A Novel Solar Panel Fault Monitoring System Using IOT for Solar Power Plant

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Abstract: - The fault monitoring of the solar power plant is needed to obtain the optimum output power. This efficient output power plants while monitoring for connections, the accumulation of dust or any other faults in solar panels affects the solar performance by lowering by the output IoT based the solar power monitoring system allows the solar monitoring and check whether there is the problem in the solar panel connection by lowering the output to find the problem occurs in the solar panel. The at mega controller used to monitors the parameters in the solar panel. They monitor the solar panel and transmit the output to the IoT thingspeak transmits the solar power parameters in the WEB PAGE server. The parameters are displayed by using GUI and when the output falls below the specific limit it alerts the user, there is the problem in solar panel connections or any dust particles on the solar panel. This makes the monitoring of the solar panel easier and ensure the best power.

Key Words: ***IOT, ESP32, Dust sensor, Intensity sensor.***

I. INTRODUCTION

Current situation the energy deficiency faced by the world countries are urging researches to find alternative energy source that would complement the conventional fossil fuel. Solar energy is taken from sun in that form of heat light. This energy is essential for life on earth. It is a renewable resource that is pure, economical, and less pollution compared to other resources and energy. Solar energy is the energy generated by harnessing the power of the solar radiation. Solar energy is energy produced by sun (solar energy has a fixed orientation to the sky) solar power plants need to be monitored for optimum power output.

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The power output of solar panels is unable to extract the maximum when it's oriented perpendicular to the direction of the sun rays as both the area of illumination of sunlight on solar panel and intensity of sun rays is maximum in this case. This retrieves efficient power output from power plants, while monitoring faulty of PV cells connections and dust accumulated on cells lowering output and other such issues affecting solar performance. So, we propose an automated IoT based solar power monitoring from anywhere over this internet. We can use Arduino parameter because Arduino boards are relatively inexpensive compared to another microcontroller.

The Arduino is based Atmel's ATMEGA8 and ATMEGA168 microcontrollers. Our system constantly monitors the PV cells transmits the power output to IoT system over the internet. Then we use IoT to transmit solar power parameters over internet. Jongbae Kim, [8] designed a remote intelligent monitoring system based on Tiny OS for monitoring and management for PV power generation. This system had implemented remote monitoring and reverse control by the host computer, ARM gateways, wireless sensor networks, and other components. S. Adhya, D. Saha [2] proposed a renewable energy monitoring system (REMS).

A new concept of an open source and low-cost data acquisition and transmission system using multi-user cloud remote monitoring, Raspberry Pi, and IoT, applied to decentralized RE plants. The REMS architecture, based on the Internet of Things (IoT) and Cloud computing principles, consists of three main parts San USB microcontroller, Raspberry Pi (RPi) Embedded Linux System (ELS) and Online Web Monitor for real time cloud.

II. System Design And Block Diagram

The proposed method is for monitoring solar electricity using IoT the solar panel facilitates to shop the electricity within the battery. The battery has the energy which is beneficial for electrical appliances. Is four sensors voltage, contemporary, dirt, and the depth sensor that's linked with Arduino in addition to the bread board Arduino microcontroller can be used to read the sensor values.

The Arduino has been used which abates the programming complexity. Arduino initiatives may be stand by myself, or they can communicate with the software going for walks for your laptop (e.g. the flash, processing Max MSP). Open supply physical computing platform primarily based on an easy microcontroller board. IoT is a community of physical gadgets with embedded electronics that gather and proportion records".

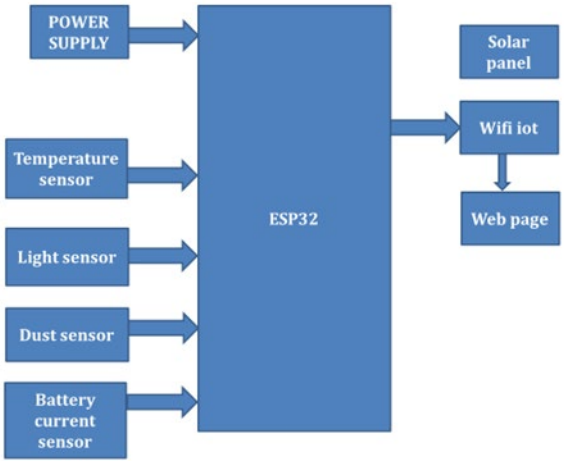

Fig.1. Block diagram.

