# 单片机实验报告

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# 实验五　重量测量

1. 实验目的

掌握点阵式液晶显示屏的原理和控制方法，掌握点阵字符的显示方法。

掌握模拟/数字（A/D）转换方式，

进一步掌握使用C51语言编写程序的方法，使用C51语言编写实现重量测量的功能。

2. 实验内容

参考辅助材料，学习C51语言使用

编写C51程序，使用重量测量实验板测量标准砝码的重量，将结果（以克计）显示到液晶屏上。误差可允许的范围之间。

3.实验器材

单片机测控实验系统

重量测量实验板/砝码

Keil开发环境

STC-ISP程序下载工具

4.实验步骤

1. 阅读实验原理，掌握YM12864C的控制方式，编写出基本的输出命令和数据的子程序；

2. 掌握点阵字模的构成方式。使用字模软件PCtoLCD2002，设定正确的输出模式，生成点阵数据

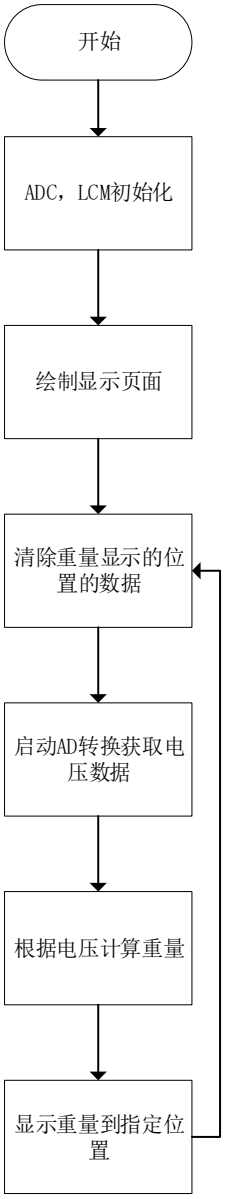
3. 使用C51语言编写重量测量程序；

4. 调零，满量程校准；

5. 将编译后的程序下载到51单片机；

6. 在托盘中放上相应重量的法码，使显示值为正确重量。

5.实验流程图




6.实验代码

```
#include<reg52.h>

#include<intrins.h>
```

```
#define  CORRECT_WEIGHT 100
#define  WEI_CHANNEL 0

#define ADC_POWER 0x80
#define ADC_START 0x08
#define ADC_FLAG 0x10
#define ADC_SPEED_LL 0x00
#define ADC_SPEED_L 0x20
#define ADC_SPEED_H 0x40
#define ADC_SPEED_HH 0x60

#define LCM_DATA P2
#define LCM_SW 0x3E
#define LCM_PAGE 0xB8
#define LCM_COL 0x40
#define LCM_START_ROW 0xC0

#define NUM_PAGE_FROM 0x02
#define NUM_PAGE_END 0x03
#define NUM_COL_FROM 0x08
#define NUM_COL_END 0x1F
```

```
typedef unsigned int uint;
typedef unsigned char uchar;

sfr ADC_CONTR=0xBC;
sfr ADC_RES=0xBD;
sfr ADC_RESL=0xBE;
sfr P1ASF=0x9D;
sfr AUXR1=0xA2;

sbit SW1=P3^6;
sbit SW2=P3^7;
sbit RST=P1^5;
sbit CS1=P1^7;
sbit CS2=P1^6;
sbit E=P3^3;
sbit RW=P3^4;
sbit RS=P3^5;
sbit BUSY=P2^7;

uchar code
WordCode[]={0x10,0x10,0x14,0xD4,0x54,0x54,0x54,0xFC,0x52,0x
52,0x52,0xD3,0x12,0x10,0x10,0x00,
```

0x40, 0x40, 0x50, 0x57, 0x55, 0x55, 0x55, 0x7F, 0x55, 0x55, 0x55, 0x57
, 0x50, 0x40, 0x40, 0x00, //zhong

0x20, 0x20, 0x20, 0xBE, 0xAA, 0xAA, 0xAA, 0xAA, 0xAA, 0xAA, 0xAA, 0xBE
, 0x20, 0x20, 0x20, 0x00,
0x00, 0x80, 0x80, 0xAF, 0xAA, 0xAA, 0xAA, 0xFF, 0xAA, 0xAA, 0xAA, 0xAF
, 0x80, 0x80, 0x00, 0x00, //liang

0x10, 0x60, 0x02, 0x8C, 0x00, 0xFE, 0x02, 0xF2, 0x02, 0xFE, 0x00, 0xF8
, 0x00, 0xFF, 0x00, 0x00,
0x04, 0x04, 0x7E, 0x01, 0x80, 0x47, 0x30, 0x0F, 0x10, 0x27, 0x00, 0x47
, 0x80, 0x7F, 0x00, 0x00, //ce

0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00
, 0x00, 0x00, 0x00, 0x00,
0x00, 0x00, 0x36, 0x36, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00
, 0x00, 0x00, 0x00, 0x00, //;

0x10, 0x10, 0x10, 0xFF, 0x90, 0x20, 0x98, 0x88, 0x88, 0xE9, 0x8E, 0x88
, 0x88, 0xA8, 0x98, 0x00,
0x02, 0x42, 0x81, 0x7F, 0x00, 0x00, 0x80, 0x84, 0x4B, 0x28, 0x10, 0x28
, 0x47, 0x80, 0x00, 0x00, //an

0x40,0x42,0xCC,0x00,0x00,0xFE,0x82,0x92,0x92,0xFE,0x92,0x92
,0x82,0xFE,0x00,0x00,
0x00,0x00,0x3F,0x10,0x88,0x7F,0x00,0x1E,0x12,0x12,0x12,0x5E
,0x80,0x7F,0x00,0x00,//tiao

