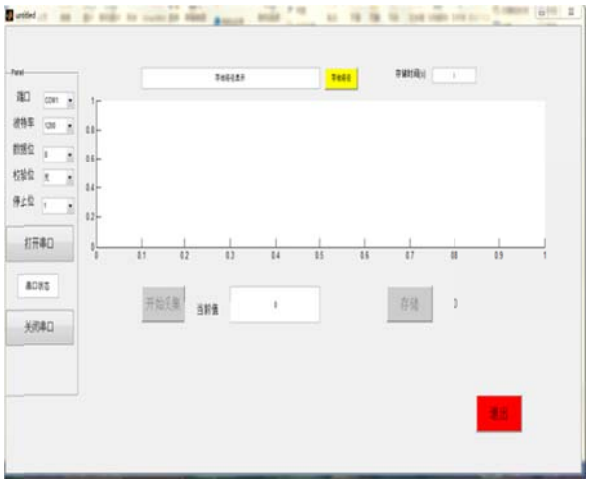

Fig.3 serial port communication interface

IV. TEST RESULTS

Currently, by the impact of sensor's size, the project in the quality of the measurement ranges from 100mg to 1000mg. Data obtained from the known system in the testing process for the same quality of existence within a certain range of frequency offset oscillation, after repeated sampling averaged frequency offset

results obtained and displayed at different quality in the final GUI interface on. Since the test data is subjected to vibration and impact cantilever sensor great influence PVDF film properties, appear small part of the frequency offset distortions, the system has a certain instability.

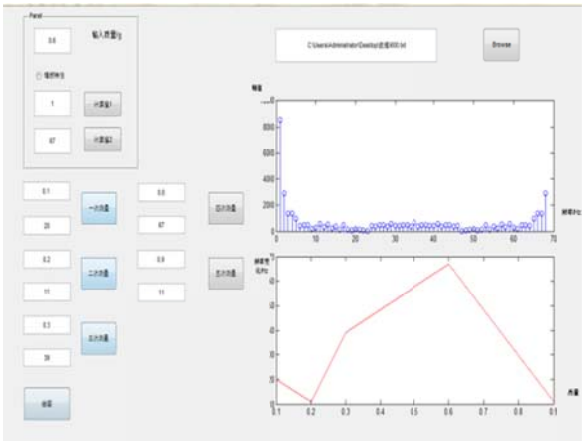

Fig.4 spectral analysis, statistical and computational interface

V. CONCLUSION

The author designed a small quality PVDF-based weighing system, which has high sensitivity, precision and so on. PVDF has good mechanical toughness, and high sensitivity piezoelectric plasticity, so that it could be combinated with the cantilever to achieve that the quality signal would be converted to an electrical signal, and then finally realized a tiny quality experimental test system through software functions.

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The research and design of the single oil well tank of information monitoring and control system

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***Abstract*-This article makes design of the single oil well tank's information monitoring and control system and mainly aimed at the questions which the single oil well tank exists now,such as the single oil well tank can't give feedbacks in time,petroleum may be stolen and the producting of petroleum waste too much manpower resource.This system makes MCU to be the main control and measure unit and adopts distributed measurement to collect the information of petroleum in the single oil well tank,includingtemperature,liquid lever and flow.The system can prevent petroleum solidification and install the anti-theft alarm device.In the end,the system passes the tested information to the computer terminal by the GSM network.This project makes the long-range control of the single oil well tank come ture,and significantly improves the productivity efficiency, and also saves the cost of production.**

***Key words*-The single oil well tank;Distributed measurement ; Information control; GSM network**

I. INTRODUCTION

IN the process of drilling for oil,traditional way of oil collections included pipeline transport and stored in a the single oil well tanks,among them,the later is used to product oil which is small-scale,it can cut funding which used to laying pipelines.At present,the researchs of the single oil well tanks had gained a lot at home and abroad,specailists not only achieve the oil efficient collection,but also make the equipment which can heat oil without explosion in confined spaces,improving the energy's utilization compared with the previous ,reducing traditional heating ways' pollution,but now,the single oil well tanks which were used also exist many defects,the problems mainly focus on low automation and relying on manpower.it not only waste many human resources.but only be easy to have problems which stopping productions because of monitoring untimely and oil stolen.

In this paper,we are aimed at building a general single oil well tanks' automatic monitoring and control system,it can monitor the single oil well tanks which disrupt in the wild,in order to saving most of human resources, improving the production efficiency, realizing the digital management. This design aimed at small-scale oil drilling and saving, it has important significance.

II. OVERALL DESIGN

AS shown in figure 1,this system include three sections: measurement part,data transmission part, monitoring center. The measurement part is respansible for collecting the informations in the single oil well tanks, including traffic, liquid level and temperature. The informations which the system measure are send to monitoring center after encryption, the monitoring center make the informations which received decoding, extracting, separating and storaging, PC display the informations and judge the time to remove oil .

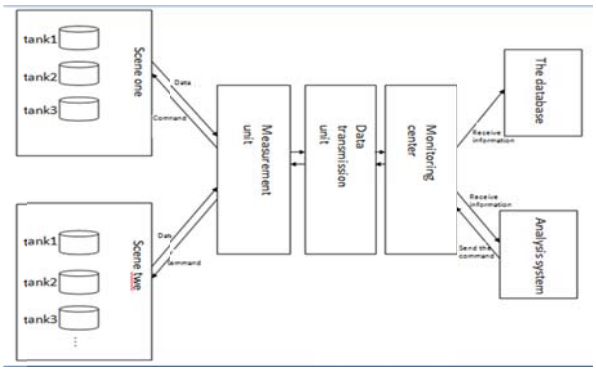

Figure 1.system structure diagram

III. SYSTEM SECURITY AND STABILITY OF THE DESIGN

System in the process of measurement and data communication, in order to guarantee the accuracy of the measurement data, using PID algorithm to control the temperature heating module, and in the process of data transmission, the data stability checking and data encryption.

3.1 the PID temperature control algorithm

In the process of temperature measurement,

because of the influence of the external conditions, there exist deviations in the measured temperature data.Then through the PID algorithm to control the temperature measurement system to obtain the temperature of the measuring unit to collect signal deviation.In order to overcome the deviation, and PID temperature controller [1] calculated output to control the heating temperature.

Control deviation:

$$e(t) = r_{in}(t) - y_{ou}(t) \tag{1}$$

The transfer function:

$$G(s) = \frac{U(s)}{E(s)} = K_P(1 + \frac{1}{T_I} + T_D s) \tag{2}$$

Proportional action:

$$P = K_P \Delta e + P_0 \tag{3}$$

Proportional controller is used to reduce the deviation, but there are still poor.

PI controller:

$$P = K_P[\Delta e + \frac{1}{T_I}\int \Delta e dt] + P_0 \tag{4}$$

Combined with integral control effect, eliminate static error of the system.

PID controller:

$$P = P_P + P_I + P_D = K_P(\Delta e + \frac{1}{T_I}\int \Delta e dt + T_D \frac{d\Delta e}{dt}) \tag{5}$$

Join the differential function is helpful to improve the stability of the system.

3.2 the stability of data remote transmission problem

The process of data communication is susceptible to be interferenced.This project by using Cyclic Redundancy Check algorithm [2] (Cyclic Redundancy Check, CRC) to achieve the stability of the monitoring data.

The length of CRC check code is N,and N=K+R.For any one yard character, there exists and there is only a polynomial $g(x)$,making

$$V(x) = A(x)g(x) = xR_m(x) + r(x) \tag{6}$$

Among them: $m(x)$ is K times the original polynomial information, $r(x)$ is R-1 times calibration polynomial(that is the CRC checksum), $g(x)$ is called to generate polynomial:

$$g(x) = g_0 + g_1 x_1 + g_2 x_2 + \ldots + g(R-1)x(R-1) + g(R)x(R) \tag{7}$$

$g(x)$ can generate a information check code.By examining the check whether the remainder is 0 to judge whether the data transmission is wrong, if the data is wrong ,then send the request to system.

