Lab 5. Solar Power Measurement

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1. Introduction

In this experiment, we will use a solar sensor to measure solar power and display the value on an LCD screen. The project uses an Arduino to read values from the solar sensor and calculate the power generated, which is then shown on the LCD. This experiment is useful for understanding how solar power is measured and displayed in an easy-to-read format.

Experiment objectives:

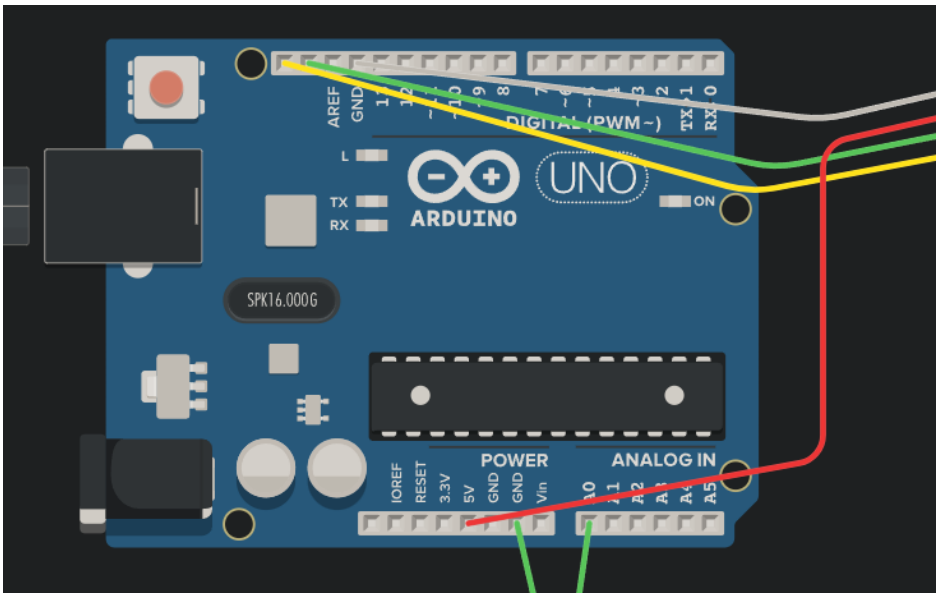
- Measure the voltage generated by a solar sensor.
- Calculate the solar power based on the measured voltage.

Display the calculated value on an LCD screen.

2. Required Components

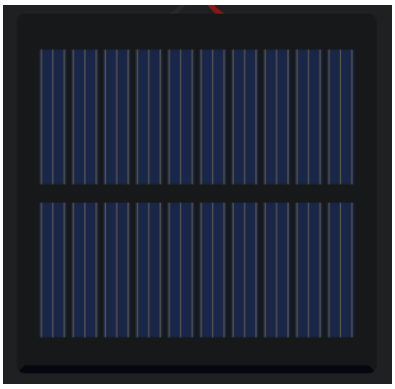
Arduino Uno R3

- **Description:** Microcontroller used to read values from the solar sensor and control the LCD.



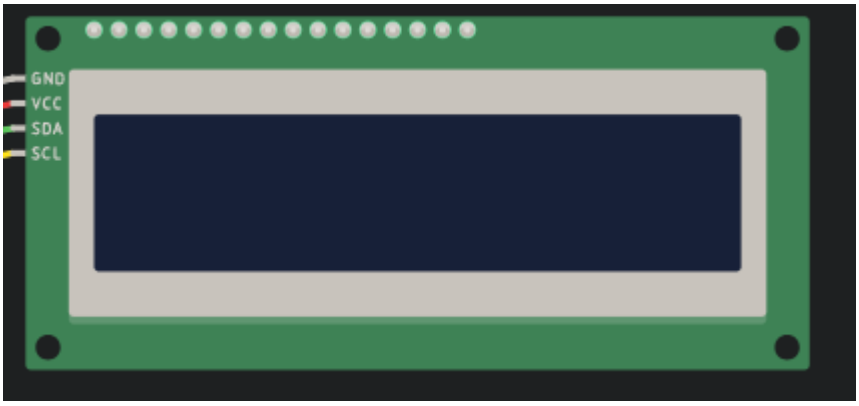
Solar Sensor

- **Description:** A component that measures sunlight intensity and generates an analog signal.



