

Design of Temperature Control System Using LM35

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ABSTRACTA: Temperature Controlled System is a type of control system that automatically controls the temperature of an object or an area. We commonly use temperature control systems in Air Conditioners, Refrigerators, geysers, etc. where the temperature is automatically adjusted as per the input settings. In order to implement a temperature control system, we need a temperature sensor, a controller, and a cooling system. In this project, we have implemented a simple Temperature control system using simple components. The aim of this project is to automatically turn on or off the fan by detecting the surrounding temperature.

KEYWORDS: Temperature Control, Temperature sensor, Cooling system, Surrounding temperature.

I. INTRODUCTION

A temperature controller is a device used to hold a desired temperature at a specified value. The simplest example of a temperature controller is a common thermostat found in homes. For instance, a hot water heater uses a thermostat to control the temperature of the water and maintain it at a certain commanded temperature. Temperature controllers are also used in ovens. When a temperature is set for an oven, a controller monitors the actual temperature inside of the oven. If it falls below the set temperature, it sends a signal to activate the heater to raise the temperature back to the set point. Thermostats are also used in refrigerators. So if the temperature gets too high, a controller initiates an action to bring the temperature down.

The major objective of this project would be to create a Temperature Control System that would be able to automatically control the temperature of the environment it is placed in by the timely activation of the effector devices to influence the temperature in relation to the set-point.

II. COMPONENTS USED

1. PIC16F877A
2. Regulated power supply
3. Temperature sensor LM35
4. 16*2 LCD module
5. Reset switch
6. Crystal Oscillator
7. 5v DC buzzer
8. Fire proof wire
9. Capacitor
10. PCB
11. Ribbon cable
12. 5v DC adapter
13. IC base DIP socket

14.NPN transistor

15.Resistor

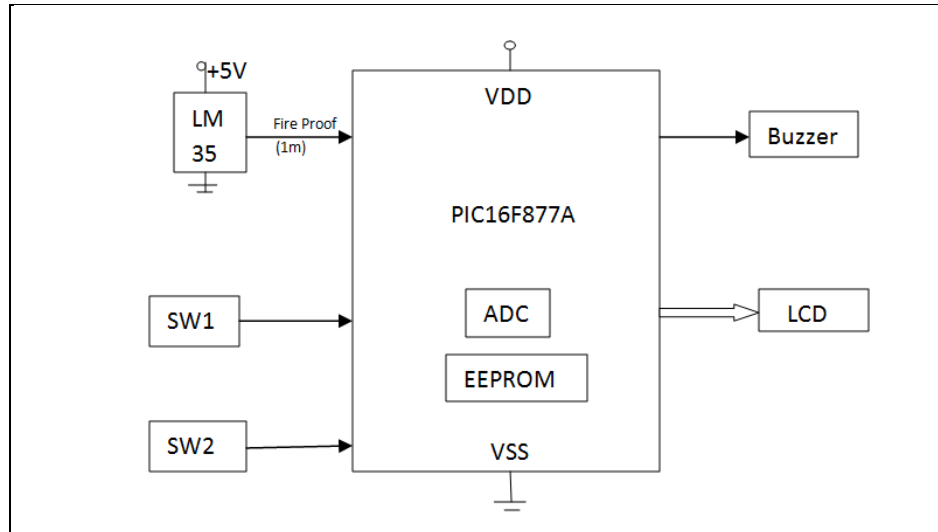


Fig. 1. Block diagram of Gas Saver system

III. RELATED WORK

The working of the Temperature Control System project can be explained easily by comparing it with a closed loop control system. A closed loop control system consists of an input, a control device, output and feedback. The input is typically a sensor that continuously monitors the test parameter. Here, the input is the LM35 Temperature Sensor and the parameter we are interested in measuring is the Temperature. The data from the input is given to a control device or system. This control device will actuate the output according to the input signals. In our project, LM35 Op – Amp is controller and it acts as a comparator.

