Realization of Dry Cleaning Machine

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Abstract. An alarm system automatic dryer control circuit SMS use STC89C52 microcontroller, DHT11 temperature sensor, display, relay, GSM technology components. GSM technology based on GSM module, send text messages to the relay, according to the SMS commands to control motor, when the clothes are temperature and humidity were collected by the detector and data processing through the transmission pin is transmitted to the single chip microcomputer.

1. Introduction

Nowadays, the average household dryer is common among families in many western countries. It is mainly used in combination with a washing machine, that is, clothes are dried by a dryer after washed by the washing machine, which can save time of use of clothing. However,it is not very popular in our country at present, it is only a small part of the family that can use the combination of a washing machine and a dryer, for which the main reason is that the price is expensive.

However, with the development of society and economy, the function of the dryer on the market in the future will be more comprehensive and the price will also be reduced. In this way, the dryer will reach tens of millions of families.

People tend to do other things after drying their clothes. This circumstance requires a clothes dryer that can automatically dry clothes. However, there are few dryers on the market can automatically dry clothes and promptly send text messages to remind users the progress of the clothes dry. This article describes the GSM-based dryer SMS alarm system.

2. Design Scheme

The design is mainly composed of STC89C52 microcontroller controller, DHT11 temperature and humidity sensor, GSM technology module and LCD1602 LCD module circuit. After the clothes' humidity and temperature real-time data is detected by DHT11 temperature and humidity sensor,it will be passed to the STC89C52 microcontroller, the relay controller will automatically request control the motor, and the temperature and humidity around clothes will be displayed on the LCD1602 LCD module when the motor starts working , then after the motor drying clothes and when the temperature and humidity meets the design requirements, the relay control dryer to automatically shut down, finally, GSM technology module will send SMS notification.

2.1 Analysis of Power Part

Since the operating voltage of the system components is 5V, and now most Android smart phones have a 5V DC power supply USB interface as well as the computer USB output is 5V voltage, so all modules of this system can be powered. Therefore, when designed power, the motor needs 22V, adopting directly plug in the general household power supply, in order to reduce costs and ease of use of other control circuit power, deciding to use a separate power supply and selecting the USB power supply.

Figure 1. Physical Map of STC89C52

Port 0 (P0.0 ~ P0.7): Port 0 is also used as the lower 8 bits for address and data multiplexing when accessing external programs and data memory. In this mode, P0 has an internal pull-up resistor. Port 0 is also used to receive the instruction byte while flash programming; the instruction byte [5] is output during program verification. It needs external pull-up resistor during program verification.

Port P2 (P2.0 ~P2.7): When accessing external program memory or reading external data memory with 16-bit address, P2 port sends out the upper eight bits address; in this case, P2 port uses strong internal pull-up to send "1" [3]; Port 2 outputs the contents of the P2 latch when accessing the external data memory using an 8-bit address; Port 2 also receives the upper 8-bit address byte and some control signals[5] while flashing programming and verifying.
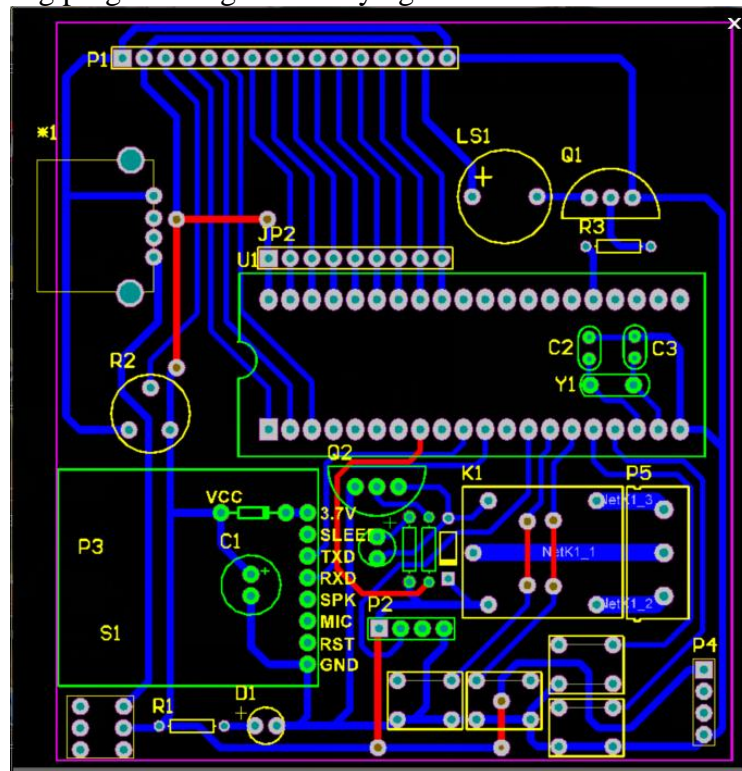

