Temperature sensor

5th Sem Embedded ‘C’ and Design (UE17EE306B)

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1 Introduction to Project

The HDC1008 is a digital humidity sensor with integrated temperature sensor that provides excellent measurement and high accuracy at very low power. Here, these real time values are printed on a LCD screen.
This project was chosen to understand MSP430 interfacing and Embedded C programming better.

1.1 Problem Statement

To interface the temperature sensor **HDC1008** with TI **MSP430G2553** and obtain real time values to print it on an LCD.

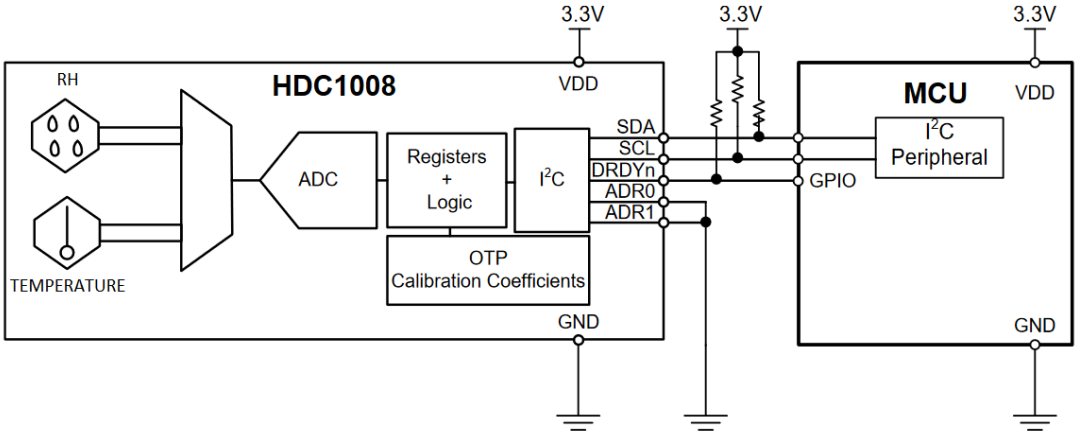
1.2 Scope

This is a great practical application of MSP430 in a person's everyday life and also in industries. Since the whole process is real time, if the temperature value crosses a certain pre-set threshold value, a trigger circuit can be activated and an alarm can be raised to warn the user. It can also be connected to a cooling equipment to trigger it whenever the temperature rises.
Eg: A very simple and basic example of this is for pet owners.
If a pet owner leaves his pet in the car but is paranoid to leave the windows open, he can set up this experiment in his car. So, whenever the temperature in the car rises, the circuit is triggered and the car cools down. This way the owner need not keep his vehicle ignited.

Technical Details

Temperature sensor is communicating with MSP430 via I2C lines -SDL and SCL. MSP430 will read values from TSL and print the real time values on an LCD screen.
The slave address for HDC1008 can be from 0x40 to 0x43. Using oscilloscope, it was found to be at 0x43.
I2C library is included and its appropriate functions are used. Here msp430 is the master and HDC1008 is the slave. Then the data sheet is read and the command register 0x02 is configured appropriately (we are writing to the slave device). Next, we read the temperature values from temperature register and store it in an array thereby receiving two bytes. These two bytes are the high and the low bytes. The high byte is shifted by 8 spaces to the left and added to the low byte. This value is converted into temperature in the Celsius scale using the formula mentioned in the data sheet. Now the LCD is initialized in a loop. The real time temperature values are printed on the LCD screen.

1.3 Block Diagram



1.3.1 Design Details

- main.c
- mylcd.c
- mylcd.h

1.3.2 Modules and Interfaces

Function name: void delay()
Parameters: unsigned int c
Return Type: void
Description: generates a delay.

