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Department of MCA
MCALE232 Internet of Things Lab

Practical 5

Aim: - To interface Liquid Crystal Display (LCD) with Arduino and write a program to display message.

Components Required :

Arduino Board, Bread Board, Liquid Crystal Display (LCD), Potentiometer, Resistors, Connecting wires.

Theory:

The LCD (**Liquid Crystal Display**) is a type of display that uses the liquid crystals for its operation. The LCD display has a 16-pin interface.

The Liquid Crystal Display has a parallel interface. It means that the microcontroller operates several pins at once to control the LCD display.

The 16-pins present on the LCD display are discussed below:

- **RS**

The **Register Select (RS)** pin controls the memory of the LCD in which we write the data. We can select either the **data register** or the **instruction register**. The LCD looks for the upcoming instruction, which is present in the instruction register.

- **R/W**

The Read/Write pin selects the reading or writing mode.

- **E**

The **Enable (E)** mode is used to enable the writing to the registers. It sends the data to the data pins when the mode is HIGH.

- **D0 to D7**

These are eight data pins numbered as D0, D1, D3, D3, D4, D5, D6, and D7. We can set the state of the data pin either HIGH or LOW.

Pin 1 of the LCD is the **Ground** pin, and pin 2 is the **Vcc** or the voltage source pin. The pin 3 of the LCD is the **VEE** or the **contrast pin**. For example, we can connect the potentiometer's output to the VEE and can adjust the contrast of the LCD.

The A and K pins are also called as **Backlight pins** (Bklt+ and Bklt-).

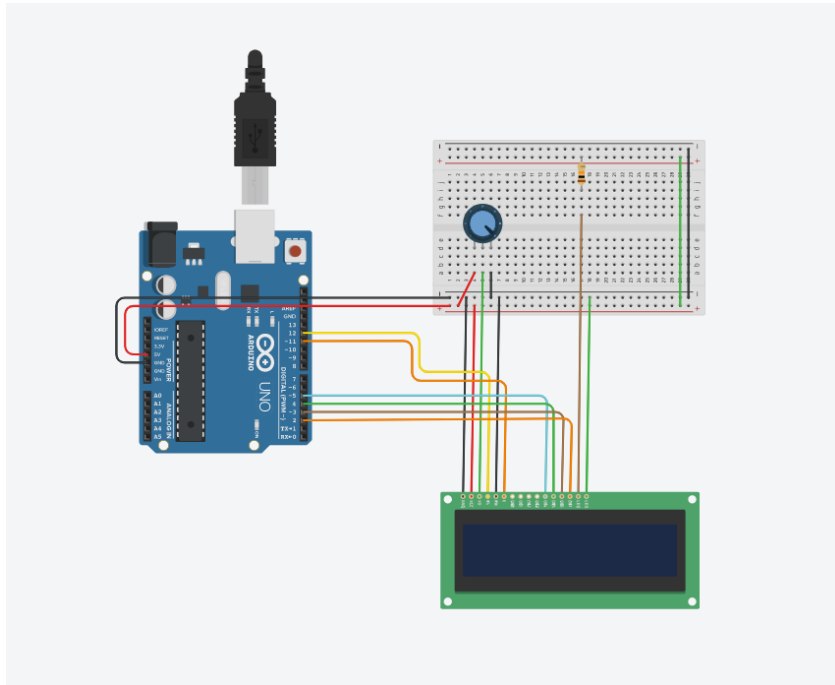
The process includes putting the data (to be displayed on the LCD screen) into the data registers. The instructions in the Register Select are kept in the instruction register. The liquid crystal library has simplified process to display the characters on the LCD.

Implementation :

We need to first connect the data pins of LCD to the digital pins.

- Connect the RS pin of LCD to pin 13 of the Arduino board.
- Connect the Enable pin of LCD to pin 12 of the Arduino board.
- Connect the D4 pin of LCD to pin 6 of the Arduino board.
- Connect the D5 pin of LCD to pin 4 of the Arduino board.
- Connect the D6 pin of LCD to pin 3 of the Arduino board.
- Connect D7 pin of LCD to pin 2 of the Arduino board.
- Connect the middle terminal of the potentiometer to the VEE (contrast pin).
- Connect the two ends of the potentiometer to the Ground and 5V.
- Connect one end of a resistor to the A and K of the LCD and another end to 5V.