0x10,0x0C,0x05,0x55,0x55,0x55,0x85,0x7F,0x85,0x55,0x55,0x55
,0x05,0x14,0x0C,0x00,
0x04,0x04,0x02,0x0A,0x09,0x29,0x2A,0x4C,0x48,0xA9,0x19,0x02
,0x02,0x04,0x04,0x00,//ling

0x10,0x10,0xD0,0xFF,0x90,0x10,0x80,0x48,0x28,0x09,0x0E,0x08
,0x28,0x48,0x88,0x00,
0x04,0x03,0x00,0xFF,0x00,0x01,0x80,0x80,0x43,0x2C,0x10,0x2C
,0x43,0x80,0x80,0x00,//jiao

0x00,0x02,0x0C,0xE0,0x40,0x20,0xF8,0x4F,0x48,0x49,0xFE,0x48
,0x48,0x48,0x08,0x00,
0x04,0x04,0x7F,0x00,0x00,0x00,0xFF,0x22,0x22,0x22,0x3F,0x22
,0x22,0x22,0x20,0x00};//zhun

uchar code

CharCode[]={0x00, 0xE0, 0x10, 0x08, 0x08, 0x10, 0xE0, 0x00, 0x00, 0x0F, 0x10, 0x20, 0x20, 0x10, 0x0F, 0x00, /*"0", 0*/

0x00, 0x10, 0x10, 0xF8, 0x00, 0x00, 0x00, 0x00, 0x00, 0x20, 0x20, 0x3F, 0x20, 0x20, 0x00, 0x00, /*"1", 1*/

0x00, 0x70, 0x08, 0x08, 0x08, 0x88, 0x70, 0x00, 0x00, 0x30, 0x28, 0x24, 0x22, 0x21, 0x30, 0x00, /*"2", 2*/

0x00, 0x30, 0x08, 0x88, 0x88, 0x48, 0x30, 0x00, 0x00, 0x18, 0x20, 0x20, 0x20, 0x11, 0x0E, 0x00, /*"3", 3*/

0x00, 0x00, 0xC0, 0x20, 0x10, 0xF8, 0x00, 0x00, 0x00, 0x07, 0x04, 0x24, 0x24, 0x3F, 0x24, 0x00, /*"4", 4*/

0x00, 0xF8, 0x08, 0x88, 0x88, 0x08, 0x08, 0x00, 0x00, 0x19, 0x21, 0x20, 0x20, 0x11, 0x0E, 0x00, /*"5", 5*/

0x00, 0xE0, 0x10, 0x88, 0x88, 0x18, 0x00, 0x00, 0x00, 0x0F, 0x11, 0x20, 0x20, 0x11, 0x0E, 0x00, /*"6", 6*/

