Report on interfacing a Temperature Sensor to LPC1768 and displaying it on a 7-segment display.

Group 7 (CCE-A1)

Abhijeet Sinha

(RegNo. 190953066, Roll No.21)

Arsh Dayal

(RegNo. 190953056, Roll No.20)

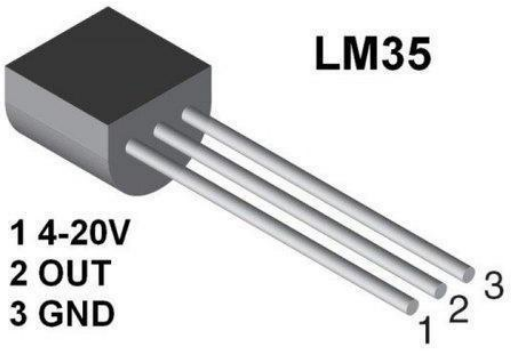
Problem Statement:

Write a program to interface a temperature sensor to LPC1768 and display the temperature on 7-Segment Display.

Components Used:

Component Name	Quantity
NXP ARM LPC1768 KIT	1
Cross cable for programming and serial communication	2
LM35 Temperature Sensor	1
Jumper cables (male-female, male-male, female-female)	4
1K-Ohm-Resistor	1
Zener-Diode	1
Breadboard	1
USB port in the host computer system and PC for downloading the software.	

LM35 Diagram



Code

```
#include<LPC17xx.h>

float x,y,temp;

unsigned long a,b,temp2,r1,i;

unsigned char
seven_seg[16]={0x3F,0x06,0x5B,0x4F,0x66,0x6D,0x7D,0x07,0x7F,0x6F,0x77,0x7C
,0x39,0X5E,0X79,0X71};//store hex values of each digit from 0 to F

unsigned char digits[]={0,0,0,0};//will store the digits to be displayed

unsigned int dig_sel[]={0<<23,1<<23,2<<23,3<<23};//stores value for
selection of 7 segment

void display(void);

void timer_init(void);

int main(void)

{

      SystemInit();

      SystemCoreClockUpdate();

      timer_init();//delay

      LPC_PINCON->PINSEL0&=0XFF0000FF;//P0.4 to P0.11 as data lines to 7
      segment

      LPC_PINCON->PINSEL1|=1<<16;//P0.24 as ADC input (ADD0.1)

      LPC_PINCON->PINSEL3|=0x00<<14;//configuring P1.23 to P1.26 as
      decoder lines

      LPC_GPIO0->FIODIR=0XFF<<4;//Data lines are output lines

      LPC_GPIO1->FIODIR=0XF<<23;//Decoder lines are also output lines

      LPC_SC->PCONP|=1<<12;//Power to the ADC by enabling the 12th pin of
      PCONP (Power Control for Peripheral)

      LPC_ADC->ADCR=(1<<1|1<<16|1<<21);//Enable channel 1 (ADD0.1) in
      burst mode and enable power down (PDN)

      NVIC_EnableIRQ(ADC_IRQn);//Enable the NVIC

      LPC_ADC->ADINTEN=(1<<1);//Enable interrupt on channel 1 (ADD0.1)

      while(1);

}

void ADC_IRQHandler()

{

      a=(LPC_ADC->ADSTAT) & 1<<1;//Check if channel 1's DONE bit is high
```

```
	if(a)

	{

		b=(LPC_ADC->ADDR1);//if DONE bit high, read the data in ADDR1
	register (this also clears the DONE bit)

	}

	temp2=LPC_ADC->ADGDR;//Read the data in ADGDR register to clear the
	DONE bit of ADGDR

	b= b & 0xFFFF;//The data is present on 4th to 15th bit

	b>>=4;//to get the digital value in lower bit positions

	y=((float)b*(330.0/4096));//Conversion of result in the register to
	temperature in °C as 10mV of input represents 1°C

	digits[3]=((int)y/10);//MSB of the calculated temp should be
	displayed on the 3rd 7 segment

	digits[2]=((int)(y)%10);//LSB of the calculated temp should be
	displayed on the 2nd 7 segment

	digits[1]=((int)(y*10)%10);//decimal digit of the calculated temp
	should be displayed on the 1st 7 segment

	while(LPC_TIM0->EMR & 0X01)

	{

		display();//display same value for the next 3s

	}

	LPC_TIM0->EMR=0X011;//reset the EMR value as in timer_init()

}

void display(void)

{

	int x=0,i;

	/* display 4 segments values one by one */

	for(x=0;x<4;x++)

	{

			LPC_GPIO1->FIOPIN=dig_sel[x];//enable the decoder lines
		according to the x value

		if(x==2)

		{

			r1=(seven_seg[digits[x]] |0x80);//third segment should
		have a decimal point(since room-temp is 2 digit)

		}

		else
```

