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Experiment - 7

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Branch: BE - CSE   **Section/Group: 603/A**
Semester: 6th semester   **Subject: IoT Lab**

Aim:

To display data generated by sensor on LCD using Arduino/Raspberry Pi.

Objective:

1. Learn about LCD Interfacing and sensors.
2. Learn about IoT programming.

Components Required:

1. 1x Raspberry PI (Raspberry Pi B+ with rasbian wheezy)
2. 1x Arduino (I'm using the Arduino UNO)
3. 1x LCD 16x2

About LCD:

A Liquid Crystal Display commonly abbreviated as LCD is basically a display unit built using Liquid Crystal technology. When we build real life/real world electronics based projects, we need a medium/device to display output values and messages. The most basic form of electronic display available is seven segment display, which has its own limitations. The next best available option is Liquid Crystal Displays which comes in different size specifications. Out of all available LCD modules in market, the most commonly used one is 16×2 LCD Module which can display 32 ASCII characters in 2 lines (16 characters in 1 line).

Interfacing 16×2 LCD to Arduino uno:

LCD modules form a very important part in many arduino based embedded system designs. So the knowledge on interfacing LCD module to arduino is very essential in designing embedded systems. This section of the article is about interfacing an Arduino to 16×2 LCD. JHD162A is the LCD module used here. JHD162A is a 16×2 LCD module based on the HD44780 driver from Hitachi. The JHD162A has 16 pins and can be operated in 4-bit mode (using only 4 data lines) or 8-bit mode (using all 8 data lines). Here we are using the LCD module in 4-bit mode. First, I will show you how to display a plain text messages on the LCD module using arduino and then I have designed a useful project using LCD and arduino – a digital thermometer. Before going in to the details of the project, let's have a look at the JHD162A LCD module.

16×2 LCD Module Pin Out Diagram:

The JHD162A lcd module has 16 pins and can be operated in 4-bit mode or 8-bit mode. Here we are using the LCD module in 4-bit mode. Before going in to the details of the project, let's have a look at the JHD162A LCD module.The schematic of a JHD162A LCD pin diagram is given below.
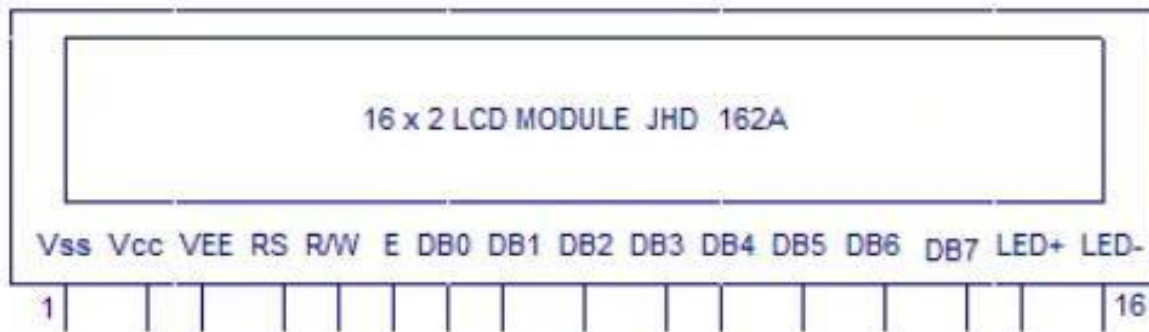
Pin1(Vss):Ground pin of the LCD module.

Pin2(Vcc): Power to LCD module (+5V supply is given to this pin)

Pin3(VEE):Contrast adjustment pin. This is done by connecting the ends of a 10K potentimeter to +5V and ground and then connecting the slider pin to the VEE pin. The voltage at the VEE pin defines the contrast. The normal setting is between 0.4 and 0.9V.

Pin4(RS):Register select pin. The JHD162A has two registers namely command register and data register. Logic HIGH at RS pin selects data register and logic LOW at RS pin selects command register. If we make the RS pin HIGH and feed an input to the data lines (DB0 to DB7), this input will be treated as data to display on LCD screen. If we make the RS pin LOW and feed an input to the data lines, then this will be treated as a command (a command to be written to LCD controller – like positioning cursor or clear screen or scroll).

Pin5(R/W): Read/Write modes. This pin is used for selecting between read and write modes. Logic HIGH at this pin activates read mode and logic LOW at this pin activates write mode.

Pin6(E): This pin is meant for enabling the LCD module. A HIGH to LOW signal at this pin will enable the module.

Pin7(DB0) to Pin14(DB7): These are data pins. The commands and data are fed to the LCD module though these pins.