0x00, 0x38, 0x08, 0x08, 0xC8, 0x38, 0x08, 0x00, 0x00, 0x00, 0x00, 0x3F

```
,0x00,0x00,0x00,0x00,/*"7",7*/

0x00,0x70,0x88,0x08,0x08,0x88,0x70,0x00,0x00,0x1C,0x22,0x21
,0x21,0x22,0x1C,0x00,/*"8",8*/

0x00,0xE0,0x10,0x08,0x08,0x10,0xE0,0x00,0x00,0x00,0x31,0x22
,0x22,0x11,0x0F,0x00,

0x00,0x00,0x80,0x80,0x80,0x80,0x80,0x00,0x00,0x6B,0x94,0x94
,0x94,0x93,0x60,0x00,/*"g",0*/

0x40,0xC0,0x78,0x40,0xC0,0x78,0x40,0x00,0x04,0x3F,0x04,0x04
,0x3F,0x04,0x04,0x00,/*"#",1*/

0x00,0x70,0x88,0x08,0x08,0x08,0x38,0x00,0x00,0x38,0x20,0x21
,0x21,0x22,0x1C,0x00};
uint zero_argc=0;
uint correct_argc=194;
uchar adjust_flag=0x00;
uint getADCData();
void Show (uint weight);
void PaintMainBoard();
```

```
void Adjust();
void InitADC();
void InitLCM();
void Clear(uchar screen,uchar page_from,uchar
page_end,uchar col_from,uchar col_end);
void DisOneWord(uchar screen,uchar page,uchar col,uint
length,uchar *from);
void Delay(uint time);
void WaitBusy();
void SendCmdToLCM(uchar cmd);
void SendDataToLCM(uchar datas);
void main()
{
  uint voltage=0;
   InitADC();
   InitLCM();
   PaintMainBoard();
   while(1)//循环读取外界信息
   {

   Clear(2,NUM_PAGE_FROM,NUM_PAGE_END,NUM_COL_FROM,NUM_COL_
END);//每次读取重量前，将之前已经显示的重量清除
```

```
        Adjust();//判断是否按下了调零按钮SW1
        voltage=getADCData();
        Show(voltage);
    }
}
void InitADC()
{
    AUXR1|=0X04;//ADRJ置1，让res低2位和resf进行存储
    P1ASF=1;//用P1.1作为AD转换口
    ADC_CONTR=0x80;//使AD转换启动，并且为低速
    Delay(2);//延时
}

void Delay(uint time)
{
        uint x;
    while(time--){
        x = 1000;
        while(x--);
    }
}
void InitLCM()
```

```
{
    WaitBusy();//等待有效
    RST=1;
    SendCmdToLCM(LCM_SW|0x01);//显示开关设置为开
    SendCmdToLCM(LCM_START_ROW|0x00);//显示起始行为0
    Clear(1,0,7,0,63);//清屏左半屏幕,
    Clear(2,0,7,0,63);//清屏右半屏幕
    Delay(2);//延时
}
void SendCmdToLCM(uchar cmd )
{
    WaitBusy();
    RS = 0;
    RW = 0;
    LCM_DATA = cmd;//传送相应的命令到DATA
    E = 1;//E的下降沿才能写入
    Delay(2);
    E = 0;
}
void Clear(uchar screen,uchar page_from,uchar
page_end,uchar col_from,uchar col_end)
    {
```

```
    uchar i,j;//对指定左右的屏幕，指定页数和列进行置0
    if(screen == 1){//左半屏
       CS1 = 1;
       CS2 = 0;
    }
    else if(screen == 2)
       {//右半屏幕
       CS1 = 0;
       CS2 = 1;
    }
    for(i=page_from;i<=page_end;++i)
    {
       SendCmdToLCM(LCM_PAGE|i);//设置起始页
       SendCmdToLCM(LCM_COL|col_from);//设置起始校列
       for(j=col_from;j<col_end;++j){//对从起始到结束的页面
的列进行清零
          SendDataToLCM(0x00);
       }
    }
}

    void SendDataToLCM(uchar datas)
```

```
    {
    WaitBusy();
    RS = 1;//RS1 RW0时才能写入的才是显示存储器单元
    RW = 0;
    P2 = datas;
    E = 1;
    Delay(2);
    E = 0;
    }
    void PaintMainBoard()
{
    DisOneWord(1,0x00,0x20,16,&WordCode[0]);
    DisOneWord(1,0x00,0x30,16,&WordCode[32]);
    DisOneWord(2,0x00,0x00,16,&WordCode[64]);
    DisOneWord(2,0x00,0x10,16,&WordCode[32]);
    DisOneWord(1,0x02,0x10,16,&WordCode[0]);
    DisOneWord(1,0x02,0x20,16,&WordCode[32]);
    DisOneWord(1,0x02,0x30,16,&WordCode[96]);
    DisOneWord(2,0x02,0x08,8,&CharCode[0]);
    DisOneWord(2,0x02,0x10,8,&CharCode[0]);
    DisOneWord(2,0x02,0x18,8,&CharCode[0]);
    DisOneWord(2,0x02,0x28,8,&CharCode[160]);
```

```
    //在指定位置显示指定的文字或字母

}
void DisOneWord(uchar screen,uchar page,uchar col,uint
length,uchar *from)//在指定屏幕的指定页面和指定列，根据
LENGTH，从指定的指针位置显示字母或汉字
{
    uint i=0,j=0;
    WaitBusy();
    if(screen == 1){
        CS1 = 1;
        CS2 = 0;
    }
    else if(screen == 2){
        CS1 = 0;
        CS2 = 1;
    }
    for(j=0;j<2;++j){
        SendCmdToLCM(LCM_PAGE|page);
        SendCmdToLCM(LCM_COL|col);
        for(i=0;i<length;++i){
            SendDataToLCM(*from);
```

```
            from++;//输入到显示寄存器中后指针加1
        }
        page++;
}
}
    void Adjust()
{
    if(!SW1){//按下了SW1，将当前的电压放到zero变量中
        zero_argc = getADCData();
        adjust_flag=0x01;
    }
}
uint getADCData()
{
    ADC_RES=ADC_RESL=0;//先软件清零这两个寄存器
    ADC_CONTR=ADC_POWER|ADC_SPEED_LL|ADC_START;//启动ADC并将速度调至540一次
    _nop_();
    _nop_();
   _nop_();
    _nop_();//4个空操作延时
    while(!(ADC_CONTR&0x10));//当程序的CONTR中的FLAG为1转换
```

```
结束
    ADC_CONTR&=~ADC_FLAG;//对FLAG进行清零
    return(ADC_RES&0x03)*256+ADC_RESL;//返回电压值的数字信号
}
void Show(uint voltage)
{
    uint a,b,c;
    //uint real_wt=(voltage -
zero_argc)*(CORRECT_WEIGHT)/(correct_argc - zero_argc);//实
际的重量计算，
    uint  real_wt=(voltage-zero_argc)*100/197+20;
    if (real_wt==20)
    {
       a=0;
       b=0;
       c=0;
    }
    else
    {
    a=real_wt%10;
    real_wt/=10;
    b=real_wt%10;
```

```
    c=real_wt/10;
    }
    DisOneWord(2,0x02,0x08,8,&CharCode[c*16]);
    DisOneWord(2,0x02,0x10,8,&CharCode[b*16]);
    DisOneWord(2,0x02,0x18,8,&CharCode[a*16]);
    Delay(200);
}
void WaitBusy(){
    RS = 0;
    RW = 1;
    E = 1;//在使能端下降沿读取
    while(BUSY);//只有当BUSY为低点位时跳出循环
    E = 0;
}
```

# 实验六　直流电机脉宽调制调速

## 1. 实验目的

掌握脉宽调制调速的原理与方法，学习频率/周期测量的方法，了解闭环控制的原理。

## 2. 实验内容

1. 在液晶显示屏上显示出直流电机的：当前转速、低目标转速、高目标转速。

2. 固定向P1.1输出0，然后测量每秒钟电机转动的转数，将其显示

在数码管，每秒刷新一次即可。

3. 使用脉宽调制的方法，动态调整向P1.1输出的内容，使得电机转速能够稳定在一个预定值附近，同时实时显示当前转速。

4. 根据输入修改电机得目标转速值，设置两个转速目标值：低转速和高转速。

5. 每隔一秒钟读取两个开关的状态，如果S1按下，动态调整输出，使得电机转速能够稳定到低转速目标值附近，如果S2按下，动态调整输出，使得电机转速能够稳定到高转速目标值附近。交替显示目标值和当前转速值。