Figure 2. Port P2 (P2.0 ～P2.7):

2.2 Crystal Oscillator Circuit

The design of the crystal oscillator circuit is shown in Figure 4. There is an inverting amplifier used to form the internal oscillator in the STC89C52 microcontroller, XTAL1 and XTAL2 are the amplifier's input and output respectively, when externally connects ceramic oscillator, the capacitor C2 and C3 choose 40pF ± 10pF; the crystal oscillator frequency is generally chosen in the range of 1.2 ～12MHz in the STC89C52 system; external connected quartz crystal or ceramic oscillator and compensation capacitors C2, C3 form a parallel resonant circuit[9]; when connects quartz crystal externally, capacitor C2, C3 chooses 30pF ± 10pF; the size of external connected capacitors C2, C3 will affect the level of oscillator frequency, oscillation frequency stability, start-up time and temperature stability [9]; in the design of the circuit board, the crystal oscillator and capacitor should be close to the microcontroller in order to reduce parasitic capacitance to ensure stable and reliable oscillator work.
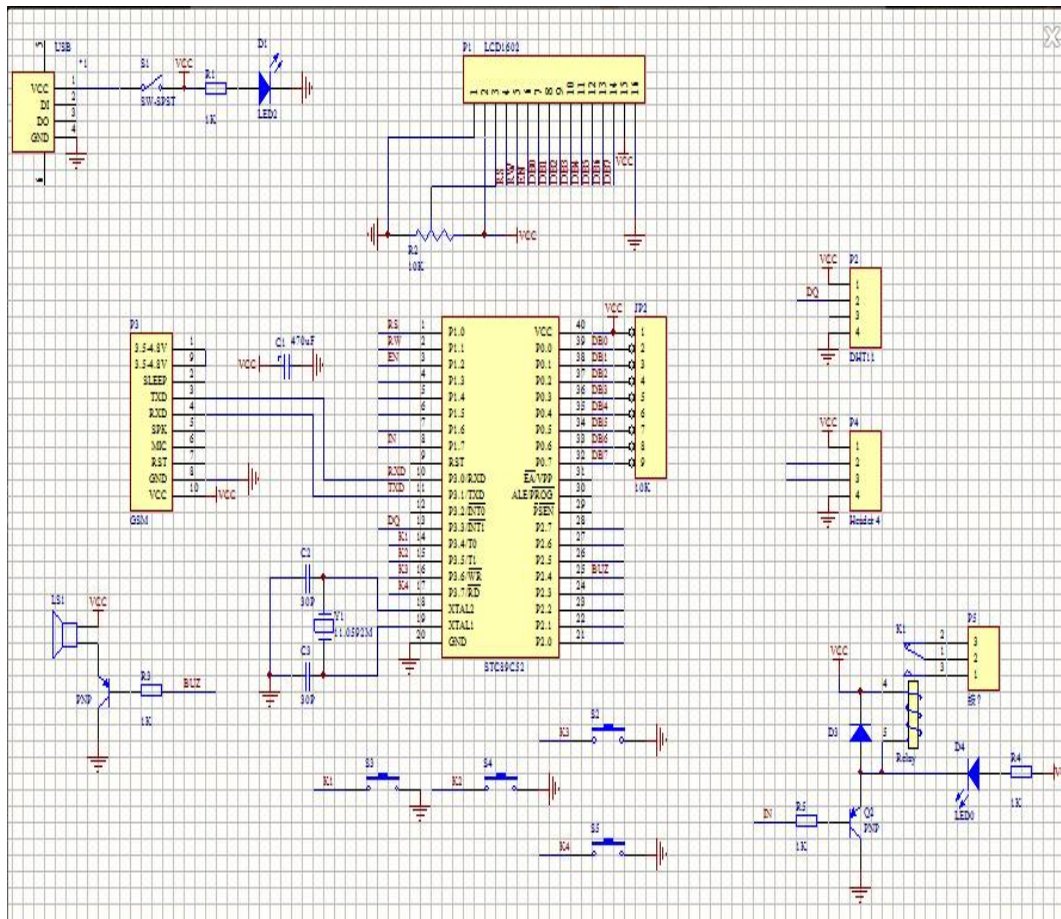
Figure 3. Crystal Oscillator Circuit

2.3 Serial Communication Circuit

Nowadays, the LCD screen can be seen everywhere. It has been widely used as the original display of electronic products, such as computers, multimeters and many household appliances, etc., which mainly for displaying numbers or images. There are many advantages in use of liquid crystal display in the microcontroller as the output of the original, such as relatively high quality of the display of output, small size, light weight, low power consumption and so on.