Ⅳ.CONCRETE DESIGN SCHEME

Figure 2 for the whole model, by single-chip microcomputer control heating temperature control module, the flow measurement module and ultrasonic liquid level measuring module.And the information encryption will be measured by the tank liquid, then passed on to the GSM module [4].The GSM network will encrypt and package all the information in an orderly way, then sent to the remote PC.And PC determine if accord with oil conditions is calculated with time and notify the oil well, notice in the process of the heating heating module, if do not meet the conditions will continue to monitor the oil.Besides infrared module is responsible for the security function, in non-working personnel take oil phenomenon appeared in the process of monitoring the notification by the GSM network remote PC and shut off the valve of oil tank.

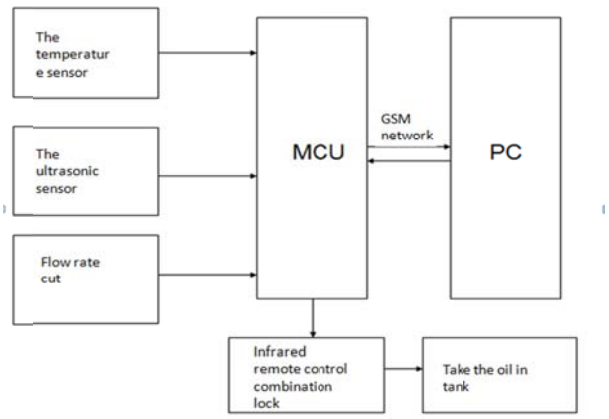

Figure 2. Network monitoring control system diagram

4.1. Software Design

Software overall design as shown in figure 3. :

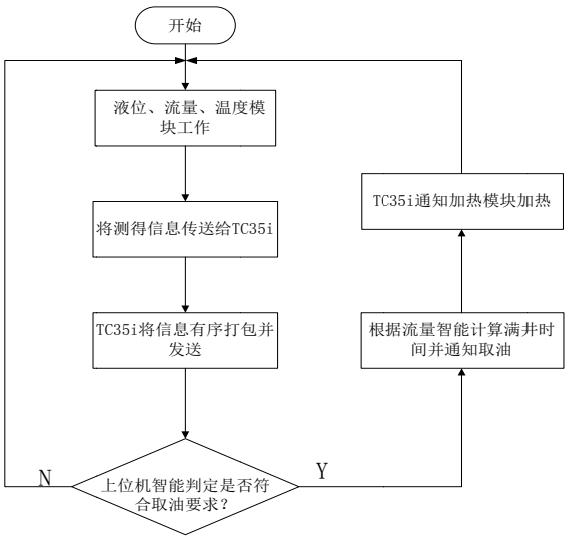

Figure 3. The overall work flow chart

4.1.1 heating temperature control module

As shown in figure 4, the module USES ds18b20 temperature sensor placement in the oil gathering temperature, heating part adopts the traditional electric heating [5], by the master microcontroller through the PID algorithm restricts the heating temperature between 40 to 60 ℃, with suitable for single well jar of oil operations.

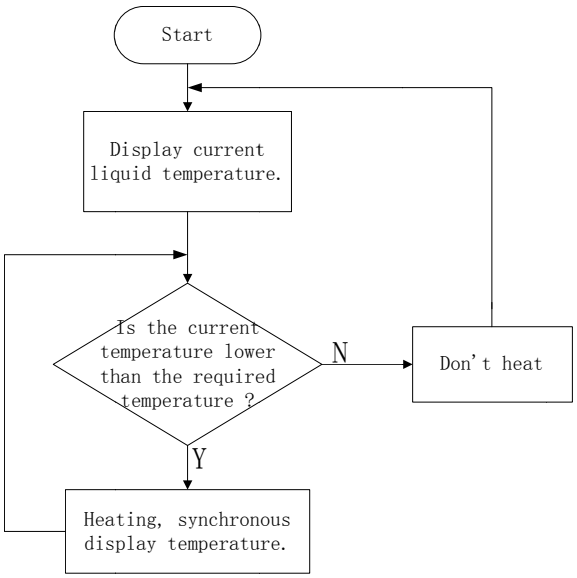

Figure 4. The heating temperature control module flow chart

4.1.2 ultrasonic liquid level measurement module

The module using the ultrasonic sensors to collect data first [6], according to the ultrasonic signal timer record oil return time calculation module to the distance of the plane, and the calculating formula is

$$x = \frac{v * t}{2} \tag{8}$$

According to the height of range conversion in the plane of the oil, and then the real-time display, the specific process as shown in figure 5.

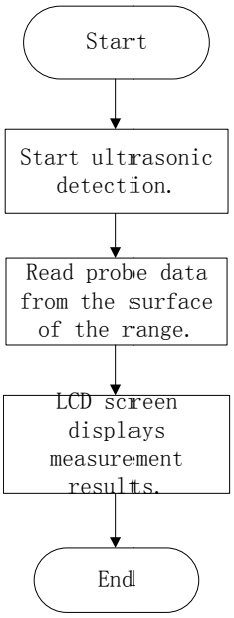

Figure 5. Level module flow chart

4.1.3 flow measurement module

Use the generic type vortex flow sensor measurement of liquid flow rate [7], the species flow sensor precision is relatively high. In the measurement, internal gear rotation driven by flows into the oil sensor, through the A/D conversion, produce square wave pulse current or voltage output. Then per unit time is obtained by the pulse square wave frequency gear revolutions which flow velocity are obtained.The relationship between velocity and revolutions in table 1.

Table 1. The flow speed and the liquid velocity sensor

	Data 1	Data 2	Data 3	Data 4
Speed (r/L)	2 100	2 280	2 350	2 460
Velocity(L/Min)	0.2～0.4	0.5～0.8	0.9～1.2	1.2～2.5

4.2 PC

PC via wireless GSM network [8] received from the remote information and decryption, decrypted information stored in the database automatically, and displays information about the oil field single-well jar test.Display module, real time display [9] the remote single well temperature, flow, liquid level of tank, infrared security information such as [10], support query data in the database information playback;PC will also be within the scope of the selected time information to generate the trend of the temperature, liquid level, flow chart, distal single-well function display will have a prompt when the tank is filled with remind oil.When the remote single-well cans appear bunkering phenomenon [11], it will receive the alarm information displayed on the interface notify [12].