## 3.实验器材

单片机测控实验系统

直流电机调速实验模块

Keil开发环境

STC-ISP程序下载工具

## 4.实验步骤

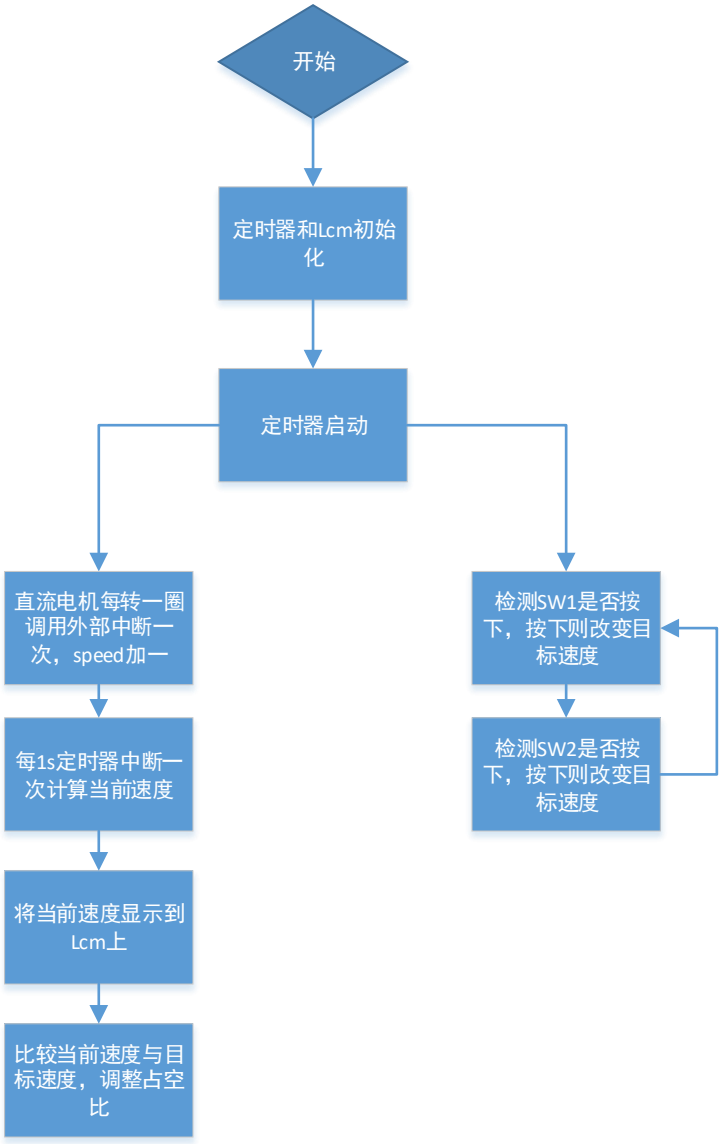
4.1 建立工程，实现实验内容1

4.2 编写中断程序，测量电机转速

4.3 完成控制转速程序

4.4 完成整体实验内容

## 5.实验流程图




6.实验代码

```
#include <reg52.h>
#include<intrins.h>
typedef unsigned char uchar;
typedef unsigned int uint;
#define LCM_DATA P2
#define LCM_SW 0x3E
#define LCM_PAGE 0xB8
#define LCM_COL 0x40
#define LCM_START_ROW 0xC0
#define NUM_PAGE_FROM 0x02
#define NUM_PAGE_END 0x03
#define NUM_COL_FROM 0x08
#define NUM_COL_END 0x1F
sbit V=P1^1;
sbit SW1=P3^6;
```

```
sbit SW2=P3^7;
sbit RST=P1^5;
sbit CS1=P1^7;
sbit CS2=P1^6;
sbit E=P3^3;
sbit RW=P3^4;
sbit RS=P3^5;
sbit BUSY=P2^7;
uchar code
WordCode[]={{0x00,0x00,0xFE,0x22,0x22,0x22,0x22,0x22,0x22,0x22,0x22,0
x22,0xFE,0x00,0x00,0x00,
0x00,0x00,0xFF,0x42,0x42,0x42,0x42,0x42,0x42,0x42,0x42,0x42,0xFF,0x00
,0x00,0x00,/*"目",0*/

0x10,0x10,0xD0,0xFF,0x90,0x10,0x20,0x22,0x22,0x22,0xE2,0x22,0x22,0x22
,0x20,0x00,
0x04,0x03,0x00,0xFF,0x00,0x13,0x0C,0x03,0x40,0x80,0x7F,0x00,0x01,0x06
,0x18,0x00,/*"标",1*/

0x00,0x40,0x42,0x44,0x58,0x40,0x40,0x7F,0x40,0x40,0x50,0x48,0xC6,0x00
,0x00,0x00,
0x00,0x40,0x44,0x44,0x44,0x44,0x44,0x44,0x44,0x44,0x44,0x44,0xFF,0x00
,0x00,0x00,/*"当",3*/

0x08,0x08,0xE8,0x29,0x2E,0x28,0xE8,0x08,0x08,0xC8,0x0C,0x0B,0xE8,0x08
,0x08,0x00,
0x00,0x00,0xFF,0x09,0x49,0x89,0x7F,0x00,0x00,0x0F,0x40,0x80,0x7F,0x00
,0x00,0x00,/*"前",4*/
};
uchar code CharCode[]={
0x00,0xE0,0x10,0x08,0x08,0x10,0xE0,0x00,0x00,0x0F,0x10,0x20,0x20,0x10
,0x0F,0x00,/*"0",0*/

0x00,0x10,0x10,0xF8,0x00,0x00,0x00,0x00,0x00,0x20,0x20,0x3F,0x20,0x20
,0x00,0x00,/*"1",1*/

0x00,0x70,0x08,0x08,0x08,0x88,0x70,0x00,0x00,0x30,0x28,0x24,0x22,0x21
,0x30,0x00,/*"2",2*/

0x00,0x30,0x08,0x88,0x88,0x48,0x30,0x00,0x00,0x18,0x20,0x20,0x20,0x11
,0x0E,0x00,/*"3",3*/

0x00,0x00,0xC0,0x20,0x10,0xF8,0x00,0x00,0x00,0x07,0x04,0x24,0x24,0x3F
,0x24,0x00,/*"4",4*/
```

```
0x00,0xF8,0x08,0x88,0x88,0x08,0x08,0x00,0x00,0x19,0x21,0x20,0x20,0x11
,0x0E,0x00,/*"5",5*/

0x00,0xE0,0x10,0x88,0x88,0x18,0x00,0x00,0x00,0x0F,0x11,0x20,0x20,0x11
,0x0E,0x00,/*"6",6*/

0x00,0x38,0x08,0x08,0xC8,0x38,0x08,0x00,0x00,0x00,0x00,0x3F,0x00,0x00
,0x00,0x00,/*"7",7*/

0x00,0x70,0x88,0x08,0x08,0x88,0x70,0x00,0x00,0x1C,0x22,0x21,0x21,0x22
,0x1C,0x00,/*"8",8*/

0x00,0xE0,0x10,0x08,0x08,0x10,0xE0,0x00,0x00,0x00,0x31,0x22,0x22,0x11
,0x0F,0x00,/*"9",9*/

0x00,0x00,0x00,0xC0,0xC0,0x00,0x00,0x00,0x00,0x00,0x00,0x30,0x30,0x00
,0x00,0x00};
uint t_count = 0;
uint speed = 60;
uint t0_cnt = 0;
uint t_speed= 0;
uint m=256;
uint n=200;
uint x=0;
uint correct_speed=80;
    //uint a,b,c;
void IntInit();
void InitLCM();
void Clear(uchar screen,uchar page_from,uchar page_end,uchar
col_from,uchar col_end);
void DisOneWord(uchar screen,uchar page,uchar col,uint length,uchar
*from);
void WaitBusy();
void SendCmdToLCM(uchar cmd);
void SendDataToLCM(uchar datas);
void PaintMainBoard();
void Delay(uint time);
void Show(uint cspeed);
void main()
{
    IntInit();
    InitLCM();
    PaintMainBoard();
```

```
    TR0=1;
    while(1)
    {
        if(!SW1)
        {
            correct_speed=100;
        }

        else if(!SW2)
        {
            correct_speed=200;
        }
        else if(SW1&&SW2)
        {
            correct_speed=150;
        }
        Show(speed);
    }
}
void IntInit()
{

    EA = 1;
    TMOD = 0x01;