LCD1602 is a dot matrix LCD character LCD module specially designed for displaying letters, numbers, symbols, etc.. It is divided into two types, namely are with backlight and without backlight. The main technical parameters are display capacity: 16×2 characters, chip operating voltage: 4.5-5.5V, operating current: 2.0mA (5.0V), the best working voltage of the module: 5.0V the module, character size: 2.95×4.35 (W $\times$ H) mm.
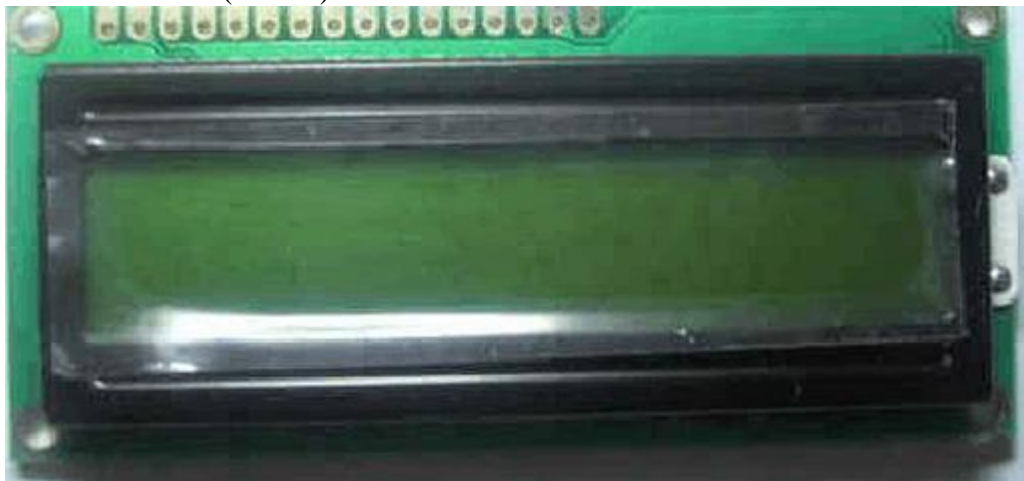

Figure 4. Physical Map of LCD1602 Viewing Screen

3. Software Design

Only the reading is completed can the next judgment command be performed. If the read command is the same as the preset command, the corresponding code is executed. If not, the process returns to the previous step. In this way, the alarm SMS is set and user receives the number. After the number is set, the corresponding information will be fed back to the receiving side of the mobile phone according to the instruction and running status, and the receiver can send the message back according to their own intention after receiving the reminder, that is, sending ON to control the motor to open and sending OFF to turn off the motor.