Circuit Diagram:



Program:

```
// include the library code:  
#include <LiquidCrystal.h>
```

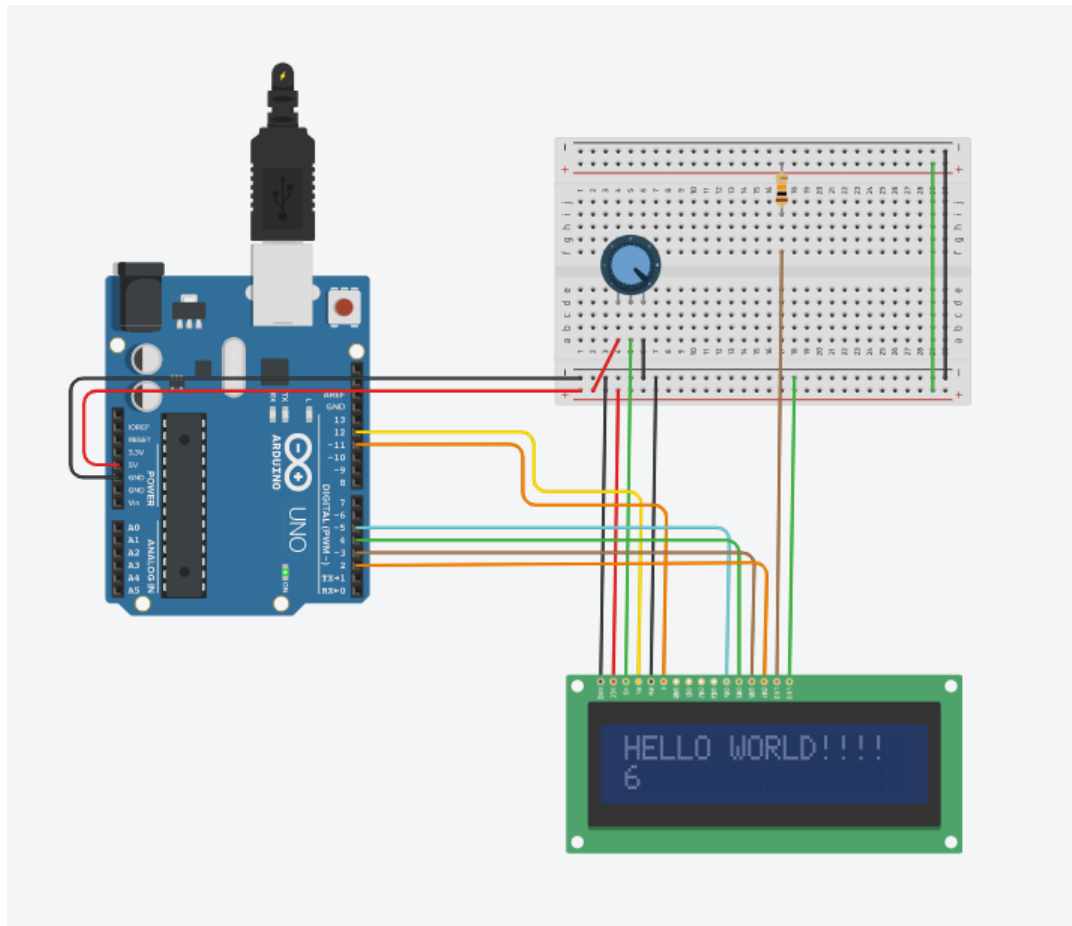
```
// initialize the library by associating any needed LCD interface pin  
// with the arduino pin number it is connected to  
const int rs = 12, en = 11, d4 = 5, d5 = 4, d6 = 3, d7 = 2;  
LiquidCrystal lcd(rs, en, d4, d5, d6, d7);
```

```
void setup() {  
  // set up the LCD's number of columns and rows:  
  lcd.begin(16, 2);  
  // Print a message to the LCD.  
  lcd.print("HELLO WORLD!!!!");  
}
```

```
void loop() {  
  // set the cursor to column 0, line 1  
  // (note: line 1 is the second row, since counting begins with 0):
```

```
lcd.setCursor(0, 1);  
// print the number of seconds since reset:  
lcd.print(millis() / 1000);  
}
```

Output:



Conclusion: Thus we studied the interfacing of Liquid Crystal Display and how to display different messages on the display.