Ⅴ.RUNNING TEST

ACCORDING to this article describes the single well

can of network monitoring control system, the test result is as follows:

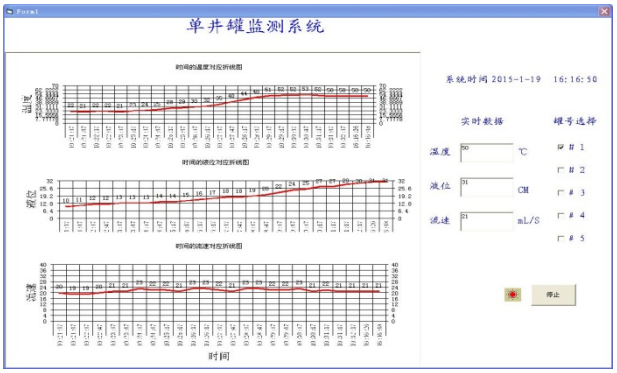

Figure 6. PC display real-time information

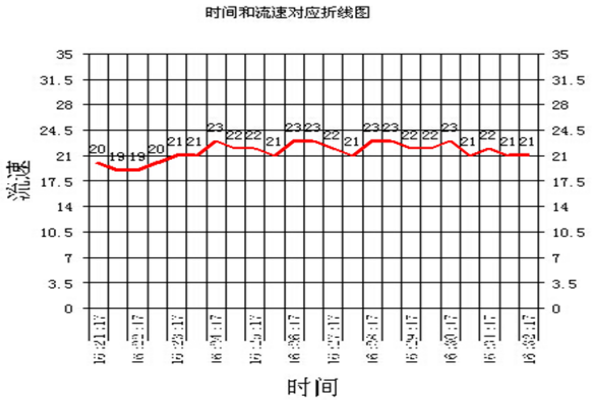

Figure 7. The actual flow rate trend chart

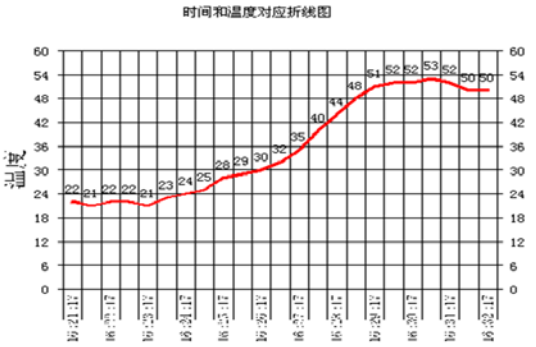

Figure 8. Actual temperature trend chart

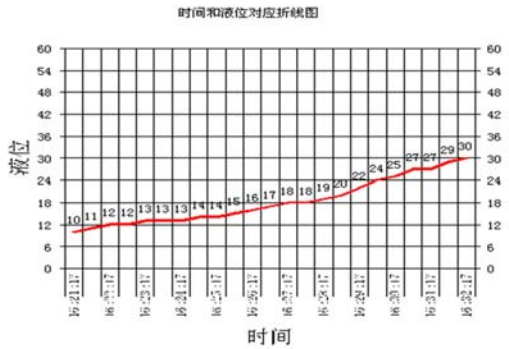

Figure 9.The actual level trend chart

VI. CONCLUSION

This design is based on the modern communication and automation technology of single well can of remote information feedback and the security of the system. And the well stop and the oil loss phenomenon was decreased effective through the systematic control and monitor. This design can achieve the function of basic temperature control, liquid level and flow testing ,besides the information of temperature ,liquid level, and flow can feedback to the terminal computer. At the same time it can use infrared remote control combination lock of guard against theft system Settings and alarm functions, finally achieved the single well can of distributed automation detection and control.

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The design of bluetooth entrance control system

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***Abstract*-This article designs a blue tooth door control system by the use of MCU and motor-driver. The whole design simulates to open and close the door of garage on the base of MCU STC89C52 and DS1302, LCD and motor-driver. Garage access control system uses motor-driven program to simulate the realization, when the system receives a Bluetooth phone to send command to open the door, the motor 10 seconds to perform forward simulation to achieve open warehouse doors closed when the system receives a Bluetooth phone to send the command C, an anti-motor 10 seconds to turn off analog implementation warehouse door; system with date and time display function to record each time the door lock when recording warehouse, collection date and time using the DS1302 clock module, the time and date using LCD1602 LCD display interface display; system uses Bluetooth control end Android phone APP software manipulation, transmission via Bluetooth data communication and instruction.**

***Key words*-MCU Warehouse control Bluetooth remote control Motor-control**

I. INTRODUCTION

ELECTRONIC technology, automatic control technology and the development of computer technology will bring human society into an era of electronic information, electronic control system is widely used in a new technology revolution in the era of digital information. People's pursuit of life intelligence, efficiency and convenience makes the electronic technology has been greatly integrated into the life. Access control system is also known as access control system (CONTROL SYSTEM ACCESS). Is a kind of intelligent management system for the management of personnel. Summary is: management of what people can access those doors, and to provide information on the post, and so on, common access control systems are: password access control systems, non-contact Carmen system, fingerprint iris biometric access control system, and so on, access control system has been widely used in the management control system. Among them, the access control system in human nature, intelligent improvement has become more and more popular, based on the Bluetooth remote control technology of intelligent access control system and in many enterprises and high-end residential to get promotion and application.

Access control system as the name suggests is a system of control of the entrance channel, which is based on the development of the traditional door lock. The traditional mechanical lock is a simple mechanical device, no matter how reasonable the structure design, the material is strong, people can always use a variety of means to open it. In the access to many of the key management of the key is very troublesome, the key is lost or replacement of personnel to the lock and the key to replace. In order to solve these problems, it appeared that the electronic card lock, electronic password lock, the two lock appear in a certain extent, improve the people to go out to ban channel management, channel management into the electronic age, but with the continuous application of electronic lock and their defects gradually exposed, magnetic card lock problem is information is easy to copy, cards and card card between the equipment wear, high failure rate, safety coefficient low. Password lock is the problem is easy to leak, and can not be found, the safety factor is very low. At the same time, this period of products due to the majority of the use of the read card part (password input) and the control part of the installation in the door, it is easy to open the door lock. This period of access control system is still in the early stages of immature, so the access control system is often referred to as electronic lock, the application is not widespread.

With the rise of the use of portable devices such as smart phones, tablet PCs, and the rise of the near distance wireless communication technology, access control systems in addition to security, but also need to be able to use access control system to complete a variety of applications. In the future, the security of access control system, integration capability, openness, diversity of applications and mobile intelligent terminal control will be the future development trend. Today, smart phones and other mobile terminal equipment has entered the life, combined with the Bluetooth remote control technology of such mobile

devices will be put forward solutions to the above problems. Bluetooth remote control not only avoids the security of the electronic lock, but also has a great improvement in the operability and intelligence [1].

In all aspects, this paper designs a set of warehouse and bluetooth access control system based on SCM technology, motor driver technology, mobile phone Bluetooth communication technology and LCD display technology. System including data acquisition module, wireless transmission, motor driver module, display module, and so on four parts. The design has simple structure, reliable operation, low cost, flexible control, strong application. Therefore, not only in the promotion of the market has a significant practical significance, but also has a certain significance in the academic research[1].

II. System's Function Composition

The design of bluetooth access control system consists of five parts: STC89C52 microcontroller, DS1302 clock acquisition unit, LCD liquid crystal display unit, motor driving unit and mobile control terminal. System function diagram as shown in Figure 1, after entering the Bluetooth connection, the mobile phone through the app connected system, the initial connection requires a password.

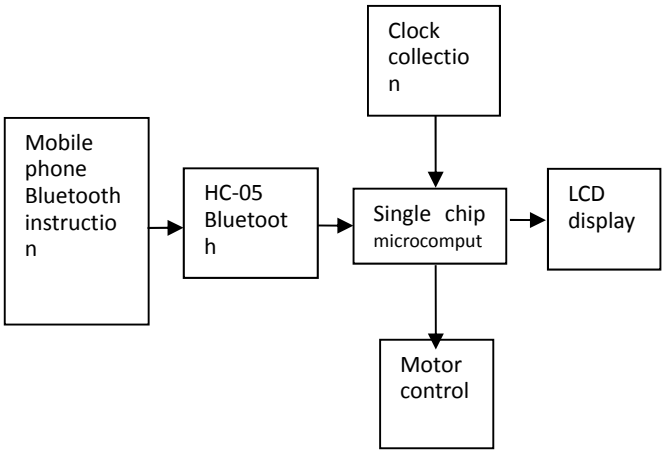

Fig.1 Working procedure diagram

III. Hardware Design

A. System Overall Design

This scheme is shown in the display of the LCD display with a character graphic display, simple and feasible. The mobile terminal can use the smart phone, through the mobile phone Bluetooth debug assistant software to achieve the command of the MCU control board through the board on the HC-05 Bluetooth module to achieve the mobile phone Bluetooth command to achieve the control of the motor to achieve the opening and closing.

