International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 05 Issue: 06 | June - 2021 ISSN: 2582-3930

SOLAR POWER PANEL MONITORING AND DATA ACQUISITION SYSTEM

Swapnil Bhawarkar [1], Prajyot Nimje[2], Kartik Kature[3], Yuvraj Talekar[4], Nilesh Dhengre[5], Bhavesh Bhoyar[6]

[1] Associate Professor, Department of Electrical Engineering, Priyadarshini J.L College of Engineering, Nagpur, Maharashtra, India

[2-6] B.E Scholars, Department of Electrical Engineering, Priyadarshini J.L College of Engineering, Nagpur, Maharashtra, India

ABSTRACT - As the world now is turning towards renewable energy sources and countries like Iceland have obtained 100% renewable energy status and India has also started to lean towards renewable energy, moreover rooftop solar panels are becoming a trend nowadays but In order to know how efficiently the solar photovoltaic system is working and for performance evaluation there should be some monitoring system.

Therefore here we propose a system using a microcontroller and internet of things technology using sensors to monitor the parameters of the solar photovoltaic system remotely from anywhere using smart phones and computers using web server. Some solar photovoltaic systems are located in inaccessible locations and it is difficult to monitor it and the solar panels are not utilized to its full efficiency all day ,in order to achieve the solar panel must absorb maximum sunlight every instant , in order to achieve it here we propose a sun tracking technology to control the solar panel and rotate it so it absorbs maximum sunlight every instant .The system is based on a new cost effective technology using a microcontroller and internet of things technology monitors and controls the solar photovoltaic system remotely from anywhere around the world.

***Keywords*:** Arduino Uno, Wireless Sensors, IOT, Sun tracking system

I. INTRODUCTION

The internet of things is a futuristic technology by which an object could be sensed, monitored and controlled remotely using the cloud server network. By using this technology machines can communicate with themselves and be controlled without requiring humans.

In the past decade of years there is increase in demand for reliable and abundant electrical energy derive from renewable energy sources renewable energy plays important role in energy crisis of country. One example of renewable energy is Solar power. **Solar energy** is a very large, inexhaustible source of energy.

Each hour the earth receives 430 quintillion joules of solar energy which is more than enough to power the whole world for a year. But the problem here is it is tough to utilize this much of energy efficiently.

The solar panels nowadays are installed everywhere but they are not and controlling the solar panel using different devices available in market.

The system will show the power generated by solar panel on the LCD and as well as on a webpage so that it can be monitored very easily.

II. PROBLEMS WITH EXISTING SYSTEM

The solar panels are monitored using a controller and current and voltage are sensed using current and potential transformers. The solar tracking is not implemented and controlling of solar panel is not done till now. Therefore, the solar panel is not used to its maximum.

Hotspots are among the most common issues with solar or PV systems. hotspots occur when panels get too warm and overload. They are caused by several things, including the accumulation of dirt on the panels. They can also be caused by badly soldered connections, which result in low resistance in the part of the panel that generates power. this problem can lower the performance and lifespan of the solar panels.

The experts had to physically present for the checkup of each and every solar panel supervision.

III. PROPOSED SYSTEM

This system monitors the solar panel parameters like voltage, current and power generated

This will update in the web server. So, we can monitor anywhere through internet.

Web server keeps track of the daily power production of solar panel and stores it on a daily basis.

The solar panel is rotated and aligned to a position where it receives maximum sunlight so that it can operate at its maximum efficiency.