A part of code as follow:

```
#include<reg52.h>
#include"lcd1602.h"
#include"GSM.h"
#include "key's"
#include "dht11.h"
#finder char
#define char unsigned char
#define unit unsigned into
#endive
Sit JD=P1^7; /char data recive_buff[70];
Char Newel [12];
Char telnmb[12]="15857513121";
Bit flag=0;
Bit start flag=0;
Bit send flag=0;
Bit Flag;
Bit err=0;
Bit MsgFlag;
Sit beef=P2^4;
Char tiao;
Char sec=0;

Unit Mind=3000;
Char Math=40;
Char Miner=30;
Char tinder;
Extern into wend, shade;
Void Ini_UART(void)
{
  SCON=0x50;  //UART
  PCON=0x00;  //SMOD
  TMOD=0x20;  //T1
  TH1=0xFD;
  TL1=0xFD;  //UART   TR1=1;
    EA=1;
    ES=1;
}
Void t0_init (void)
{
    TMOD|=0x01;
    TH0= (65536-46080)/256;
    TL0= (65536-46080) %256;
```

```
    ET0=1;
    TR0=0;
}
Void Showmen ()
{
    lcd_wcom(0x01);
    lcd_wcom(0x80);
    lcd_wstr("Max:");
    lcd_wdat(Max_TH/10+0x30);
    lcd_wdat(Max_TH%10+0x30);
    lcd_wdat('C');

    lcd_wcom(0x80+9);
    lcd_wstr("Min:");
    lcd_wdat(Min_RH/10+0x30);
    lcd_wdat(Min_RH%10+0x30);
    lcd_wdat('%');
}
Void stroppy (char *s1, char *s2)
{
    Char i=0;
    While (s2 [i]! ='\0')
    {
            s1 [i] =s2 [i];
            i++;
    }
}
Char trampy (char *str1, uchar *str2)
{
    while (*str2!='\0')
    {
            if(*str1!=*str2)
                    return 1;
            str1++;
            str2++;
    }
    if(*str1=='\0')
            return 0;
    return 1;
}
uchar strncmpy(uchar *str1,uchar *str2,uchar len)
{
    uchar i=0;
    while(str2[i]!='\0'&&i<len)
    {
            if(str1[i]!=str2[i])
                    return 1;
            i++;
    }
    return 0;
}
```

```
uchar strncmp(uchar *str1,uchar *str2,uchar len){
    uchar i=0;
    while(str2[i]!='\0'&&i<len)
    {
            if(str1[i]!=str2[i])
                    return 1;
            i++;
    }
    return 0;
}
void clear_line(uchar line)
{

    lcd_wcom(0x80+0x40*line);
    lcd_wstr("              ");
}
void Clear_RxBuffer(void)
{
    uchar ij;
  for(ij=0;ij<70;ij++)
  recive_buff[ij]=0;
}
void Set_Wendu()
{
    lcd_wcom(0x01);
    lcd_wcom(0x80);
    lcd_wstr("Set Max_TH");
    while(1)
    {
            switch(getkey())
            {
                    case 1:return;
                    case 3:if(Max_TH<100)Max_TH++;break;
                    case 4:if(Max_TH>0)Max_TH--;break;
            }
            lcd_wcom(0x80+0x45);
            lcd_wdat(Max_TH/10+0x30);
            lcd_wdat(Max_TH%10+0x30);
    }
}
void Set_Shidu()
{
    lcd_wcom(0x01);
    lcd_wcom(0x80);
    lcd_wstr("Set Min_RH");
    while(1)
    {
            switch(getkey())
            {
                    case 2:return;
                    case 3:if(Min_RH<100)Min_RH++;break;
```

```
                case 4:if(Min_RH>0)Min_RH--;break;
            }
            lcd_wcom(0x80+0x45);
            lcd_wdat(Min_RH/10+0x30);
            lcd_wdat(Min_RH%10+0x30);
        }
    }
```

4. Software Debugging

It was relatively knotty when programming software programs in the very beginning,for did not know preset what command firstly, which needed to search information and ask teachers and classmates for just a little clue, and finally the program was programmed step by step. We used the C language, because it is not only more popular and easy to understand, but also very good to meet our system requirements. Programming used keil software in the software debugging, inputting software in the compiled program and compile to generate code, and then connect the circuit, downloading, reading and writing the program code into the STC89C52 microcontroller, and then debug module by module to see whether each module can achieve their own requirements of the function, if not, you need to check the program and the circuit diagram carefully, repeat in this way until each module can achieve its function. Then debug the entire program and have an overall test.
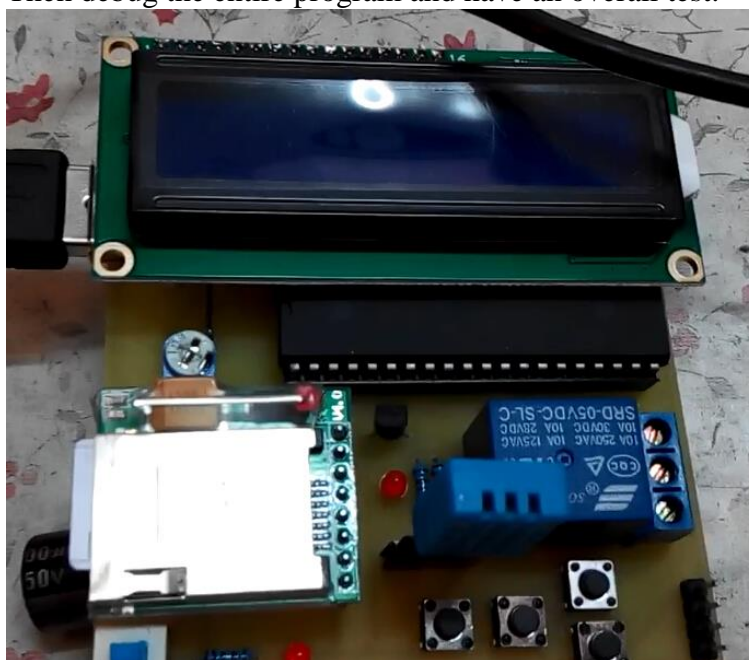

Figure 5. Hardware diagram

In the process of the completion of the debug, microcontroller would reset and reboot automatically sometimes, which may be caused by the instability of the software, also may be a welding problem, it would work again when it is reset.

5. Summary

Through months of continuous learning and practice, my design was finally completed. This work is supported the following fund:

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