B. MCU Circuit

Minimum system circuit of MCU is the control core of the whole system, used to control the normal operation of the system, MCU minimum system circuit are mainly STC89C52 microcontroller, crystal oscillator circuit, reset circuit, the circuit diagram as shown in Figure2[2-4].

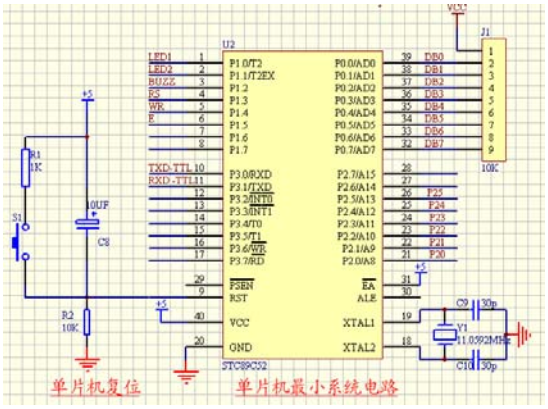

Fig. 2. Circuit connection diagram with LCD12864

C. Display Circuit

Show part of the LCD1602 LCD module, LCD board arranged on a number of 5 x 7 or 5 x 10 dot matrix display, each display can display 1 characters, from the specification into each line 8, 16, 20, 32, 40, 24, two lines and four lines three categories. The connection circuit with the single chip is shown in figure 3.

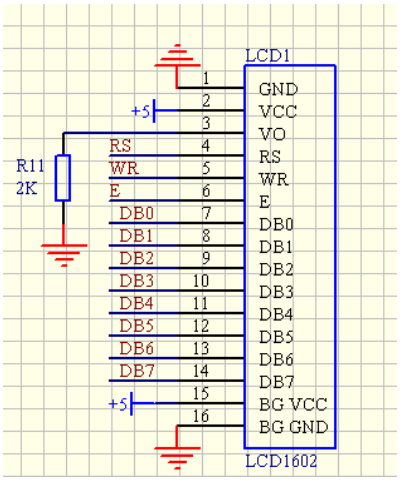

Fig. 3. Circuit connection diagram with LCD12864

Pins 1 and 2 for 1602 LCD and power pin, pin 3 for backlight adjust pin, grounded through a 10k potentiometer, the backlight can be through the potentiometer to adjust brightness; 4 feet, 5 feet, 6 feet for the chip select LCD control pins, respectively connected to the microcontroller p1.3, P1.4 P1.5 port, 7 to 14 feet for data interface, and SCM P0 mouth connected to realize data transmission, 15, 16, foot for LCD backlight control foot respectively received power and ground.

D. Clock Collecting Circuit

The system clock acquisition circuit sampling DS1302 clock chip as the core device, combined with peripheral circuit to achieve the collection and processing of the clock signal, to change the circuit as shown in figure 4. In which the battery BT1 as the clock chip backup battery, in the case of the system power can guarantee that the clock information is not lost, again on the power system clock time information without the need to re adjust. DS1302 pin 2 and pin 3 pins for the crystal oscillator clock, chip, external 32.768HZ crystal oscillator five feet, 6 feet, 7 feet is and SCM data communication pins and pin output port connected 4.7K to 10K pullup resistor.

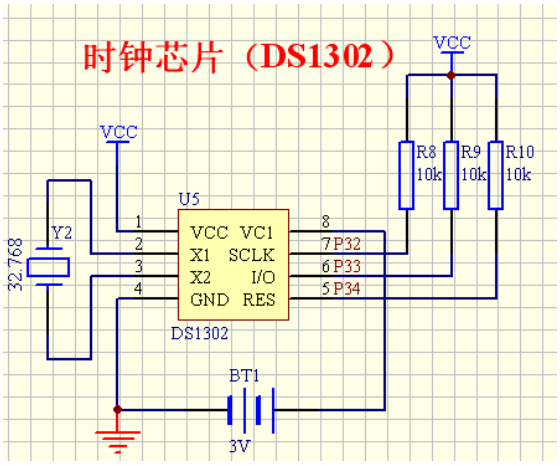

Fig. 4 Circuit of time collection

E. Moter Drive circuit

The motor drive circuit of the system is realized by ULN2003 integrated circuit, the ULN2003 is low, the peripheral circuit is simple, and is the ideal chip of the small stepping motor driver, which is shown in Figure 5.

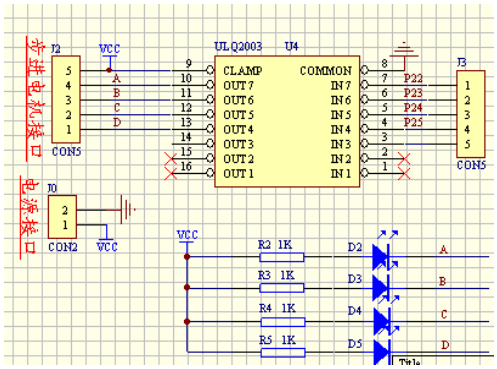

Fig. 5. Circuit of Moter Drive

F. Blue tooth Circuit

The system uses the HC-05 module as the core of the system, and the peripheral circuit is designed to complete the system of the Bluetooth communication circuit.

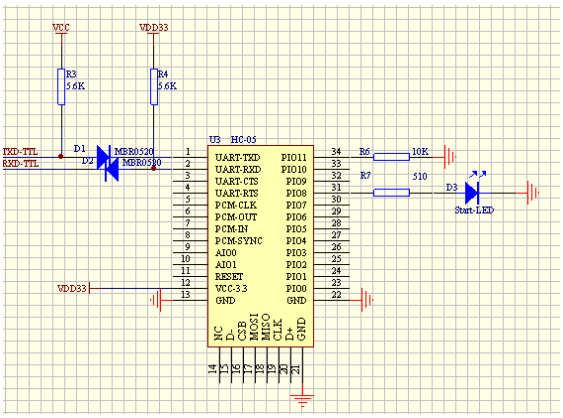

Fig. 6. Circuit Blue tooth Part

As shown in Figure 6, the U3 for Bluetooth communication module HC-05 module, diodes D1 and D2 and a resistor R10, R11 composition level conversion circuit to ensure system can also work under the voltage of 5V and 3.3V, D3 for Bluetooth module working state indicating lamp, and the work of the state are the following three: a power module in the same time the BS-KEY pin is set to high level (or to VCC) at D3 to light a second death a second frequency slow flash module into at. At this time, the baud rate is fixed 38400. Two, the BS-KEY pin is set to a low level (or ground) at the same time, and the D3 takes one second to flash 2 times, which indicates that the module can enter into the D3 state. If the BS-KEY pin level is set high, the module will enter the AT state. Three, the module pair is successful, at this time D3 double flash, flash 2 times, 2 seconds flash once. The system has the D3 indicator light can be very intuitive to judge the current state of the module, easy to use.

IV. Software Design

This design through the C language to the bottom of the design, control the microcontroller to coordinate the work of each module, mainly including the clock chip programming, Bluetooth to serial and motor drive design flow chart, such as figure 7[5].