Function name: void data_write()
Parameters: void
Return Type: void
Description: writes the data onto the temperature register

Function name: void data_read()
Parameters: void
Return Type: void
Description: reads data from the temperature register

Function name: void send_command()
Parameters: unsigned char comd
Return Type: void
Description: gives command to the slave device

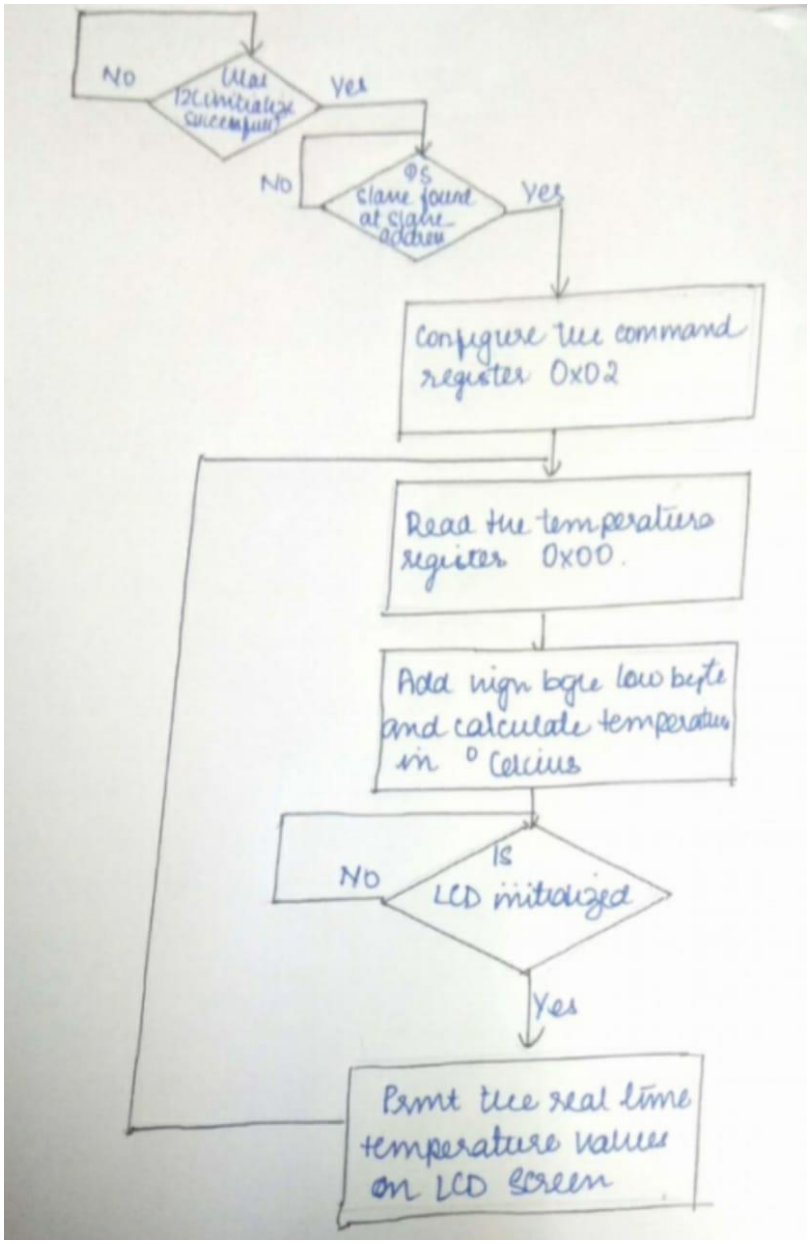
Function name: void lcd_init()
Parameters: void
Return Type: void
Description: initializes the output pins on MSP430

Function name: void check_busy()
Parameters: void
Return Type: void
Description:

Function name: void send_data()
Parameters: unsigned char data
Return Type: void
Description: used to send the data

Function name: void send_string()
Parameters: char *s
Return Type: void
Description: sends string data to temperature register

1.3.3 Algorithm, Flow Chart etc.



2 Results

Real time temperature values were obtained. When the threshold temperature was crossed, an LED was made to glow.

3 Learning experience

I learnt to handle MSP430 and learnt some Energia code along with Embedded C code. The major difficulties were faced in converting the Energia code to C code and also writing code my myself. Another hurdle I had to overcome was working alone in a very tight time frame due to ESA.

4 References/Credits

< List papers, web sites from which code was referred, and your friends who helped>

- Wikipedia.com
- Ti.com
- Circuitdigest.com

Friends who helped:

- Vallabh Ramakanth (EEE, IIT Madras)
- Manan Gupta (EEE, BITS Hyderabad)
- Rahul (CSE graduate, PESIT)