The assessment of modern-day and voltage are checked and sent to the IoT module, at that point the IoT module stores the modern also, voltage analyze with records and time. IoT gadgets proportion the sensor data they accumulate through connecting to an IoT gateways or other side device. Those devices communicate with different related gadgets and behave at the data they acquire from each other. It is a growing time powerful than current techniques for far flug checking shape for photoelectric solar cellular.

The voltage and current sensors are used to calculate and decide the AC or DC voltage stage. The input of this switch's analog voltage sign, a present day sign an audible signal and so forth. The estimation of these sensors can depend on the voltage separator. A contemporary is a tool that find out electrical modern-day in a twice and produces a signal proportional to it. it can be then applied to display the measured present day in an ammeter or can be saved similarly analysis in a statistics acquisition system or sensed can be utilized for control cause. The sensed present day and output sign can be

- AC current input
- DC current input

The intensity sensor is mild devices of a non-resistant tool that converts this "light power "whether visible or in the infra-crimson components of the spectrum into an electrical sign output. Light sensors are more commonly called "photoelectric devices "or "image sensor "because the convert the mild energy into power.

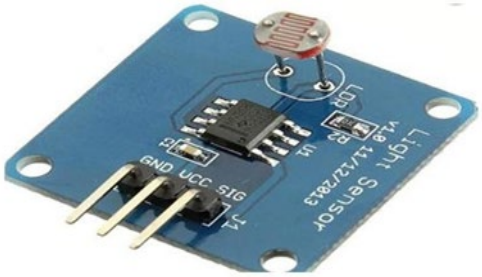

Fig.2. Intensity sensor

Dust sensor is small in size and can detect dust and smoke particles in the environment. It consumes very little power while it's running, making it ideal for an always-on monitoring system. The sensor has a tiny six-pin connection interface, it comes with a connector when you usually buy it.

Fig.3. Duct sensor

IoT Module is a community of physical gadgets with embedded electronics that gather and proportion records". The assessment of modern-day and voltage are checked and sent to the IoT module, at that point the IoT module stores the modern also, voltage analyze with records and time.

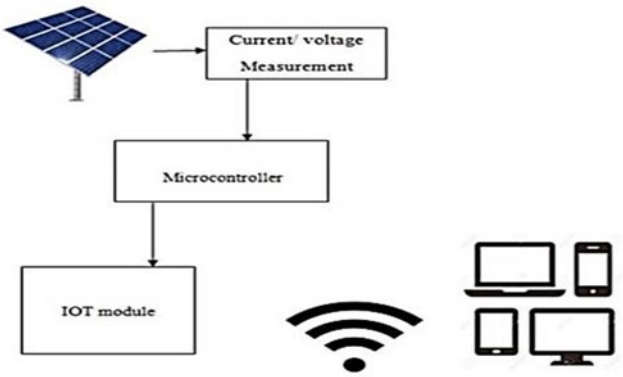

Fig.4. Structure of panel monitoring using IoT module.

IoT gadgets proportion the sensor data they accumulate through connecting to an IoT gateways or other side device. Those devices communicate with different related gadgets and behave at the data they acquire from each other. It is a growing time powerful than current techniques for far flug checking shape for photoelectric solar cellular. The work consists of faraway checking structure supposed to photoelectric sun cell. This module is utilized for far flung checking the photoelectric solar mobile. The current and voltage evaluation of PV are estimated with the assistance of present day and voltage sensor. These yields are in easy facts compose, so it changed over into automatic form using analog to superior converter. The estimated information is given to the MCU.

The microcontroller sends the planned records to the IoT. The internet of things is the gadget of physical equipment which empowers these modules to partner and exchange information. The fundamental reason for this assignment is to display the PV and setting away the statistics in the container. Along these traces from, this venture, we can productively display screen the photo voltage forums remotely and put away the deliberate records. The microcontroller unit reviews are shared to the IoT. The connectivity networking and communication eagerly depend on the specific IoT application deployed.