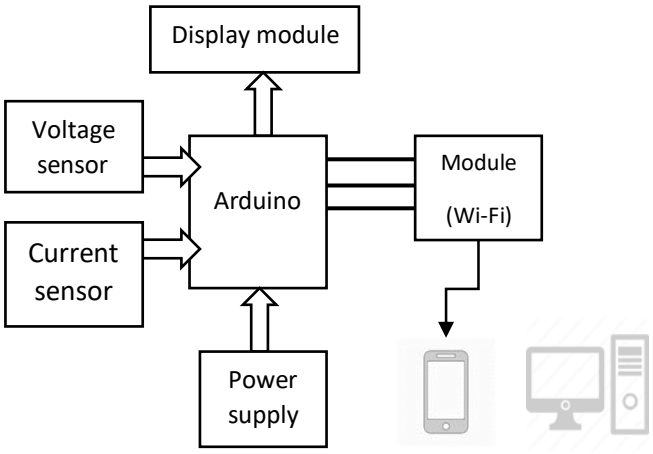
IV. WORKING

In solar power monitoring system, the solar panel is rotated and aligned to a position where it receives maximum sunlight so that it can operate maximum efficiency.

The energy is transferred to Arduino module. Arduino is connected with current sensing device like current transformer having rating 15 Amp which measure current in circuit and also for voltage measurement, voltage divider network along with optocoupler is used.

The output from sensors is displayed on LCD screen with the help of Arduino. To access the data remotely, the Wi-Fi module is connected to the monitoring panel where the Arduino serially communicate with Wi-Fi module.

Now the monitoring panel is connected to Internet using Wi-Fi. when it is connected to the internet, the serial communication starts between Arduino and Wi-Fi module which is indicate through LED.



V) 1} HARDWARE REQUIRED

- SOLAR PANEL
- CURRENT SENSOR
- VOLTAGE DIVIDER CIRCUIT
- LCD 16*2
- ARDUINO
- WIFI MODULE
- BULB AS LOAD

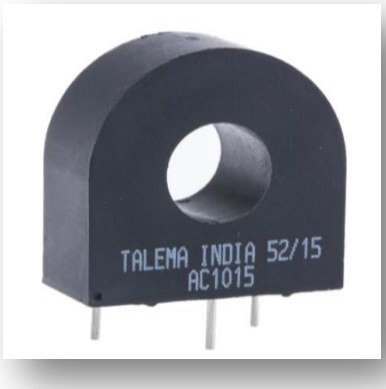
V) 2} SOFTWARE REQUIRE

- ARDUINO IDE

V] 1. SOLAR PANEL

12V 25Watt solar panel is aligned to capture maximum solar energy.

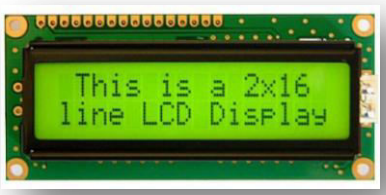
V] 2. CURRENT SENSOR



A **current sensor** is a device that detects electric **current** in a wire and generates a signal

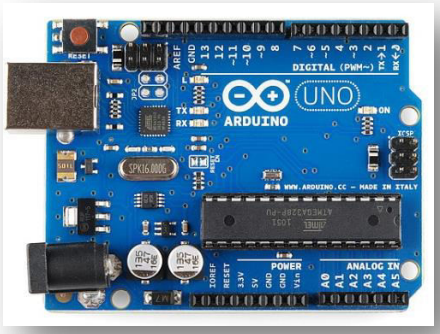
proportional to that **current**. The generated signal could be analog voltage or **current** or a digital output .

V] 3. LCD (16*2)



A 16x2 **LCD** display is very basic module and is very commonly used in various devices and circuits. A 16x2 **LCD** means it can display **16** characters per line and there are **2** such lines.

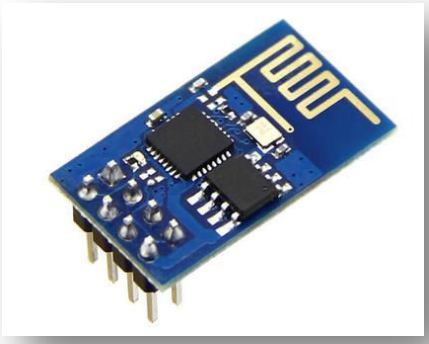
V] 4. ARDUINO



Arduino is an open-source electronics platform based on easy-to-use hardware and software. **Arduino** boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online.

V] 5. WIFI MODULE

For Current Measurement, 15Amp Current Transformer Used.



