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Software

Integrating Arduino Uno with Flex Sensor and 1602A LCD Display

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1 INTRODUCTION

This documentation presents a guide for integrating a flex sensor with an Arduino Uno to measure the degree of bend and display it on a 1602 LCD screen. The flex sensor detects changes in resistance based on the degree of bend, providing a variable input to the Arduino Uno. The Arduino Uno processes this input and displays the corresponding degree of bend on the LCD screen in real-time.

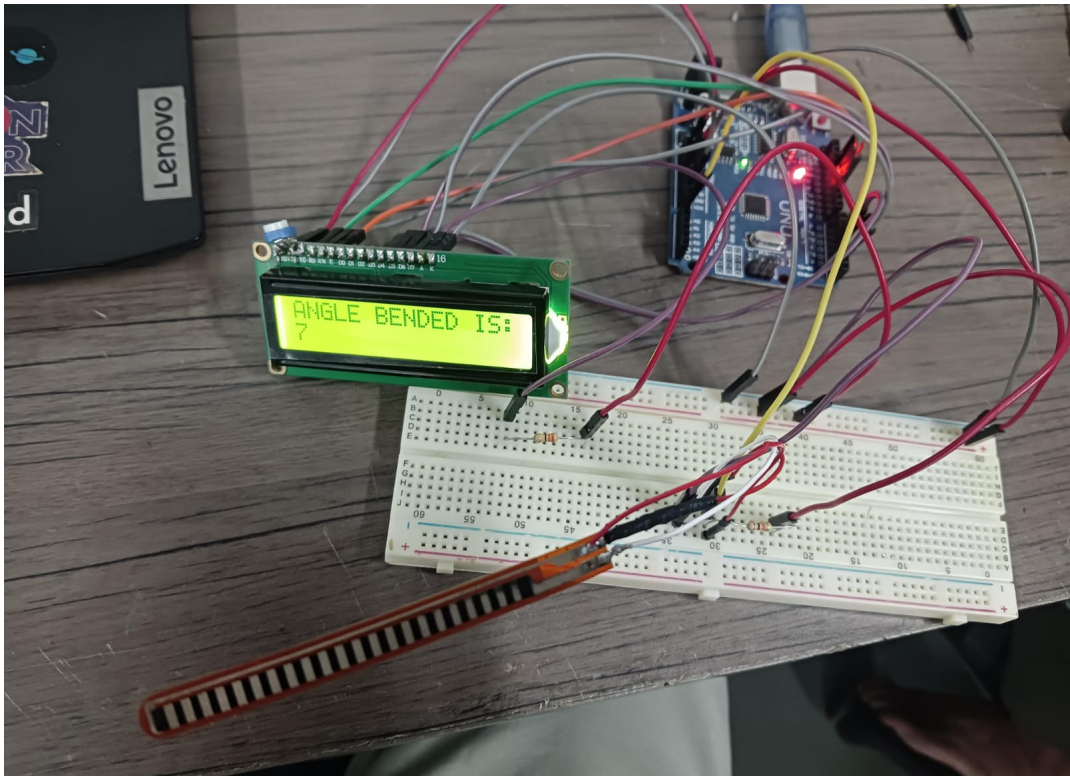


Figure 1

2 COMPONENTS USED

2.1 Hardware Components:

2.1.1 Arduino Uno:

- Includes 14 digital pins and 6 analog pins.
- Operates at a voltage of 5V.
- Microcontroller: ATmega328P
- Uses the ATmega328P microcontroller.
- Runs at a clock speed of 16MHz.

2.1.2 Flex Sensor:

- Variable resistor that changes resistance based on the degree of bend.
- Typically consists of a flexible substrate with conductive material.
- Provides a range of resistance values corresponding to different degrees of bend.

2.1.3 1602A LCD Display:

- Character LCD module with 16 columns and 2 rows.
- Requires 16 pins for interfacing: 8 data pins (D0-D7), 3 control pins (RS, RW, E), and power (VSS, VDD) and contrast (V0) pins.
- Operates on a voltage of 5V.

2.1.4 Potentiometer:

- Variable resistor used for adjusting contrast on the LCD display.
- Connected between GND and VCC, with the wiper connected to the contrast pin (V0) of the LCD display.

2.1.5 10k Ohm Resistor:

- Used in a voltage divider configuration to interface the flex sensor with the Arduino.
- Provides a fixed resistance value to complement the variable resistance of the flex sensor.
- Connected between the flex sensor and VCC.

2.1.6 330 Ohm Resistor:

- Used to limit the current flowing through the LED of the 1602A LCD display.
- Connected between the positive terminal of the LED (pin 15 or A) and the 5V power supply.