    TH0=0xf1;    //设置50ms秒的定时器中断
    TL0=0x22;
    EX0 = 1;
    EX1 = 0;
    ET0 = 1;
    ET1 = 0;
    IT0 = 1;//INT0下跳沿触发
    TR0 = 0;
}
void InitLCM()
{
    WaitBusy();
    RST=1;
    SendCmdToLCM(LCM_SW|0x01);
    SendCmdToLCM(LCM_START_ROW|0x00);
    Clear(1,0,7,0,63);
    Clear(2,0,7,0,63);
    Delay(2);
}
void WaitBusy()
```

```
{
    RS = 0;
    RW = 1;
    E = 1;
    while(BUSY);
    E = 0;
}
void DisOneWord(uchar screen,uchar page,uchar col,uint length,uchar
*from){
    uint i=0,j=0;
    WaitBusy();
    if(screen == 1){
        CS1 = 1;
        CS2 = 0;
    }
    else if(screen == 2){
        CS1 = 0;
        CS2 = 1;
    }
    for(j=0;j<2;++j){
        SendCmdToLCM(LCM_PAGE|page);
        SendCmdToLCM(LCM_COL|col);
        for(i=0;i<length;++i){
            SendDataToLCM(*from);
            from++;
        }
        page++;
    }
}
void Clear(uchar screen,uchar page_from,uchar page_end,uchar
col_from,uchar col_end){
    uchar i,j;
    if(screen == 1){
        CS1 = 1;
        CS2 = 0;
    }
    else if(screen == 2){
        CS1 = 0;
        CS2 = 1;
    }
    for(i=page_from;i<=page_end;++i){
        SendCmdToLCM(LCM_PAGE|i);
        SendCmdToLCM(LCM_COL|col_from);
        for(j=col_from;j<col_end;++j){
```

```
            SendDataToLCM(0x00);
        }
    }
}
    void SendDataToLCM(uchar datas)
    {
    WaitBusy();
    RS = 1;//RS1 RW0时才能写入的才是显示存储器单元
    RW = 0;
    P2 = datas;
    E = 1;
    Delay(2);
    E = 0;
    }
void SendCmdToLCM(uchar cmd )
{
    WaitBusy();
    RS = 0;
    RW = 0;
    LCM_DATA = cmd;//传送相应的命令到DATA
    E = 1;//E的下降沿才能写入
    Delay(2);
    E = 0;
}
    void PaintMainBoard()
{
    DisOneWord(1,0x00,0x10,16,&WordCode[0]);
    DisOneWord(1,0x00,0x20,16,&WordCode[32]);
    DisOneWord(2,0x00,0x08,8,&CharCode[154]);
    DisOneWord(2,0x00,0x18,8,&CharCode[32]);
    DisOneWord(2,0x00,0x20,8,&CharCode[0]);
    DisOneWord(2,0x00,0x28,8,&CharCode[0]);
    DisOneWord(1,0x02,0x10,16,&WordCode[64]);
    DisOneWord(1,0x02,0x20,16,&WordCode[32]);
    DisOneWord(2,0x02,0x08,8,&CharCode[154]);
    DisOneWord(2,0x02,0x18,8,&CharCode[16]);
    DisOneWord(2,0x02,0x20,8,&CharCode[0]);
    DisOneWord(2,0x02,0x28,8,&CharCode[0]);
  DisOneWord(1,0x04,0x10,16,&WordCode[96]);
    DisOneWord(1,0x04,0x20,16,&WordCode[128]);
    DisOneWord(2,0x04,0x08,8,&CharCode[154]);
    DisOneWord(2,0x04,0x18,8,&CharCode[0]);
    DisOneWord(2,0x04,0x20,8,&CharCode[0]);
    DisOneWord(2,0x04,0x28,8,&CharCode[0]);
```

```
    //在指定位置显示指定的文字或字母

}
void Delay(uint time)
{
        uint x;
    while(time--){
        x = 1000;
        while(x--);
    }
}
Ex_int0() interrupt 0 using 2
{
    t_speed++; //每转1圈，IN0中断记录速度加一
}
T0_int0() interrupt 1 using 3
{  if (++t0_cnt < 256)//转了20个0.05s，就可以显示新的这一秒的速度了
  {
    TH0 = 0xf1;
  TL0= 0x22;
  x+=n;
    if(x<m)
        V=0;
    else
    {
        V=1;
        x=x-m;
    }
    return;
   }
    x=0;

  t0_cnt = 0;
 speed = t_speed;
  t_speed=0;
if(speed>correct_speed)
{
    n=n+3;
}
else if(speed<correct_speed)
{
    n=n-3;
}
}
```

```
void Show(uint cspeed)
{
    int a,b,c;
     a =cspeed/100;
    cspeed=cspeed-a*100;
     b=cspeed/10;
     c=cspeed%10;
     DisOneWord(2,0x04,0x18,8,&CharCode[16*a]);
     DisOneWord(2,0x04,0x20,8,&CharCode[16*b]);
     DisOneWord(2,0x04,0x28,8,&CharCode[16*c]);



    Delay(10);
}
```