If the temperature is more than the desired temperature, we need to activate the fan. So, we need to adjust the Potentiometer such that if the temperature increases above a value, the output from the Op – Amp should be HIGH. This HIGH output from the Op – Amp is given to the Motor Driver, which along with the Fan, forms the output part of the Control System. Since the other drive input of the motor driver is already connected to GND, whenever the output from the Op – Amp is HIGH, the Input to the L293D is HIGH and the Fan starts rotating. This will cool down the surroundings and this phenomena acts as the feedback in the control system. If the temperature decreases, the LM35 senses it and signals the Op – Amp to turn off the Fan. The following image shows the closed loop control system representation of the temperature control system.

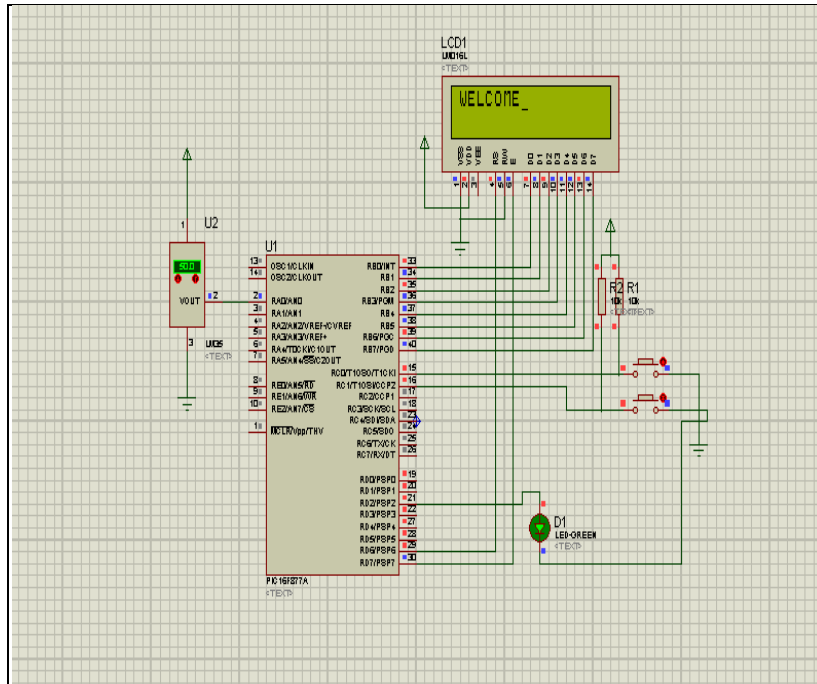


Fig.2. Proteus Design

IV. CODING

. LCD CODE

```
#include<htc.h>

#define RS PORTDbits.RD6
#define EN PORTDbits.RD7

void delay(unsigned int d)
{
while(d--);
}

void cmdwrt(unsigned char cmd)
{
delay(200);
PORTB=cmd;
RS=0;
EN=1;
delay(200);
EN=0;
}

void datawrt(unsigned char dat)
{
delay(200);
PORTB=dat;
RS=1;
```



```
EN=1;
delay(200);
EN=0;
}
void strwrt(unsigned char *ptr)
{
for(      ; *ptr!=0; ptr++)
datawrt(*ptr);
}
void lcdinit()
{
cmdwrt(0x38); //LCD Initialize in 8-bit mode.
cmdwrt(0x0E); //Display ON, Cursor ON
cmdwrt(0x06); //Cursor Autoincrement
cmdwrt(0x01); //Clear LCD
delay(200);
}
void main()
{
unsigned char st[]="WELCOME";
TRISB=TRISD=0; //PORTB & PORTC are configured as Output
OPTION_REG=0; //Enable internal Pull-ups of PORTB.
lcdinit();
cmdwrt(0x80);
strwrt(st);
while(1);
}
```