2.2 Software Components:

2.2.1 Arduino IDE:

- Integrated Development Environment (IDE) for Arduino boards.
- Provides a user-friendly interface for writing, compiling, and uploading code to the Arduino Uno.
- Offers a wide range of built-in functions and libraries for interfacing with hardware components.

2.2.2 LiquidCrystal Library:

- Installed directly from the Arduino IDE's Library Manager.
- Developed and maintained by the Arduino team.
- Offers convenient functions for controlling character LCD displays.
- Simplifies the process of interfacing LCD displays with Arduino projects.

3 HARDWARE CONNECTIONS SETUP

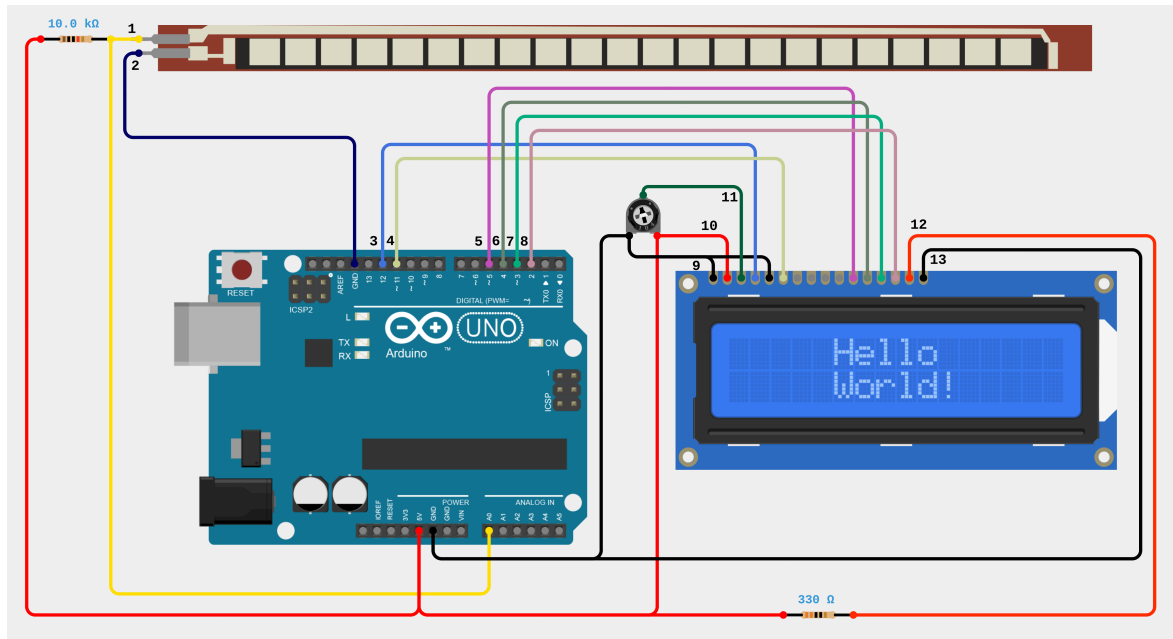


Figure 2: Hardware Connections Setup Circuit Diagram

1. Connect one terminal of the flex sensor to the +5V pin of the Arduino through a 10K resistor. Also, connect this terminal to analog pin A0 of the Arduino.
2. Connect the other terminal of the flex sensor to the ground (GND) pin of the Arduino.
3. Connect digital pin 12 of the Arduino to the RS (Register Select) pin of the LCD.
4. Connect digital pin 11 of the Arduino to the E (Enable) pin of the LCD.

5. Connect digital pin 5 of the Arduino to the D4 pin of the LCD.
6. Connect digital pin 4 of the Arduino to the D5 pin of the LCD.
7. Connect digital pin 3 of the Arduino to the D6 pin of the LCD.
8. Connect digital pin 2 of the Arduino to the D7 pin of the LCD.
9. Connect the VSS (Ground) pin of the LCD to the ground (GND) pin of the Arduino.
10. Connect the VDD (Power Supply) pin of the LCD to the +5V pin of the Arduino.
11. Connect the V0 pin of the LCD to the wiper terminal of a potentiometer.
12. Connect the A (Anode) pin of the LCD backlight to the +5V pin of the Arduino.
13. Connect the K (Cathode) pin of the LCD backlight to the ground (GND) pin of the Arduino.

4 RESULT

The integration of the Arduino Uno with the flex sensor and 1602 LCD display successfully allows for the measurement and display of the degree of bend detected by the sensor. As the flex sensor bends, its resistance changes, which is then processed by the Arduino. The corresponding degree of bend is calculated and displayed on the 1602 LCD screen in real-time. The LCD provides a clear visual indication of the flex sensor's output, allowing users to monitor the degree of bend with clarity.