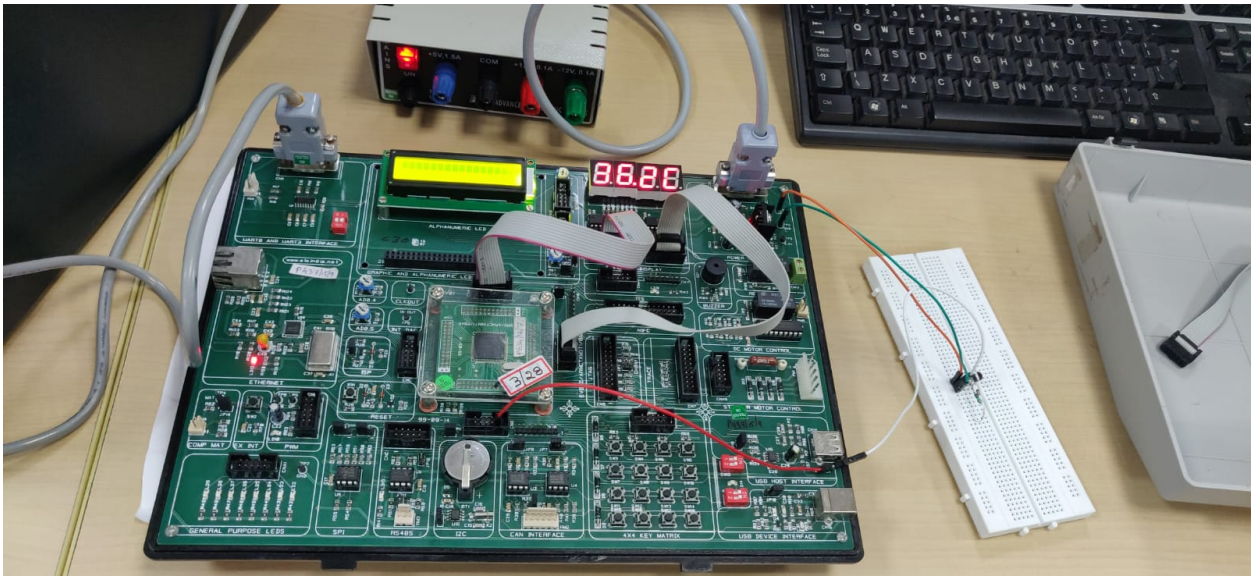
```
            if(x==0)

            {

                  r1=0x39;//0x39 is the 7 segment value for "C" so this is
            to display °C in the 0th 7 segment

            }

            else

            {

                  r1=(seven_seg[digits[x]]);//for other segments get the 7
            segment values of the digits from seven_seg[]

            }

            LPC_GPIO0->FIOPIN=r1<<4;//Put the 7 segment value into data
            lines(P0.4 to P0.11)

            for(i=0; i<500;i++);//Wait for some time (small delay)

            LPC_GPIO0->FIOPIN=00<<4;//clear the data lines

      }

}

void timer_init()

{

      LPC_TIM0->CTCR=0X00;//timer mode

      LPC_TIM0->TCR=0X02;//reset TC and PC

      LPC_TIM0->MCR=0X02;//reset the TC and PC on match

      LPC_TIM0->PR=0X02;//TC will increment for every 3 PCLK

      LPC_TIM0->MR0=2999999;//calculated using formula
      "MR=(PCLK*DELAY)/PR+1" where the delay is 3s

      LPC_TIM0->EMR=0X011;//initially EMC0 is HIGH when there is a match
      it is configured to become LOW

      LPC_TIM0->TCR=0X01;//start the timer

}
```