GAS SAVER CODE

```
#include<htc.h>

#define K1 PORTCbits.RC0
#define K2 PORTCbits.RC1
#define BUZ PORTDbits.RD2

#define RS PORTDbits.RD6
#define EN PORTDbits.RD7

void delay(unsigned int d)
{
while(d--);
}
void cmdwrt(unsigned char cmd)
{
delay(200);
PORTB=cmd;
RS=0;
EN=1;
delay(200);
```



```
EN=0;
}
void datawrt(unsigned char dat)
{
delay(200);
PORTB=dat;
RS=1;
EN=1;
delay(200);
EN=0;
}
void strwrt(unsigned char *ptr)
{
for( ; *ptr!=0; ptr++)
datawrt(*ptr);
}
void lcdinit()
{
cmdwrt(0x38); //LCD Initialize in 8-bit mode.
cmdwrt(0x0E); //Display ON, Cursor ON
cmdwrt(0x06); //Cursor Autoincrement
cmdwrt(0x01); //Clear LCD
delay(200);
}
void hex2ascii(unsigned char sp)
{
datawrt(sp/100+48);
datawrt((sp%100)/10+48);
datawrt(sp%10+48);
}
void h2a(unsigned int t)
{
char arr[3],c;
for(c=0; c<3; c++)
{
arr[c]=t%10+48;
t/=10;
}
for( ; c>0; c--)
{
datawrt(arr[c-1]);
}
}
int convert(char ch)
{
int temp;
ADCON0= (ADCON0 & 0xC7) | ch<<3;
ADCON1= 0xCE;
ADON=1;
GO_DONE=1;
while(GO_DONE);
}
```



```
temp=ADRESH*256 + ADRESL;
return temp/2;
}

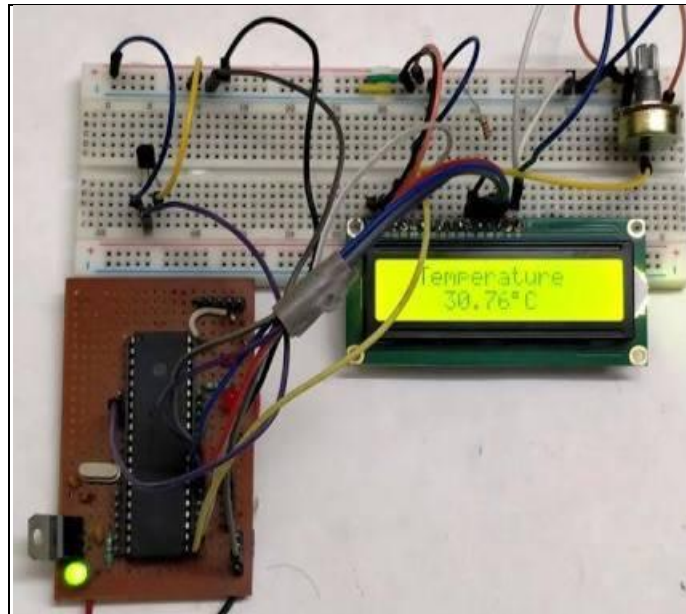
void main()
{
unsigned char set[]="SET TEMP:",sp=50;
unsigned char crt[]="TEMP:";
int temp;
TRISB=TRISD=0; //PORTB & PORTC are configured as Output
OPTION_REG=0; //Enable internal Pull-ups of PORTB.
lcdinit();
while(1)
{
cmdwrt(0x80);
strwrt(set);
if(K1==0)
{
if(sp<100) sp++;
delay(50000);
}
if(K2==0)
{
if(sp>0) sp--;
delay(50000);
}
hex2ascii(sp);

temp=convert(0);

cmdwrt(0xC0);
strwrt(crt);
h2a(temp);
if(temp>sp) BUZ=0;
else BUZ=1;
}
}
```

V. RESULT

In this way, the temperature impact of the floor or ceiling on the apartment could have been tested. Combined with schemes for control of this model, realistic because of its linear nature, equivalent electrical circuits can play a significant part in reducing building energy usage.



VI. CONCLUSION

Finding an accurate and efficient way to model and simulate the temperature profile of a building is of utmost importance. Equivalent electrical circuits demonstrate the potential to achieve both of these goals. Determining the best values for the circuit parameters can be found by relating corresponding thermal and electrical properties. As highlighted by applying this model to the real apartment, equivalent electrical circuits can project a realistic temperature profile while adjusting to changes in model conditions in ways that accurately correspond to the thermal phenomena occurring in real system.

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