LCD 16x2 (I2C)

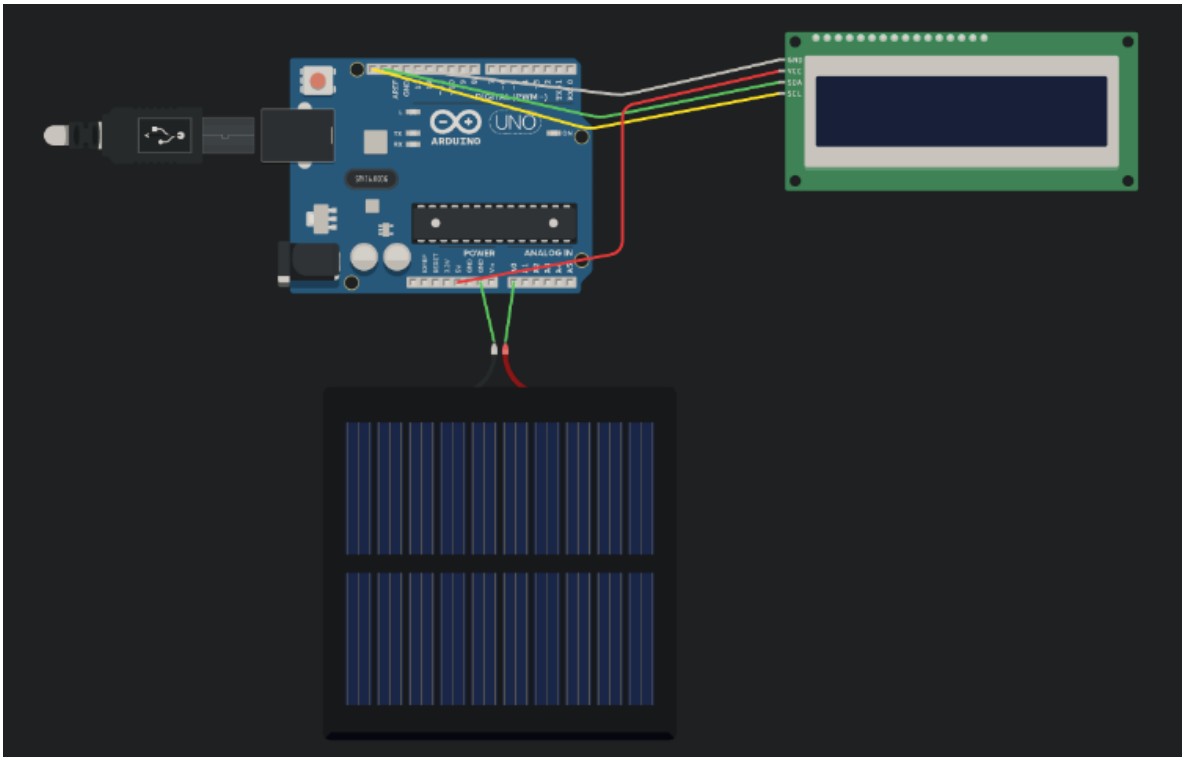
- **Description:** LCD display used to show the solar power value.
- **Images:**



