College of Science and Computer Engineering

Department of Computer Science & Artificial Intelligence

CCAI 321

Advanced Topics in Artificial Intelligence

Lab# 7

LCD Display

جامعة جدة
University of Jeddah

Lab Objectives:

The aim of this LAB experiment is to teach students how to interface a Liquid Crystal Displays (LCD) screen to the Arduino board and display the number of seconds since the reset of the board.

Hardware Required:

1. Arduino Uno Board
2. HD44780 LCD Display Screen
3. Potentiometer
4. Breadboard

Circuit:

The circuit to be implemented in this experiment is a simple interface of LCD display screen to the Arduino board using 4-bit mode.
The implementation of this interface using Virtual Breadboard software is show in Figure 7.1.

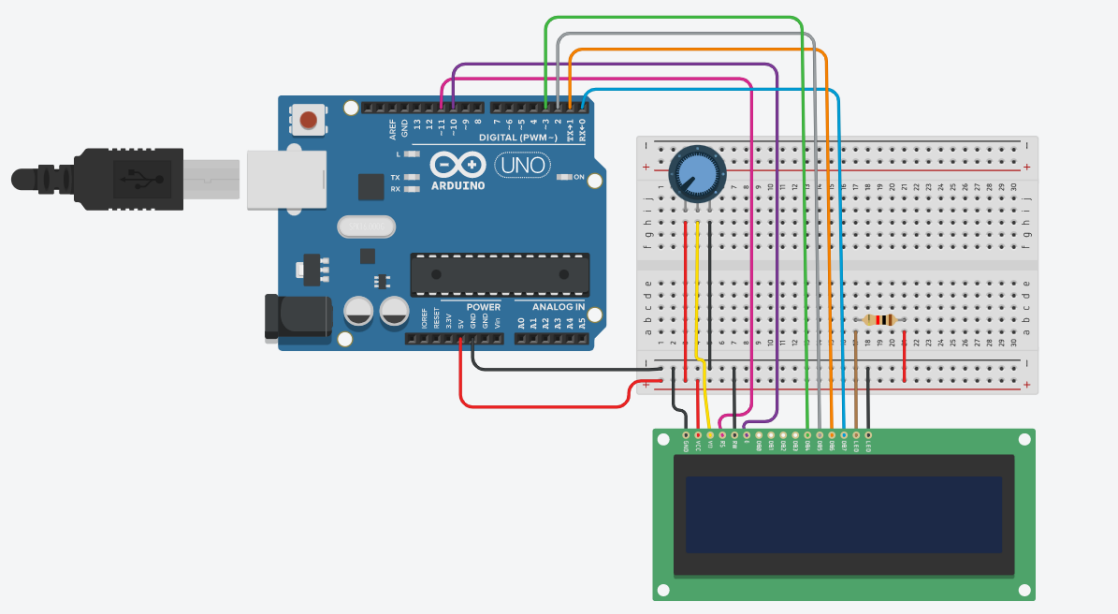

Figure 7.1

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To build this circuit follow the steps discussed in Experiments 1 and 2 to place and connect the following components:
1. the *Arduino Uno Board*.
2. the *HD44780 LCD Display Screen*.

Program:

In this part, you will write a program to display the number of seconds since the restart of the Arduino board on an LCD display screen.

Code:

```
/*
 The circuit:
 * LCD RS pin to digital pin 11
 * LCD Enable pin to digital pin 10
 * LCD D4 pin to digital pin 3
 * LCD D5 pin to digital pin 2
 * LCD D6 pin to digital pin 1
 * LCD D7 pin to digital pin 0
 * LCD R/W pin to ground
 * LCD VSS pin to ground
 * LCD VCC pin to 5V
 * 10K resistor:
 * ends to +5V and ground
 * wiper to LCD VO pin (pin 3)
 */

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

// initialize the library with the numbers of the interface pins
LiquidCrystal lcd(11, 10, 3, 2, 1, 0);

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

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);
}
```

➢ Lab Implementation:

To validate your design, you need first to build the source code and then run the emulator.
On the *Debug Toolbar*, locate and click the *Build* button to build your code. If there are no errors in the compilation process, emulate your program by clicking the run button located on the *Application Toolbar*. Observe the displayed number of seconds on the LCD
display screen.

➢ Exercise 7.1

Modify Program 7.1 to display the time since reset in hours, minutes and seconds using
the format "HH :MM :SS".