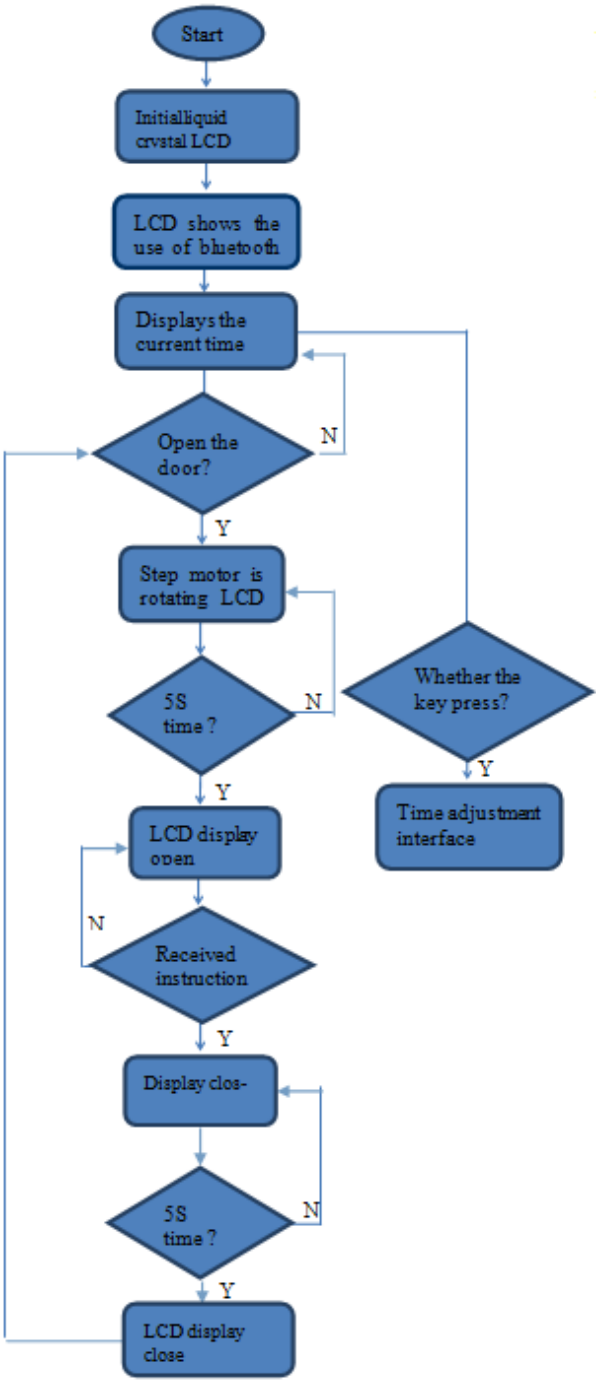

Fig. 7. Flow chart of software design

V. Outcome of Tests

After the design of the finished product, we have tested it. In the mobile terminal to send the open door to open the motor can make the motor according to the requirements of rotation. Mobile control end interface and finished drawings are as follows[6].

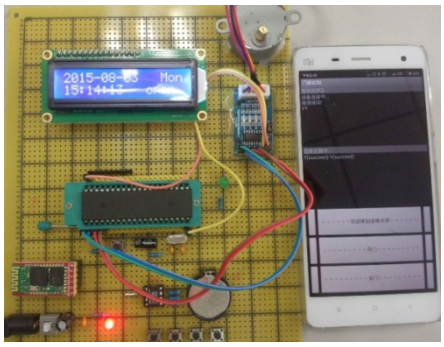

Fig. 8. Interface of cellphone control end

Fig. 9. Complete design

VI. Conclusion

The design uses STC89C52 microcontroller as control core, and DS1302 clock acquisition unit, LCD LCD module, motor drive unit and mobile control terminal and other five parts of the intelligent access control system[7]. After the improvement can be easily applied to the life, from the entrance card to avoid the tedious, not out of the door of the switch garage door.

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Ultrasonic Ranging Based on blind navigation Headphones

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***Abstract*-Studied a control system based on microcontroller as STC89C51 blind navigation headphone three directions Ultrasonic Ranging System, the hardware and software control system was designed with an adjustable alarm function, With real-time voice broadcast distance function， easy to carry, and finally to conduct research ranging error improve accuracy, there are some practical value in the field to guide the blind.**

INTRODUCTION

CHINA has the world's largest blind, due to defects in physical, visual impairment who have a lot of inconvenience in life and work, how to make the blind has become a problem on the road or indoor safe walking. In recent years, the continuous development of ultrasonic ranging technology research, ultrasonic dust, fog, the unique advantages of non-contact and attention been found, on the application of ultrasonic distance measurement is more universal. The important issue is how to design major research more practical ultrasonic ranging application in guiding system to achieve an accurate measurement of the guide of the blind system, and be able to accurately prompt, while reducing cost.

1 OVERALL DESIGN

The system consists of four parts: MCU control part, voice alarm part, Ultrasonic Ranging section, LCD display section. SCM is the core component of the system for controlling the coordination of various parts. In operation, microprocessor controlled oscillator source generates signals to drive the ultrasonic sensor, so that they continued firing pulse. Ultrasonic Ranging section, for each ultrasonic transducer, when after the first ultrasonic pulse emission, the counter starts counting, when the first echo pulse is detected, the counter will immediately stop counting, and also calculated from pulse emission to the time difference between the received Δt, and finally the use of the microcontroller to calculate the distance to the obstacle. Voice broadcast in part on distance plus and minus buttons to set the alarm from the control value of real-time voice broadcast and alarm indication. LCD display section for displaying the current three directions left, front and right side of the distance and display voice broadcast function on or off and alarm from the current through the key set. System structure is as follows:

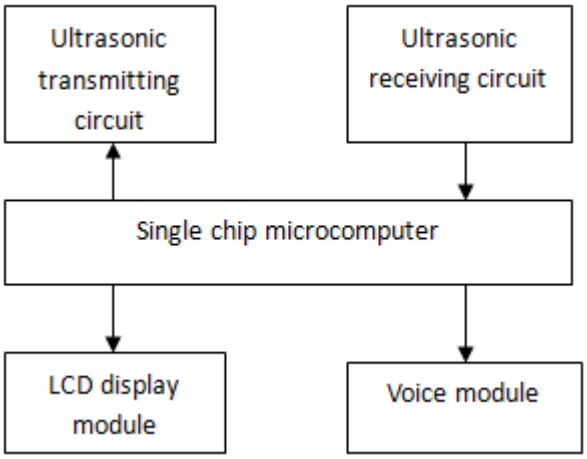

Fig 1 Diagram of the system's structure

2 ULTRASONIC DISTANCE MEASUREMENT PRINCIPLE

Ultrasound is a straight line of communication, using the piezoelectric effect to the principle of mutual transformation and ultrasonic energy, the higher the frequency, reflecting the stronger, but weaker diffraction ability. With this feature ultrasonic waves to measure the distance with regular transit time detection. Ultrasonic ranging principle is: When the ultrasonic ranging, under the control of the control circuit, ultrasonic transmitter transmitting a plurality of ultrasonic probe forward, when the ultrasonic obstacle in the air, will be reflected back and received by the ultrasonic probe converted into an electrical

signal, determining the echo signal by the controller. Provided an ultrasonic propagation velocity in air is known, and the round-trip travel time are equal, as long as the measured acoustic transmitter and acoustic receiver time difference, multiplied by the propagation velocity can be calculated from the emission point to the actual obstacle. If the medium is known sound velocity is c, an echo (receive sound waves) transmitted wave arrival time and the time difference of the time t, we can calculate the emission point and the reflection point (obstacle) distance s,

$$s=c\times\frac{t}{2} \quad (1),$$

Where, c is the ultrasonic wave propagation velocity (m / s). Ultrasonic wave propagation in solids fastest in the gas propagation speed of the slowest, but the speed of sound c and the temperature. If the ambient temperature varies significantly, we must consider the temperature compensation. Relationship between the speed of sound in air temperature can be expressed as

$$c=331.4\times\sqrt{1+T/273} \quad (2),$$

Where T is the ambient temperature (℃). Ultrasonic wave propagation velocity at room temperature in air is 340 m / s, this distance is not long since the measurement, the measurement accuracy is not required, do not consider other effects, as long as the measured ultrasonic wave transmitting and receiving echoes of the time difference t, according to equation (1) can be calculated.