Cloud can offer the opportunity of storing records about each day energy intake. Thing speak is an open source IoT software and API to store and retrieve data from things the usage of neighborhood place network or net. Aspect communicate allows the advent of sensor logging programs, area tracking programs and a social internet of factors with station updates. The cloud has constructed in functions in it which constitute the values in form of graphs. Multiple submit operations are accomplished on records over cloud and cell utility also access the records from cloud.

III. FLOW CHART AND IMPLEMENTATION

The work flow represents the process of proposed system from load to the monitoring system. The work flow of the solar energy monitoring system is presented in the form of step below.

- *Step 1:* Arduino show the capacity usage using sensed Values through current sensor and voltage divider.
- *Step 2:* Fetch the Arduino output data through serial port and display.
- *Step 3:* Arduino sends the monitoring data on to the Cloud.
- *Step 4:* Cloud display the data in the form of graph, which is visible to the entire user.

The flow chart indicates the hardware framework our challenge device. The solar electricity stored in battery by way of PV is DC modern. One terminal of the bulb is hooked up to the battery for power supply. Different terminal is connecting to the cutting-edge sensor for present day reading. Breadboard is used for the complex circuit to construct. It additionally allows to construct voltage divider.

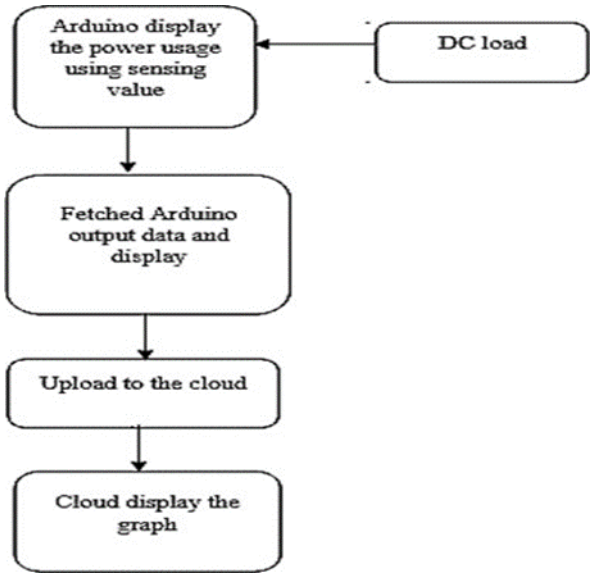

Fig.5. Flow chart

IV. Results And Discussions

The result of the system is displayed on in the form of current. In Amber, voltage in volts, power in watts and energy in watt-hours with respect to data and time. The monitoring data send to the cloud are store in a separate field. Each field displays the individual graph.

ADVANTAGES:

- Cost of production is low,
- No need to purchase heavy machinery,
- Manual assistance is not required,
- Working principle is quite easy,
- Portable,
- It is easy to construct, low cost and low maintenance.

V. Conclusion

The necessity of energy is rising every day. And traditional sources of energy are not producing enough to meet this graph. This exponential need also effects on electricity cost and human lives. Internet of things revolutionizing human lives in every field of life. Photovoltaic board is not established source of energy that may fulfill the need with energy. In this paper, an IoT based approach for monitoring the solar power consumption is presented and a prototype is developed to simulate the results.

The future work of this system is fabrication of microcontroller using ASIC concept. The number of wires can be significantly decreased by rightly if a customized PCB is built upon which all the resistors can be directly soldered. This also removes the use of a Breadboard which was utilized to make all the external connections.

The improvements of design with the current design, it can be view that the controller orbit goes round along with the board. This was over to eliminate tangling of wires. An inch, better design may be realized in which only the panel rotates and all other parts are stationery mounting of the Panels: In our design the panels are mounted on a horizontal shaft supported strongly at both ends.

We can mount the panels directly onto a motor placed at the center of the Panel-Base in order to provide East-West movement. This reduces the weight and effective cost of the system.

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