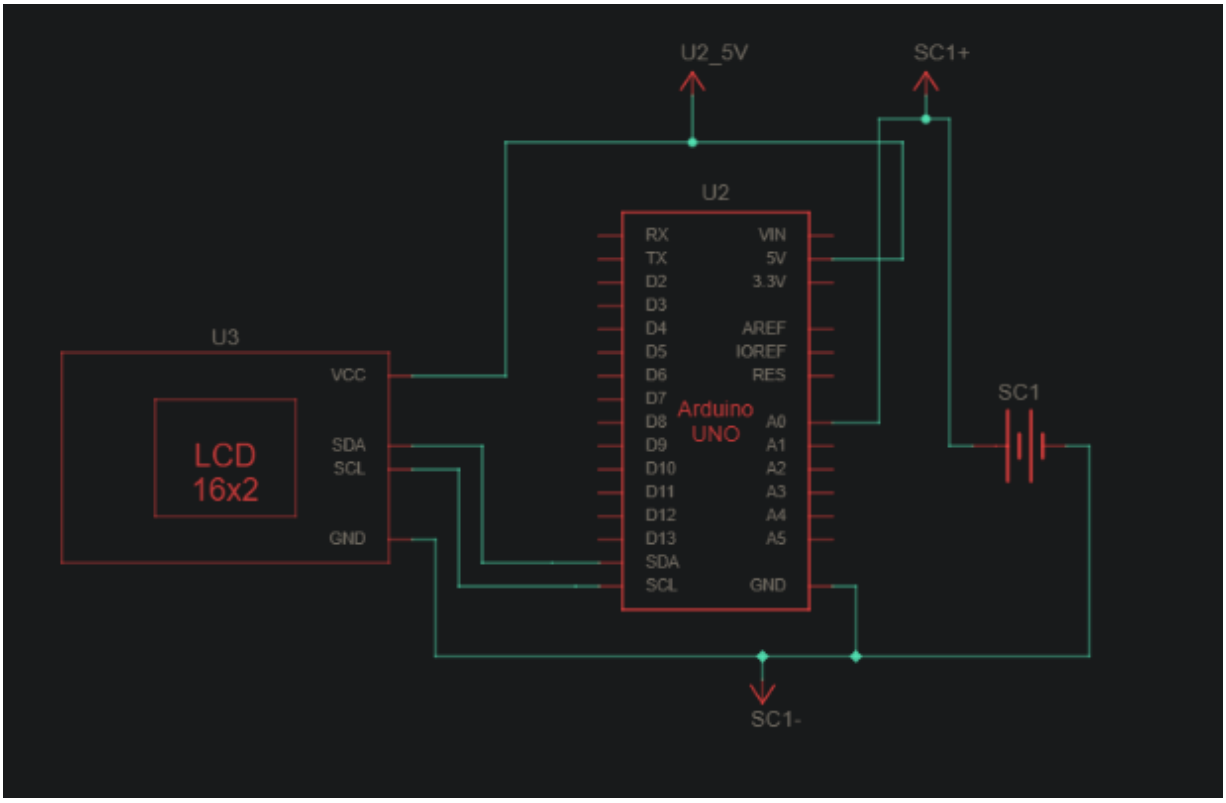
220 ohm resistor (optional, for motor protection, if needed)

- **Description***:* A resistor used to limit current in the circuit, if necessary.

3. Wiring Diagram



4. Electrical diagram



5. Instructions

Step-by-step description of the experiment process:

1. **Component Setup:**
    - Connect the solar sensor to analog pin A0 on the Arduino.
    - Connect the LCD to the SDA and SCL pins of the Arduino.
    - Ensure proper power supply to all components (5V and GND).
2. **Arduino Programming:**
    - Write and upload the Arduino code to read the solar sensor value, calculate power, and display the value on the LCD.
3. **Testing the Circuit:**
    - Check if the LCD correctly displays the calculated solar power and that the values are updating as expected.

6. Programming

Software used: Arduino IDE

Code:

```
#include <Adafruit_LiquidCrystal.h>
Adafruit_LiquidCrystal lcd_1(0);
const int solarPin = A0; // Pinul la care este conectat senzorul solar
void setup()
{
  lcd_1.begin(16, 2);
  lcd_1.print("Solar Power:");
}

void loop()
{
  int analogValue = analogRead(solarPin);
  float voltage = analogValue * (5.0 / 1023.0);
  float power = voltage * voltage;
  lcd_1.setCursor(0, 1);
  lcd_1.print("Power: ");
  lcd_1.print(power, 2);
  lcd_1.print(" W");
  lcd_1.setBacklight(1);
  delay(1000);
```

```
  lcd_1.setBacklight(0);
  delay(1000);
}
```

7. Conclusions

- **Power Measurement and Display:** The code and circuit allow for easy reading and displaying of solar power values.
- **Functionality:** This project demonstrates how to use an analog sensor to measure values and show them on an LCD.
- **Improvements:** Future enhancements may include using a current sensor for more accurate power measurement.

8. References

- **Arduino Documentation:** Official Arduino documentation
- **LCD and Sensor Tutorials:** Tutorials on LCDs and sensors
- **Similar Projects:** Projects using solar sensors