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An IOT Based Approach for Monitoring Solar System Parameters using Arduino Microcontroller

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Abstract: The solar parameters monitoring system is the most important system for monitoring solar systems. Solar energy is a renewable form of energy that is generated by solar panels. Solar energy is a renewable form of energy that is generated by solar panels. The parameters that the system measures include voltage, light intensity, and temperature. In the recommended monitoring system, an Arduino Uno microcontroller board is employed. The system includes solar panels, an LDR sensor, an LM 35, an Arduino microcontroller, and resistors. Light. In this system, an LDR sensor detects light intensity, an L35 sensor measures temperature, and a voltage divider circuit monitors the voltage.
Keywords: Solar Panel, Monitoring, Renewable Energy, Solar Panel, Arduino Uno.

I. INTRODUCTION

Power generation is a critical component in many developing countries. As the industrial and commercial sectors develop, energy consumption is at an all-time high. As a result, we're all lured to renewable energy sources in order to meet our energy demands using green energy. In the future, this might help mankind reduce greenhouse gas emissions and ozone layer depletion. Because of its widespread availability, low cost, and ease of installation and maintenance, solar photovoltaic technology is gaining popularity. The Internet of Things (IoT) becomes smarter and more user-friendly when devices are connected via a communication protocol and a cloud platform. The effectiveness of a solar panel is affected by basic factors such as voltage, light intensity, and temperature. As a result, a real-time solar monitoring system is necessary to optimize the performance of the PV panel by comparing it to the trial result and taking preventative measures. Solar energy has received a lot of attention in recent years. Machine intelligence approaches are also used to forecast outcomes in order to attain high performance.

II. OVERALL SYSTEM DESIGN

The system presented in this work can measure solar PV voltage, light intensity, and temperature and show the results on an LCD display.

For integrating solar panels with the Arduino UNO, the system includes both hardware circuit design and software programming. A voltage divider circuit senses the solar PV voltage. A light-dependent ratio sensor measures light intensity, whereas an LM35 sensor measures temperature. The graphic below depicts a schematic representation of the system.

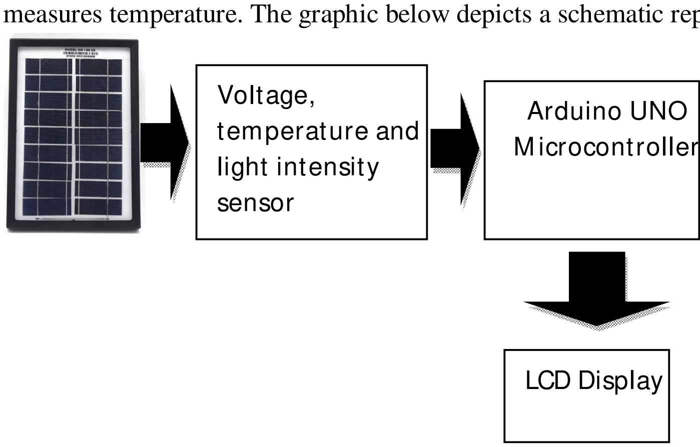

Fig: Solar parameter monitoring system

III. COMPONENTS OF SYSTEM

A. Solar Panel

A total of 3W of solar panels were installed in this installation. The apparatus depicted in the diagram is used to generate the needed output for measurement. These feature a 3W maximum power output, a 5.5 V maximum voltage, and a 370mA maximum current.

Fig: Solar Panel

B. Voltage Measurement system

The Solar Panel Voltage Measurement is simple and maybe done up to 5 volts. However, if we want to measure more than 5 volts, we'll need to add some more circuitry, such as a Voltage Divider. This circuitry varies in response to voltage, which refers to the amount of voltage we must measure. For example, if we wish to test 5 volts, we don't require any additional circuitry. Simply connect the solar panel's output voltage to the Arduino's Analog pin, convert it to Digital, and display the result on an LCD or computer. Assume you need to measure up to 10 volts and you have to utilize the circuitry provided

C. Temperature Measurement

We utilized the LM35 to measure the temperature, which yields 10 mV for every 1 degree Celsius. The circuitry is simple, and we can determine the temperature in degrees Celsius.

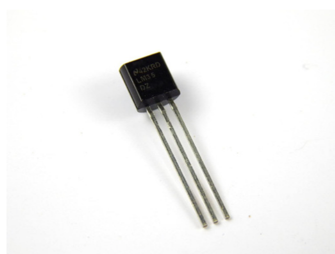

Fig: LM35

D. Light Intensity Measurement

The light-dependent resistor is a variable light control resistor whose resistance is depending on light. Light-dependent resistors are helpful in light/dark server socket applications because the resistor affected by the LDR is inversely proportional to the light brightness. The LDR sensor is utilized to detect the light intensity incident on the Solar PV in this study. By translating the resistance to the voltage equivalent, the change in the register may be easily observed. When light shines on the LDR, the center point is employed as an output linked to the board. Please voltage is applied to the analogue input of the order no, which is converted to digital equivalent corresponding to the resistance of the LDR degrees and the analogue voltage changes please voltage is applied to the analog input of the order no, which is converted to digital equivalent corresponding to The LDR voltage is transformed using an equation to measure the light intensity in degrees locks for measuring the light intensity in degrees locks.

Fig: LDR

E. Arduino UNO Microcontroller

Because of its simplicity and ease of configuration, Arduino is a popular open-source prototyping platform in the digital world. The Arduino UNO R3 utilized in the project is a microcontroller board based on the AT Mega 328 with a 16Mhz crystal, 6 analog inputs, and a USB connector that serves as a power supply and communication route.

Fig: Arduino UNO Microcontroller

F. LCD 16×2

Liquid crystal display is the abbreviation for liquid crystal display. It is a type of electronic display module that is utilized in a wide range of circuits and devices such as mobile phones, calculators, computers, television sets, and so on. Multi-segment light-emitting diodes and seven segments are the most common applications for these displays. The primary advantages of utilizing this module are its low cost, ease of programming, animations, and the fact that there are no restrictions on displaying unique characters, special and even animations, and so on.

Fig: LCD 16×2

IV. CONCLUSIONS

The usage of Renewable Energy technology is one recommended approach of reducing environmental consequences. Because of the frequent power outages, using renewable energy and keeping track of it is crucial. The user is taken through the process of monitoring renewable energy consumption. This strategy is cost-effective. The system's efficiency is estimated to be approximately 95%. This allows for more efficient utilization of renewable energy. The temperature sensor is useful for research into solar energy storage. As a result, the electrical issue becomes less of an issue. We presented work on the design and building of a solar panel parameter reading node for environmental monitoring using Arduino; the node is capable of providing information on temperature, voltage, and light intensity.

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