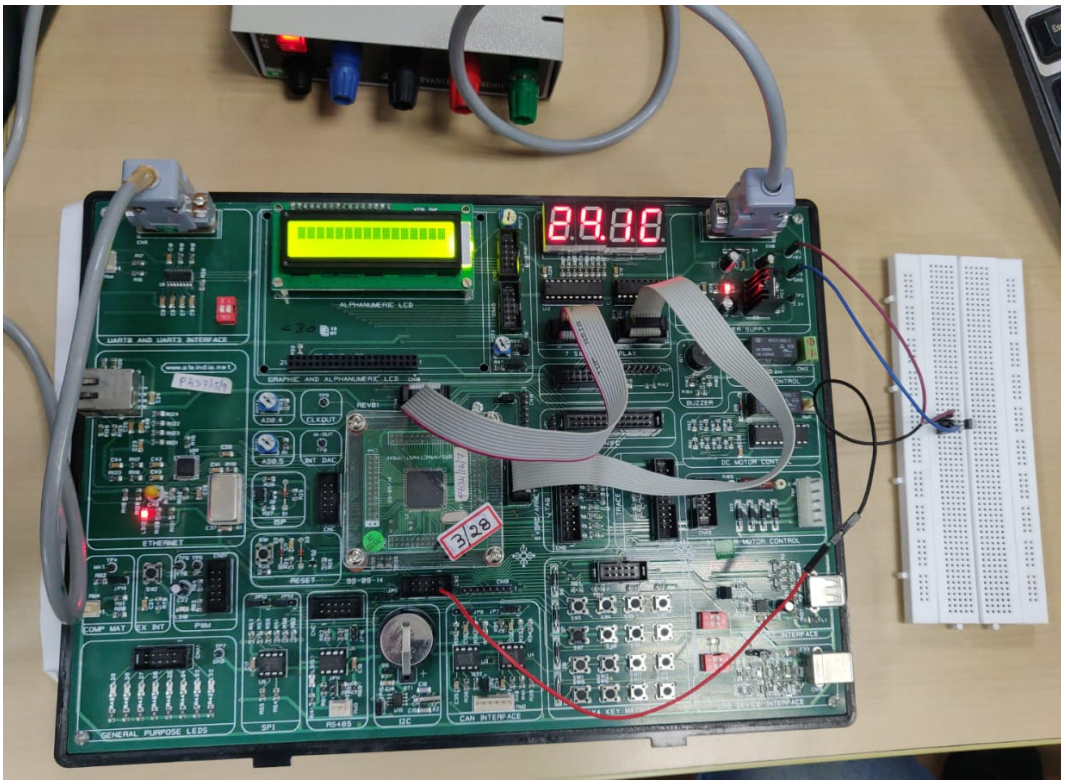
Results

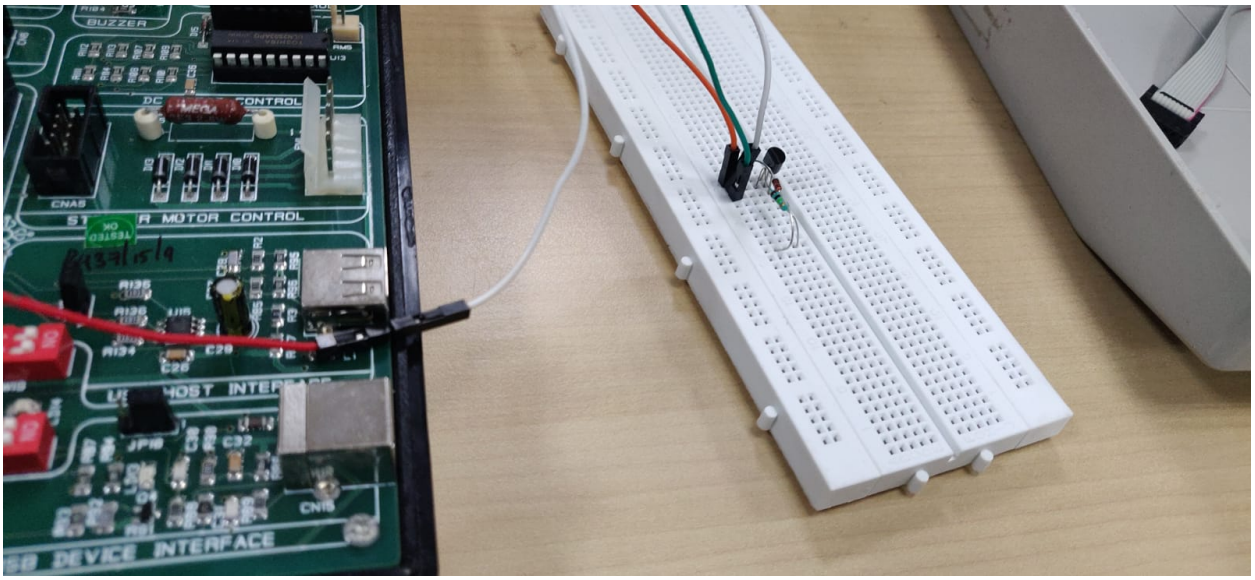
Object used to change temperature: Hair Dryer
Minimum temperature: 24.1 °C
Maximum temperature: 74.5 °C