3 SPECIFIC DESIGN

3.1 Hardware Design

Hardware structure diagram shown in Figure 2：

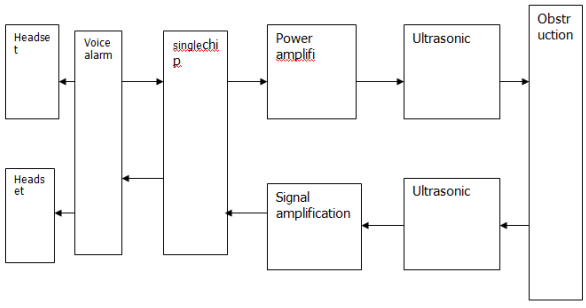

Fig 2 Har dwarestructure diagram

3.1.1 ultrasonic transceiver circuit

HC-SR04 ultrasonic ranging module provides 2cm-400cm non-contact distance sensing functions, ranging accuracy up to high to 3mm; module includes an ultrasonic transmitter, receiver and control circuitry.

The basic operating principle:

(1) The IO port TRIG trigger ranging, to the letter was the least 10us high level.

(2) module automatically sends eight 40khz square wave and automatically detect whether a signal return;

(3) the signal returned by ECHO IO port outputs a high level, high duration is Ultrasonic time from launch to return.

Ultrasonic timing diagram as follows:

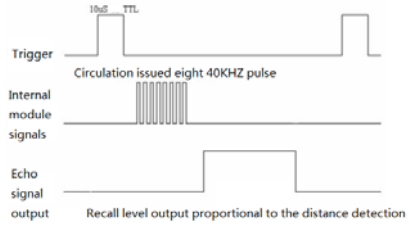

Fig 3 Ultrasonic timing diagram

Three four pins respectively SCM HC-SR04 ultrasonic sensor corresponding pin connector, and connect the power and ground, according to the ultrasonic obstacle of time, by the microcontroller from the left, front and right side calculated from the obstacle.

Ultrasonic transceiver circuit is as follows:

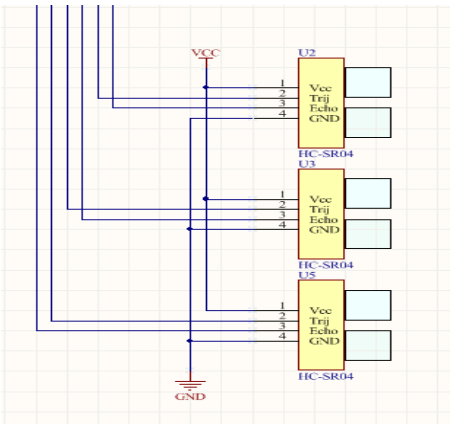

Fig 4 ultrasonic transceiver circuit

3.1.2 voice broadcast circuit

NY3P035 is stable performance of voice chip, without any external circuit, can work in extreme noise environments, it has a wide range of temperature and pressure, the normal operating range as wide as 1.8V ~ 5.5V, make up voice chip currently available anti-interference ability is poor defects.

NY3P035 voice chip has a set of PWM output, direct push headset, clear sound. Built precise resistance frequency vibrator (maximum error of only + -1%).

Serial sequence is as follows:

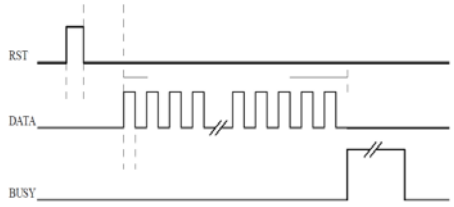

Fig 5 Serial Timing Diagram

Voice broadcast circuit part by a voice chip, a tuning capacitors and an earphone device composed by the MCU control section, you can broadcast has been burned good corresponding voice content. Users can hear the broadcast content via headset.

3.1.3 LCD display circuit

Use YM12864R LCD module to display the distance from the obstacle in three directions left, front and right side and all directions.

LCD display circuit is as follows:

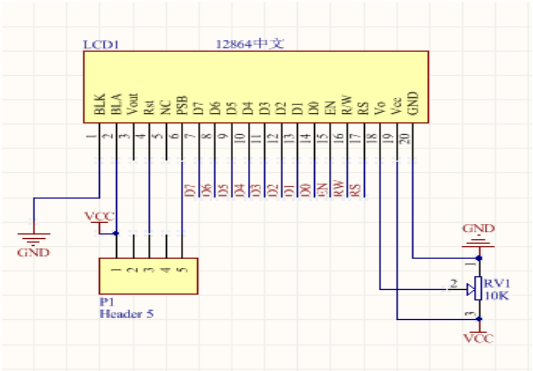

Fig 6 LCD circuit

3.2 Software Design

The system software is modular in design, communications ultrasonic transducer control, data processing and storage, with the host controller by STC89C51 microcontroller to complete, the main program flow chart shown in Figure 7.

After the control system electrical work, be initialized, set up a series of initial values for the system, including the number of ultrasound transmission interval, the initial value of the timer, distance calculation parameters. After the program controls the transmission ultrasonic wave, and start the timer; in order to avoid receiving sensor receives the ultrasonic wave transmitted directly after the emission of ultrasonic insert a delay to start the program after receiving echo delay, waiting to receive an echo timeout (in set within a given distance without obstacles) are returned to the front and re-emitting ultrasonic echo if you stop the clock, reading time difference, by the formula (1) calculating the distance, and then transmitted to the host controller via serial communication data, and finally return restart, uninterrupted detection.

Program flow chart is as follows:

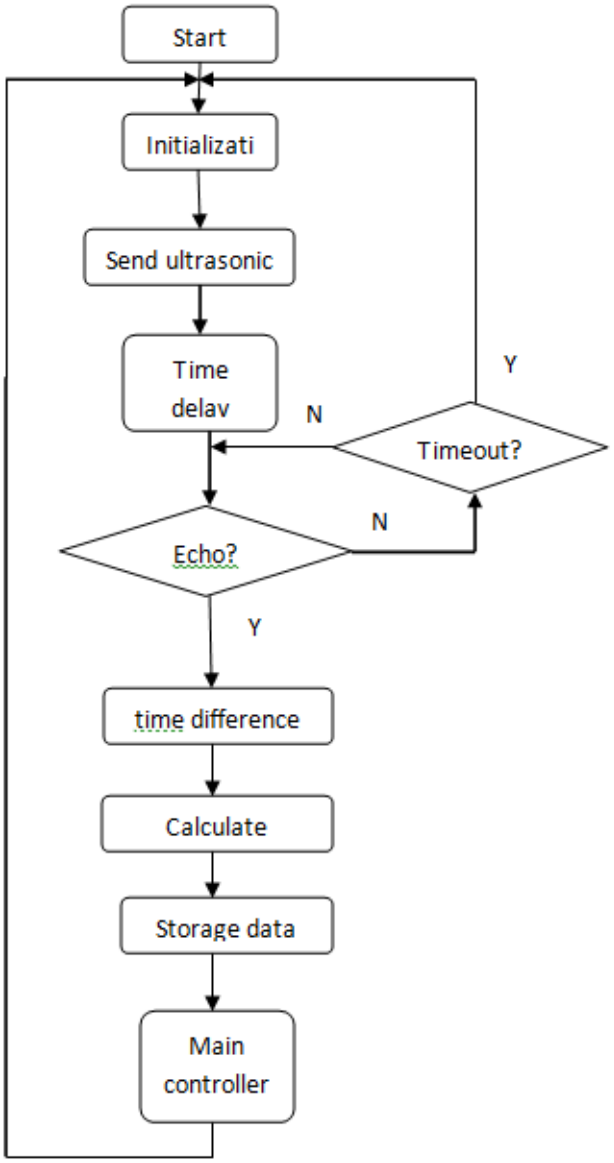

Fig 7 Program flow chart

4 TEST RESULTS AND ANALYSIS OF ERRORS

To test the accuracy of measurement of system, the system has carried on the field measurements, the surf ace smooth cardboard as obstacles to experiment, the l eft right ranging module of three directions of the mea

surement data recorded in the table.

