PROJECT 8

SOLAR POWER MONITORING USING LCD

Utkarsh Patel

G11 ES & IOT

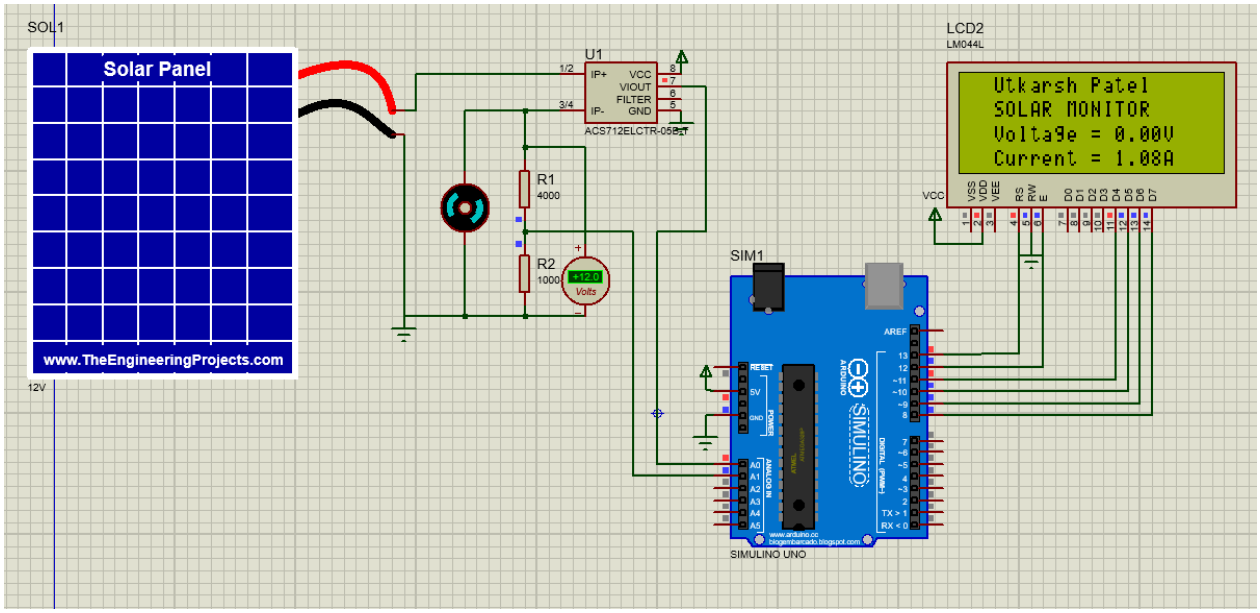
Introduction

Solar energy is one of the most promising renewable energy sources in the modern world. Monitoring solar panel output in real time is essential to analyze its efficiency and performance. This project focuses on developing a **solar power monitoring system** that measures voltage, current, and power generated by a solar panel and displays the data on an **LCD screen**.

Components Required:

- Arduino UNO R3
- ACS712 Current sensor
- Resistor (1K, 4K)
- DC motor
- LCD (20 x2)
- DC Voltmeter
- 12V Solar panel

Schematic Diagram:



Working Principle:

1. The **solar panel** generates power when exposed to sunlight.
2. The **voltage sensor** measures the voltage across the panel and converts it into an analog signal.
3. The **current sensor (ACS712)** measures the current flowing from the panel.

4. Both sensor outputs are fed to the Arduino Uno, where the analog signals are converted to digital values.
5. The power is calculated using the formula:

Power (W) = Voltage (V) x Current (A)

6. The measured voltage, current, and power values are displayed on the LCD.

Program:

```
#include <LiquidCrystal.h>

// initialize the library with the numbers of the interface pins
LiquidCrystal lcd(13, 12, 11, 10, 9, 8);

//Measuring Current Using ACS712
int sensitivity = 185;          // using 185 for 5A Module
int adcvalue= 0;
int offsetvoltage = 2500;       //Sensor Callibration
double Voltage = 0;             //voltage measuring
double ecurrent = 0;            // Current measuring

void setup()
{
  lcd.begin(20, 4);
  lcd.setCursor(0,0);
  lcd.print("  Utkarsh Patel    ");
  lcd.setCursor(0,1);
  lcd.print("  SOLAR MONITOR    ");
}

void loop()
{
  // Measuring The Voltage *********************************
  // reading the input on analog pin A1:
  int sensorValue = analogRead(A1);
  // Convert the analog reading (which goes from 0 - 1023) to a voltage (0 - 5V):
  float vol = (sensorValue * 5.0) / 1023.0;

  float voltage = vol * 5;
  lcd.setCursor(0,2);
  lcd.print("  Voltage = ");
  lcd.print(voltage);
  lcd.print("V");

  // Measuring The Current *********************************
  adcvalue = analogRead(A0);            //reading the value from the analog pin A0
  Voltage = (adcvalue / 1024.0) * 5000; // Gets you mV
  ecurrent = ((Voltage - offsetvoltage) / sensitivity);
  lcd.setCursor(0,3);
  lcd.print("  Current = ");
  lcd.print(ecurrent);
  lcd.print("A");                       //unit for the current to be measured
  delay(2000);
}
```

Applications

- Real-time monitoring of solar panels for residential or industrial use.
- Analyzing solar panel efficiency in renewable energy systems.
- Educational projects to understand renewable energy systems.
- Solar-powered IoT systems where power monitoring is critical.

Advantages

- **Real-Time Monitoring**: Displays real-time voltage, current, and power values.
- **Cost-Effective**: Simple and low-cost components.
- **Scalability**: Can be enhanced with data logging or IoT integration.
- **Educational**: Helps students and engineers learn about renewable energy systems.