Pin15(LED+): Anode of the back light LED. When operated on 5V, a 560 ohm resistor should be connected in series to this pin. In arduino based projects the back light LED can be powered from the 3.3V source on the arduino board.

Pin16(LED-): Cathode of the back light LED.

Circuit diagram – Arduino to 16×2 LCD Module:

RS pin of the LCD module is connected to digital pin 12 of the arduino. R/W pin of the LCD is grounded. Enable pin of the LCD module is connected to digital pin 11 of the arduino. In this project, the LCD module and arduino are interfaced in the 4-bit mode. This means only four of the digital input lines(DB4 to DB7) of the LCD are used. This method is very simple, requires less connections and you can almost utilize the full potential of the LCD module. Digital lines DB4, DB5, DB6 and DB7 are interfaced to digital pins 5, 4, 3 and 2 of the Arduino. The arduino can be also powered from the PC through the USB port.

Program – Arduino to LCD:

```
#include<LiquidCrystal_I2C.h>

LiquidCrystal_I2C lcd(0x27, 16, 2);

void setup() {

  lcd.init();

  lcd.backlight();

  lcd.print("Hello 603");

}

void loop() {

}
```
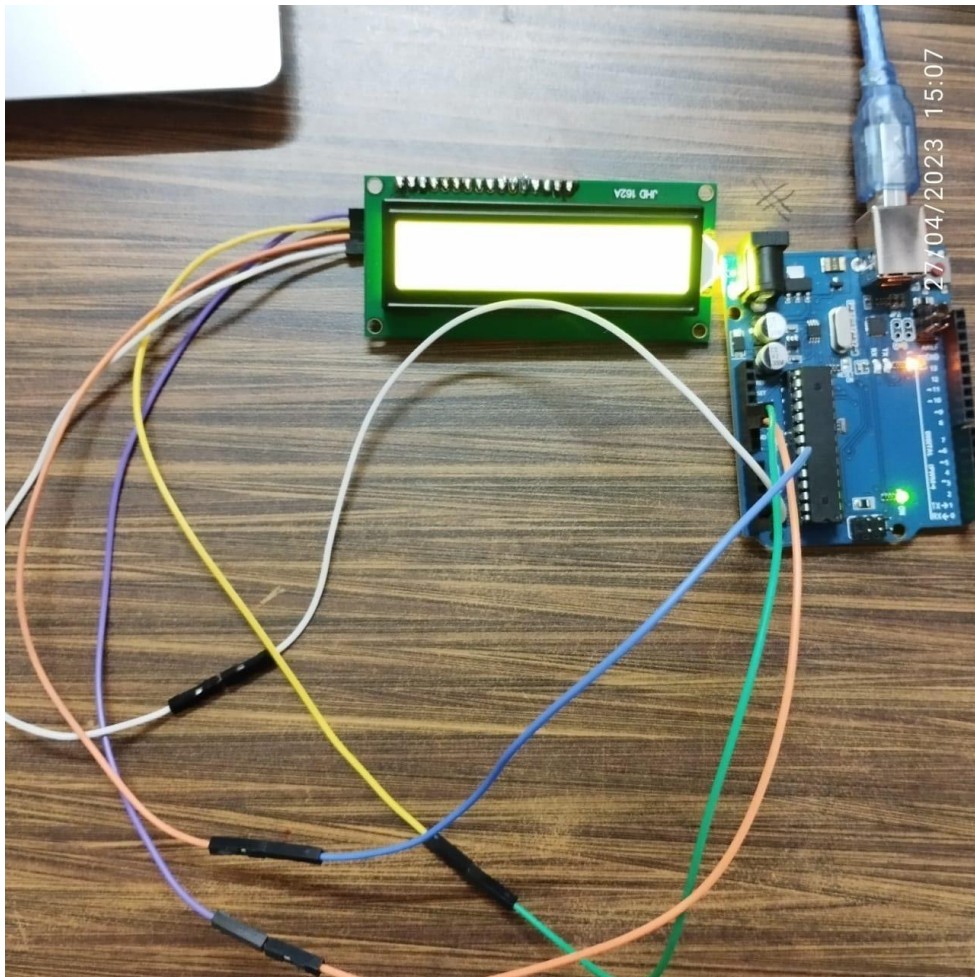
About the program:
To facilitate communication between Arduino and LCD module, we make use of a built in library in Arduino <LiquidCrystal.h> – which is written for LCD modules making use of the Hitachi HD44780 chipset (or a compatible chipset). This library can handle both 4 bit mode and 8 bit mode wiring of LCD.

Output:

20-CSP 358
Internet of Things LAB

<u>Learning Outcomes:</u>

1. Learn about IoT based simulations.

2. Learn about printing message on LCD Screen.

3. Learn about Arduino programming and Sensors.