# 实验八　温度测量与控制

## 1. 实验目的

1.学习DS18B20温度传感器的编程结构。

2.了解温度测量的原理。

3. 掌握PID控制原理及实现方法。

3. 加深C51编程语言的理解和学习。

## 2. 实验内容

掌握使用传感器测量与控制温度的原理与方法，使用C51语言编写实现温度控制的功能，使用超声波/温度实验板测量温度，将温度测量的结果（单位为摄氏度）显示到液晶屏上。

编程实现测量当前教室的温度，显示在LCM液晶显示屏上。

通过S1设定一个高于当前室温的目标温度值。

编程实现温度的控制，将当前温度值控制到目标温度值并稳定的显示。

## 3.实验器材

单片机测控实验系统

温控实验模块

Keil开发环境

STC-ISP程序下载工具

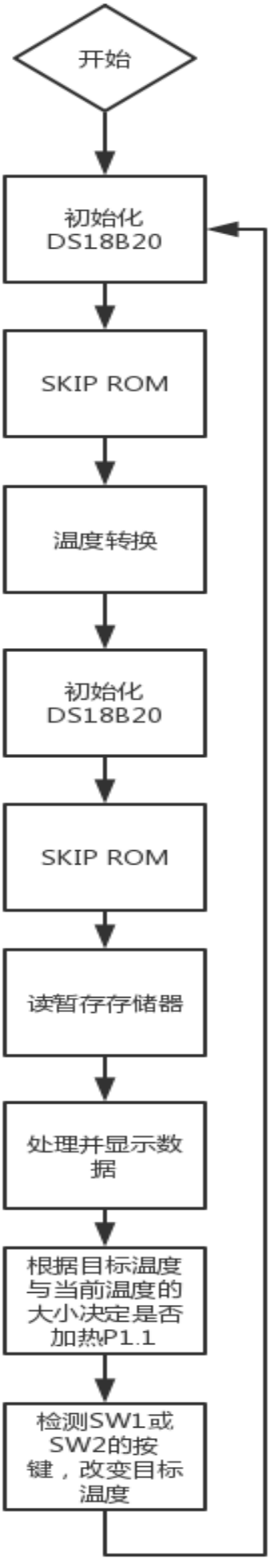
4.实验步骤

1.预习，参考附录三，预习DS18B20的编程结构，编程时注意DS18B20的时间要求，必须准确满足。根据实验原理附录中的流程图进行编程。

2. 将编译后的程序下载到51单片机，观察温度的测量结果。

3. 程序调试

5.实验流程图


开始
初始化DS18B20
SKIP ROM
温度转换
初始化DS18B20
SKIP ROM
读暂存存储器
处理并显示数据
根据目标温度与当前温度的大小决定是否加热P1.1
检测SW1或SW2的按键，改变目标温度