Wi-Fi module is an impressive, low cost Wi-Fi module suitable for adding Wi-Fi functionality to an existing microcontroller project via a UART serial connection.

VI. APPLICATIONS

Application of monitoring system are the rooftop solar, ground mounted solar , solar cities , smart villages , micro grids and solar street lights , consumer products like solar water heating system , sola home lighting systems , solar lanterns , solar pumps , solar mobile charger , LED solar torch , solar RO plant , solar inverters , etc. can be monitored through this project.

Commercial products like solar traffic signals, solar road studs/blinkers can also be monitored through the proposed system.

VII. ADVANTAGES

View performance parameters in real time, get suggestions for improved settings, and eliminate power outages at remote sites.

Facilitate remote troubleshooting of plants, firmware update, and program customization on site.

If any anomalies are detected, receive a notification and activate the solution through remote or physical inspection.

Reduce costs associated with physical monitoring 24/7 while ensuring optimal performance.

Analyze energy consumption and power generation while continuously optimizing energy use and reducing waste.

Supervise the functioning of solar equipment components and determine whether they are in optimal condition.

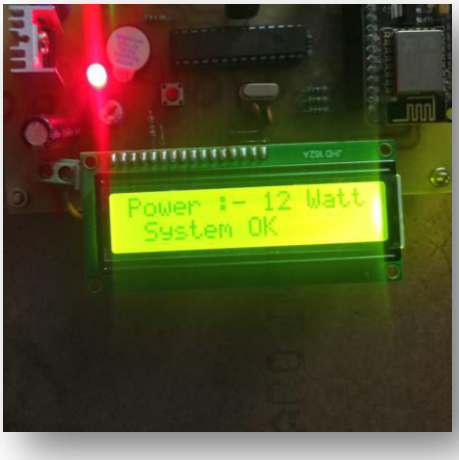
VIII. RESULT

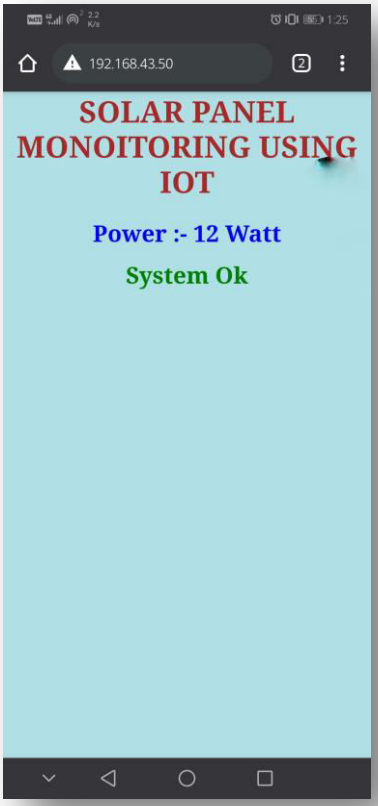
The proposed system stores the data from the solar photovoltaic system continuously, so it keeps track of the solar photovoltaic system and daily or monthly analysis becomes easy and efficient.

Using the analysis, it is possible to detect any fault occurring in the system as there would be inconsistency in the data generated by the system.

By solar tracking the solar panel is operated at its maximum efficiency all day.

By analyzing the data, it is possible to predict the future values of parameters.





IX. FUTURE SCOPE

The controller requires an external supply to work but using the power generated from solar panel itself the controller's input power supply can be met.

By analyzing the data, it is possible to predict the future values of parameters. Artificial intelligence can be implemented using various machine learning algorithms so that the system can become smart enough to take decisions about data and performance.

X. REFERENCES

1. Internet of things: Principles and Paradigms 1st edition by Rajkumar Buyya.

2. Idris. I, Robian. M.S, Mahamad. A.K, Saon. S, 'Arduino based maximum power point tracking for photovoltaic system', APRN Journal of Engineering and Applied Sciences.

3. Wikipedia (2016) Current sensor module 5A, (2016, December 22) retrieve from