Front direction		Unit: M
Standard value	Measured value	Error
0.10	0.10	0.00
0.20	0.20	0.00
0.30	0.29	-0.01
0.40	0.40	0.00
0.50	0.47	-0.03
1.00	0.99	-0.01
1.50	1.48	-0.02
2.00	1.97	-0.03
2.50	2.45	-0.05
3.00	3.00	0.00

Left direction		Unit: M
Standard value	Measured value	Error
0.10	0.10	0.00
0.20	0.20	0.00
0.30	0.30	0.00
0.40	0.40	0.00
0.50	0.51	-0.01
1.00	0.97	-0.03
1.50	1.47	-0.03
2.00	1.98	-0.02
2.50	2.47	-0.03
3.00	3.00	0.00

Right direction		Unit: M
Standard value	Measured value	Error
0.10	0.10	0.00
0.20	0.20	0.00
0.30	0.29	-0.01
0.40	0.39	-0.01
0.50	0.49	-0.01
1.00	0.98	-0.02
1.50	1.47	-0.03
2.00	1.97	-0.03
2.50	2.45	-0.05
3.00	3.00	0.00

Test results can be seen from the above, the effective distance based on ultrasonic ranging blind navigation headset design can reach 3 m, after the error analysis of the data found that the error between 0% to 3.3%, with a relatively good value, this design can be applied in real life.

5 CONCLUSIONS

Based on Ultrasonic Ranging blind navigation headphone design ranging error is small, with a voice prompt and accurate, you can adjust the volume of the headset more convenient to use in noisy outdoor space, the user can according to indoor or outdoor adjusting alarm distance. The system can meet the design requirements blind navigation of the headset, effective aid blind safe walking. With high precision, low cost, high reliability, but this design can also be applied in other ranging areas.

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The design of a tracing luggage robot based on the ultrasonic ranging

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***Abstract*-The tracing luggage robot can realize the recognition of the traced object basing on the infrared ray, and the opposite-type ultrasonic ranging is to measure the distance between the robot and the target, which the distance obtained is to control the motor to speed up or down and change the direction, so that can it locate the accurate position and do timely to trace the target. What's more, it also adds the pressure sensor to measure the weight. The robot includes the modules that can display the position of the target, the temperature of the space and the weight of the luggage.**

***Key words*-The ultrasonic ranging; Infrared Ray; Independent follow; Adjustable speed**

0. INTRODUCTION

THE intelligent robot that can trace and carry luggage can achieve automatic tracking and load bearing.In today's intelligent become a mainstream trend, it has a relatively broad application fields,but now in China the product that can follow has mainly railroad mechanical following . Part of the locomotive factory used for various types of production or playground street follow the car,is not practical for supermarkets, hotels, airports and other public occasions or family personal products,so we based on single chip microcomputer, ultrasonic positioning, integrated use for each part of the infrared time synchronization,To achieve the goal to follow content checked baggage robot,the distance can be independently set to follow,And according to the weight, distance and other information, which can realize the target accurately follow [2],Sorting can be used in laboratory experiment equipment,the release of the hands of people,reduce the burden of people,bring more convenience for people.

I. THE OVERALL PLAN

The system uses the wheel structure,the separated type ultrasonic ranging,separation from the ultrasonic transmitter and receiver,robot carries infrared receivers and two ultrasonic receiver,target carries infrared emission device and an ultrasonic launching device.

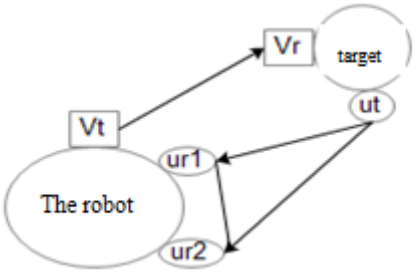

Fig.1 The principle diagram of altrosonic positioning

As shown in figure 1 as the principle of the robot,among it Vr is infrared emission,Vt is infrared receiver,ut is ultrasonic launching,ur1,ur2 are ultrasonic receivings.

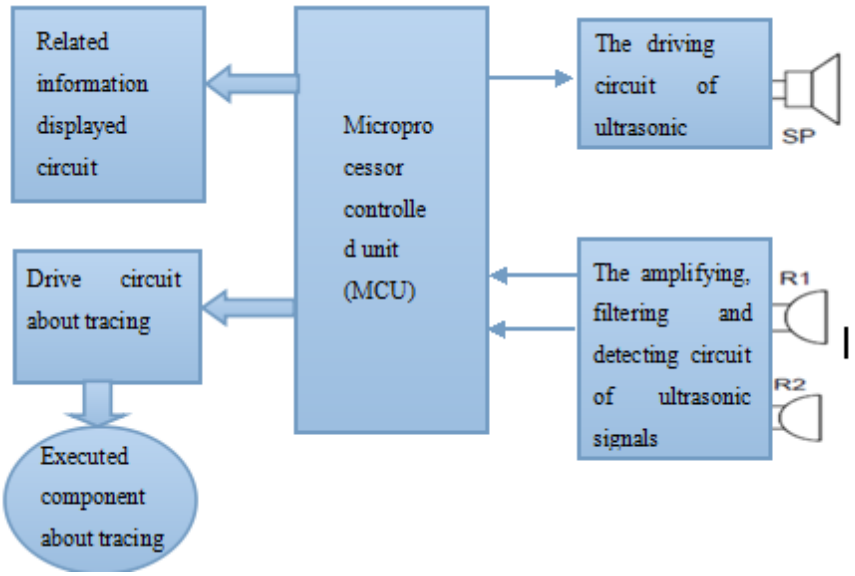

Fig.2 Composition and structure of ultrasonic target positioning system

As shown in figure 2,the working process of the ultrasonic positioning system is as follows：first,the target send infrared to the receiver 1, 2 ,and at the same time send ultrasound to the receiver 1,2.Once the receiver receives the infrared start timing,(Compared with ultrasound, infrared transmission time is negligible),When receiving ultrasonic stop timing,We can use this time difference to calculate the distance between the target and two receivers.

This design adopts the STC89C52 single-chip microcomputer,ultrasonic signal processing uses CX20106 chip application circuit that is produced by SONY,Adjusted processing frequency is 40 KHZ.Two distance values are obtained by ultrasonic ranging.Motors are driven by two L298N motor driver modules.L298N motor driver module can not only through input PWM wave to control motor speed,it can also use single chip computer to change the int1, int2, int3, int4 to control the motor steering.Due to the need to bearing,so we use four motors to drive the car.Every L298N controls one side of the two motors,same side of the motor speed and steering are no difference. The power supply voltage that motor uses is greater than 5 v,so L298N can output 5 v voltage power to supply for other modules.

II. METHODS

A. Separate Ranging

The working principle of the ultrasonic separate range is:the ultrasonic emitter emits ultrasonic wave, ultrasonic waves without reflection is directly received by receiver.So as long as measured from transmitting to receiving time t,we can use the formula (1）to calculate the distance [3],because ultrasonic wave propagation velocity is related to the temperature,so join the temperature measurement module.

$$s = v \times t \tag{1}$$

$$v = 331.45 + 0.607T \tag{2}$$

among (2),T represents the temperature .