6.实验代码

```
//????:???,??,16*16
#include<reg52.h>
#include<intrins.h> //???????
#include<math.h>

typedef unsigned char uchar;
typedef unsigned int uint;

sbit s1 = P3^6;
sbit s2 = P3^7;
sbit RS=P3^5;//???????
sbit RW=P3^4;//?/???????,????,????
sbit EN=P3^3;//????
sbit CS1=P1^7;//???????,?????
sbit CS2=P1^6;//???????,?????
sbit DQ=P1^4;
sbit up=P1^1;

uchar Ek,Ek1,Ek2;
uchar Kp,Ki,Kd;
uint res,Pmax;
uint xx=0; //??
uint times=0;//????
void delay_us(uchar n)
{
 while (n--)
 {
 _nop_();
 _nop_();
 }
}

unsigned  char code shiji[2][32]={
0x10,0x0C,0x04,0x84,0x14,0x64,0x05,0x06,0xF4,0x04,0x04,0x04,0x04,0x14
,0x0C,0x00,
0x04,0x84,0x84,0x44,0x47,0x24,0x14,0x0C,0x07,0x0C,0x14,0x24,0x44,0x84
,0x04,0x00,

0x00,0xFE,0x22,0x5A,0x86,0x00,0x20,0x22,0x22,0x22,0xE2,0x22,0x22,0x22
,0x20,0x00,
0x00,0xFF,0x04,0x08,0x07,0x10,0x0C,0x03,0x40,0x80,0x7F,0x00,0x01,0x06
,0x18,0x00,
```

```
};

unsigned  char code mubiao[2][32]={
0x00,0x00,0xFE,0x22,0x22,0x22,0x22,0x22,0x22,0x22,0x22,0x22,0xFE,0x00
,0x00,0x00,
0x00,0x00,0xFF,0x42,0x42,0x42,0x42,0x42,0x42,0x42,0x42,0x42,0xFF,0x00
,0x00,0x00,/*"?",0*/

0x10,0x10,0xD0,0xFF,0x90,0x10,0x20,0x22,0x22,0x22,0xE2,0x22,0x22,0x22
,0x20,0x00,
0x04,0x03,0x00,0xFF,0x00,0x13,0x0C,0x03,0x40,0x80,0x7F,0x00,0x01,0x06
,0x18,0x00,/*"?",1*/
};

unsigned  char code du[32]={
0x00,0x00,0xFC,0x24,0x24,0x24,0xFC,0x25,0x26,0x24,0xFC,0x24,0x24,0x24
,0x04,0x00,
0x40,0x30,0x8F,0x80,0x84,0x4C,0x55,0x25,0x25,0x25,0x55,0x4C,0x80,0x80
,0x80,0x00,/*"?",0*/
};

unsigned  char code shu[10][32]={

0x00,0x00,0xC0,0xE0,0x30,0x10,0x08,0x08,0x08,0x08,0x08,0x18,0x30,0xE0
,0xC0,0x00,
0x00,0x00,0x07,0x0F,0x18,0x10,0x20,0x20,0x20,0x20,0x20,0x10,0x18,0x0F
,0x07,0x00,/*"0",0*/

0x00,0x00,0x00,0x10,0x10,0x10,0x10,0xF0,0xF8,0x00,0x00,0x00,0x00,0x00
,0x00,0x00,
0x00,0x00,0x00,0x20,0x20,0x20,0x20,0x3F,0x3F,0x20,0x20,0x20,0x20,0x00
,0x00,0x00,/*"1",1*/

0x00,0x00,0x60,0x50,0x10,0x08,0x08,0x08,0x08,0x08,0x08,0x98,0xF0,0x70
,0x00,0x00,
0x00,0x00,0x20,0x30,0x28,0x28,0x24,0x24,0x22,0x22,0x21,0x20,0x30,0x18
,0x00,0x00,/*"2",2*/

0x00,0x00,0x30,0x30,0x08,0x08,0x88,0x88,0x88,0x88,0x58,0x70,0x30,0x00
,0x00,0x00,
0x00,0x00,0x18,0x18,0x20,0x20,0x20,0x20,0x20,0x20,0x31,0x11,0x1F,0x0E
,0x00,0x00,/*"3",3*/

0x00,0x00,0x00,0x00,0x00,0x80,0x40,0x20,0x10,0xF0,0xF8,0xF8,0x00,0x00
```

```
,0x00,0x00,
0x00,0x04,0x06,0x05,0x05,0x04,0x24,0x24,0x24,0x3F,0x3F,0x3F,0x24,0x24
,0x24,0x00,/*"4",4*/

0x00,0x00,0x00,0xC0,0x38,0x88,0x88,0x88,0x88,0x88,0x88,0x88,0x08,0x08
,0x00,0x00,
0x00,0x00,0x18,0x29,0x21,0x20,0x20,0x20,0x20,0x20,0x30,0x11,0x1F,0x0E
,0x00,0x00,/*"5",5*/

0x00,0x00,0x80,0xE0,0x30,0x10,0x98,0x88,0x88,0x88,0x88,0x88,0x98,0x10
,0x00,0x00,
0x00,0x00,0x07,0x0F,0x19,0x31,0x20,0x20,0x20,0x20,0x20,0x20,0x11,0x1F
,0x0E,0x00,/*"6",6*/

0x00,0x00,0x30,0x18,0x08,0x08,0x08,0x08,0x08,0x88,0x48,0x28,0x18,0x08
,0x00,0x00,
0x00,0x00,0x00,0x00,0x00,0x00,0x38,0x3E,0x01,0x00,0x00,0x00,0x00,0x00
,0x00,0x00,/*"7",7*/

0x00,0x00,0x70,0x70,0xD8,0x88,0x88,0x08,0x08,0x08,0x08,0x98,0x70,0x70
,0x00,0x00,
0x00,0x0C,0x1E,0x12,0x21,0x21,0x20,0x21,0x21,0x21,0x23,0x12,0x1E,0x0C
,0x00,0x00,/*"8",8*/

0x00,0xE0,0xF0,0x10,0x08,0x08,0x08,0x08,0x08,0x08,0x18,0x10,0xF0,0xC0
,0x00,0x00,
0x00,0x00,0x11,0x33,0x22,0x22,0x22,0x22,0x22,0x32,0x11,0x1D,0x0F,0x03
,0x00,0x00,/*"9",9*/



};
void delay(uint i)//?????,i??256,??256????
{
    while(--i);
}
void Read_busy()  //??BUSY=0
{       //busy p2^7
    P2=0xff;
    RS=0;//RS/RW=0/1,???????
    RW=1;
    EN=1;//??LCM????
    while(P2&0x80);//??,????P2.7=0.
    EN=0;//??LCM????
}
```

```
void write_command(uchar value)//???????
{
   P2=0xff;
   Read_busy();//??LCM??
    RS=0;//RS/RW=00,??LCM?????????
    RW=0;
    P2=value;//??
    EN=1;//??LCM????
    delay(100);
    EN=0;//??LCM????
}

void write_data(uchar value)//?????????
{
   P2=0xff;
   Read_busy();
    RS=1;// RS/RW=10,?????
    RW=0;
    P2=value;//???
    EN=1;
    delay(100);
    EN=0;
}

void Set_column(uchar column)//?????(Y)
{
  column=column&0x3f;//????0,?????????
  column=0x40|column;//01000000|column,??????????
  write_command(column);
}