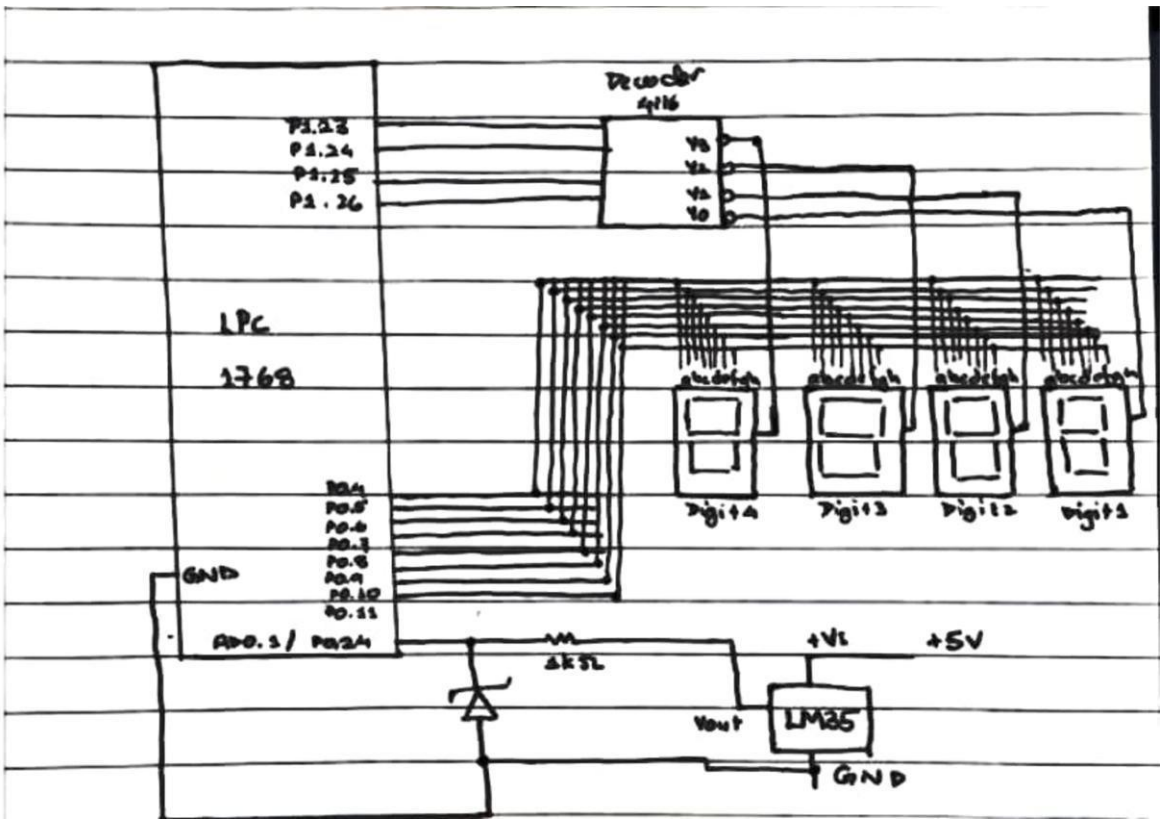
Observations:

Initially the temperature of the room was measured by the sensor which came about 24.5 °C(The temperature observed was equal to the room temperature) Upon the use of hair dryer for heating temperature rapidly increased till 74.5°C which gradually decreased back to room temperature in sometime.The fall of temperature was slow and steady.




ALPHANUMERIC LCD
GRAPHIC AND ALPHANUMERIC LCD
ETHERNET
RESET
GENERAL PURPOSE LEDS
SPI
RS485
I2C
CAN INTERFACE
BUZZER
DC MOTOR CONTROL
3/28


BUZZER
DC MOTOR CONTROL
CNA5
CNB
DEVICE INTERFACE


Decoder
4:16
P1.23
P1.24
P1.25
P1.26
LPC
1768
GND
P0.1/ P0.24
Digit4
Digit3
Digit2
Digit1
+Vt
+5V
LM35
Vout
GND