Considering the separate distance is easily affected by reflection wave,it will have poor stability, receiving range small problems.This design adopts separate range for time difference,using the infrared spread faster than sound.As shown in the following is ultrasonic receiving circuit:

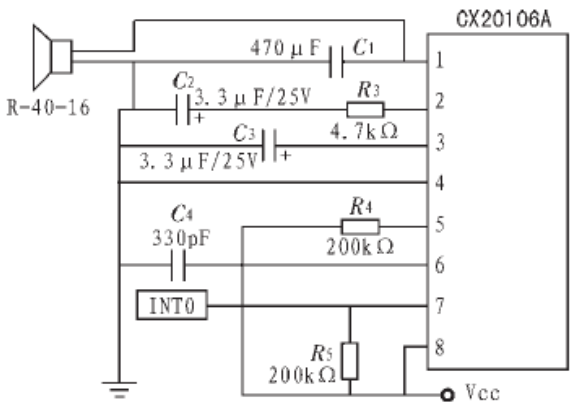

Fig.3 The main circuit of ultrasonic receiving

Emit ultrasonic transmission circuit in the launch infrared ray in the same direction at the same

time,After receiving an infrared receiving circuit boosted output level, wait for after receiving ultrasonic output into a low level.The duration of such a high level is the ultrasonic propagation time.Distance and temperature with industrial character type LCD LCD1602 display part.It can display 16 x02 namely 32 characters at the same time.

B.PWM Speed Regulation System

On the software, it interrupt by the timer ,using a timer T0,timing is 100 us,producing 100 times interrupt.

$$m1 = (u\,\mathrm{int})(100 - (dis\,\tan ce1 - 70)) \quad (3)$$

$$m2 = (u\,\mathrm{int})(100 - (dis\,\tan ce2 - 70)) \quad (4)$$

On the program calculation formula by using the above two speed values m1, m2(distance1 and distance2 are the distance from two ultrasonic transmitters to the receiver so that we get two duty ratios of PWM wave with the change of distance.Giving two PWM waves input two L298N motor driver modules for realizing PWM speed.

C. Pressure weighing module

When the baggage put on the baggage car,the baggage weight of the weighing module will display the corresponding to remind people to pay attention to whether overweight.Weighing modules are made the same as the digital voltmeter.System consists of resistance strain type pressure sensor to collect signals,this signal range of 0 ~ 5 mv ,Through the high precision instrument amplifier AD620 and magnified , the collected signals input for three and a half ICL7107 digital voltage display circuit directly displayed [4],pressure sensor and ICL7107 and AD620 adopt plus or minus 5 v power supply.So here we also need to use small power polarity reversal power converter ICL7660 to get negative voltage.

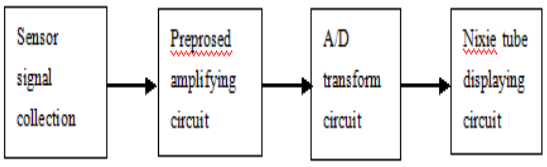

Fig.4 Weighing module workflow

III. THE TEST RESULTS

Through the test,Separate ranging module can normally range within 5 meters,ranging accuracy < 1 cm.Temperature measurement is higher than the actual temperature 0 ℃ ~ 0.2 ℃.Weighing module display digits of three,the smallest unit is 10 g.As shown in the following are the robot track the subject and object of the target device to carry.

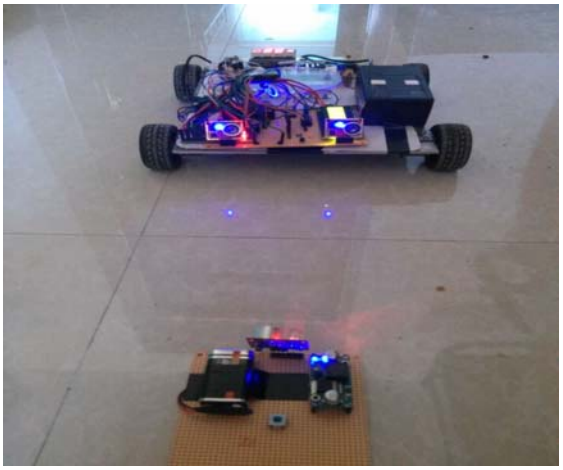

Fig.5 The photograph of real product

The car can normally turn when it has large angle towards the target.Because the car as a whole is heavy.For better realize the goal of car following turn,adopts four motors,Two into two way of turning back.This turning way can realize the function that the car track the target in situ turning.and largely reduce the time of turning.But at the same time as a result of the car in turn can not normally speed.So it will increase the distance with the target.When the target quickly turn and move on,sometimes it lead to follow the interrupt.Although separated ranging distance can reach 5 m,but when the car with the target distance is greater than 3 m,the car walk not smoothly,it can not follow the target well.So the car effectively following distance is 0 m ~ 3 m.

Table 1 Relationship between distance and tracing velocity

Distance(m)	0.5	0.7	1.2	1.7	2.5	≥3.0
Speed(m/s)	0	0.5	0.65	0.8	0.8	unstable

Table 2 Turning Angle and response time

Angle（°）	10	20	30	40	50	60	70	80
Time (s)	0.2	0.4	0.6	0.8	1.0	1.3	unstable	unstable

IV. RESULTS ANALYSIS

In the realization of its function of each module and the process of integration,We are very strict with each

module voltage,and through the voltage regulator module to ensure reliable data is provided for all components of the standard voltage.So for each error causes,Don't take into consideration the fact that the input voltage.No security around the temperature sensor of other components,The error of temperature measurement is likely to be the cause of the sensor itself.The error of weighing module is mainly caused by the limitation of the ICL7107 display circuit,In the process of zero,Because of the limitations on display,There is no guarantee that exactly zero,And in the process of weighing,100 g - 109.9 g shows the result is 100 g.So the error of weighing module 0 g ~ 10 g.

Separate ultrasonic ranging module to normal range within the 5 m,And within the scope of the 3 m ~ 5 m not normal to follow,the reason is that in the distance in 3 m ~ 5 m range,ultrasonic receiving greatly influenced by the angle,slight angle change could lead that a receiver can not receive ultrasonic .But 3 m distance has meet the design requirements.The biggest problem is the follow performance which is the most important.For better implementation following the performance,on the hardware and software need to be improved.To solve the case now,we should adopt rated voltage for the larger motor,the diameter of the wheel should be increased immediately.So that we can in the side of the motor forward side of the brake,even on both sides of the motor is turning but the realization of turning speed of varying circumstances.This can be avoided in the process of driving the car with the target was interrupted by the distance is too large to follow.But at the same time,the output of the power supply voltage and capacity must also increase.On the program,for a better implementation of follow,on the basis of the hardware upgrade,you can use a variety of ways to turn to make the target in every position the car the car is good to follow.Add turn back and back of the control program,we can make the car following will be improved.

Through actual use,this design can also be more perfect in function.Such as add the function of remote control,we can make the person carries through body positioning device to start-stop trolleys,and in the start state,If the baggage do not receive ultrasound,it will spin around,until it find targets.In addition,this design also lacks obstacle avoidance function,if used in many cases,we still need to add other recognition.

V. CONCLUSION

This paper introduces the automatic follow robot system based on ultrasonic positioning,using ultrasonic sensors and infrared device to realize real-time following the car.By experimental verification,robot's reaction speed is sensitive.Within the detection range on a single target can effectively track the object,(it can keep synchronization within 3 m distance with master to follow),and by setting the distance between the two receiving sensor can reduce the robot to track the dead zone.The system uses lithium batteries,DC motors control speed,simple structure,easy to implement,the cost is not high.Hope that can be applied to public or industrial handling purposes,bring more convenience for people.

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