void Set_line(uchar startline)//???????
{
  startline=0xC0|startline;// 11000000|startline, ??startline????????
  write_command(startline);
}

void Set_page(uchar page)//??????(X)
{
  page=0xb8|page;//10111000|page,??page??????????
  write_command(page);
}
void display(uchar ss,uchar page,uchar column,uchar *p)
```

```
{//ss????,page????,column???,P????????????
    uchar i;
    switch(ss)
   {
    case 0: CS1=1;CS2=1;break; //??
    case 1: CS1=1;CS2=0;break; //???
    case 2: CS1=0;CS2=1;break; //???
    default: break;
   }
   page=0xb8|page;//10111000|page,??page??????????
   write_command(page);

   column=column&0x3f;//????0,?????????
   column=0x40|column;//01000000|column,??????????
   write_command(column);
   for(i=0;i<16;i++)//?????+1
   {
     write_data(p[i]);//??16?????
   }
   page++;
   write_command(page);
//  column--;
   write_command(column);
   for(i=0;i<16;i++)//?????+1
   {
     write_data(p[i+16]);//??16?????
   }
}
void SetOnOff(uchar onoff)//??????
{
   onoff=0x3e|onoff;//00111110|onoff,?????????/??????,????????????
   write_command(onoff);
}
void ClearScreen()//??
{
   uchar i,j;
   CS2=1;
   CS1=1;
   for(i=0;i<8;i++)
   {
     Set_page(i); //????8???
      Set_column(0);//???0?
     for(j=0;j<64;j++)//????????1???,??????64???0????
     {
```

```
     write_data(0x00);
    }
  }
}

void InitLCD()//???
{
   Read_busy();
    CS1=1;CS2=1;
    SetOnOff(0);
   CS1=1;CS2=1;
    SetOnOff(1);//??????
    CS1=1;CS2=1;
   ClearScreen();//??
   Set_line(0);//???????
}

bit DS_init()
{
    bit flag;
    DQ = 0;
    delay_us(255);   //500us??
    DQ = 1;          //??
    delay_us(40);    //??16~60us
    flag = DQ;
    delay_us(150);
    return flag;     //????0
}
uchar read()   //byte
{
     uchar i;
     uchar val = 0;
     for (i=0; i<8; i++)
     {
         val >>= 1;
         DQ = 0; //??????????
         delay_us(1);
         DQ = 1; //??????????
         delay_us(1);
         if (DQ) val |= 0x80;
         delay_us(15);
    }
 return val;
}
```

```
void write(char val)   //byte
{
 uchar i;

 for (i=0; i<8; i++)
 {
 DQ = 0; //????,?????
 delay_us(8);
 val >>= 1;
 DQ = CY;
 delay_us(35);
 DQ = 1;
 delay_us(10);
 }
}

void PID()
{
    uchar Px,Pp,Pi,Pd,a,b,c;
    uint count;
    Pp = Kp*(Ek-Ek1);
    Pi = Ki*Ek;
    Pd = Kd*(Ek-3*Ek1+Ek2);
    Px = Pp+Pi+Pd;
    res = Px;
        a=res/100;
        b=res%100/10;
        c=res%10;

        display(1,4,2*16,shu[a]);delay(255);
        display(1,4,3*16,shu[b]);delay(255);
        display(2,4,0*16,shu[c]);delay(255);
    Ek2 = Ek1;
    Ek1 = Ek;
    count = 0;
    if(res>Pmax)
        res =Pmax ;
    while((count++)<=res)
    {
        up = 1;
        delay_us(250);
        delay_us(250);
    }
    while((count++)<=Pmax)
```

```
    {
        up = 0;
        delay_us(250);
        delay_us(250);
    }

}

void main()
{
    uchar aim,low,high,b,c;
    uint result;
    InitLCD();
    Set_line(0);
    aim = 40;

    Pmax = 5;
   res=0

    while(1)
    {
        if(s1 == 0)
            aim++;
        if(s2 == 0)
            aim--;
        while(DS_init());
        write(0xcc);  //??ROM??
        write(0x44);  //??????
        delay(600);
        while(DS_init());
        write(0xcc);
       write(0xBE);    //?DS ???????
        low = read(); //????
        high = read();
        delay(255);
        result = high;
        result <<= 8;
        result |= low;
        result >>= 4 ; //result /= 16;
        Ek = aim - result;
        b=result/10;
        c=result%10;
        display(1,0,0*16,shiji[0]);delay(255);
        display(1,0,1*16,shiji[1]);delay(255);
```

```
        display(1,0,3*16,shu[b]);delay(255);
        display(2,0,0*16,shu[c]);delay(255);
        display(2,0,1*16,du);delay(100);

        b=aim/10;
        c=aim%10;

        display(1,2,0*16,mubiao[0]);delay(255);
        display(1,2,1*16,mubiao[1]);delay(255);
        display(1,2,3*16,shu[b]);delay(255);
        display(2,2,0*16,shu[c]);delay(255);
        display(2,2,1*16,du);delay(100);
        if(aim>=result)
           up=1;
        else
            up = 0;
    }
}
```