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IOT based solar panel controlling and monitoring

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ABSTRACT

Today, solar array is wide used for generation of renewable energy. It'll be simple to monitor the solar plants mounted in small plant, however it'll be difficult to monitor for large plant and also the solar plants placed on the mountainous area. So, here we tend to try to develop the system that works through web page. The use of Internet of Things Technology for monitoring and controlling the solar array on large solar power plant works effectively. Solar tracking system is the methodology to withdraw most power from solar panels. Thus we need to develop such a method which rotate solar panel consistent to daylight. ESP32 controller provides the Wi-Fi property, in order that the statusare displayed on web page.

Keywords- Solar panel,Motor, ESP32 controller, Internet of Thing(IOT)

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I. INTRODUCTION

Structural In our project, we are primarily concentrating on:

- Rotation of the solar panel with the help of motor consistent with the direction of sun light.
- To withdraw most power from solar panels.
- Controlling the load applications from web page.

IOT based solar panel monitoring system provides automatic solar power monitoring from anyplace over the web page.We tend to use ESP32 controller based system to monitor solar panel parameters. ESP32 has built-in Wi-Fi and Bluetooth module which help us to get our data or status of load connected on the web page. System perpetually monitors the solar panel and transmits the output to IOT system over the web.Using web page user can monitor the solar panel, controls the load connected to that. Also the load may be connected, disconnected to the battery. The status of the battery also displayed.

II. LITERATURE SURVEY

Author Kabalci, Ersan, AlperGorgun, and YasinKabalci [1], introduces an instant monitoring infrastructure of a renewable energy generation system that is constituted with a wind turbine and solar panel arrays.
The monitoring platform is based on current and voltage measurements of each renewable source. The related values are measured with the developed sensing circuits and processed by an 18F4450 microcontroller ofMicrochip. The coded visual interface of monitoring software can manage the saved data to analyze daily, weekly and monthly values of each measurement separately.

Nkoloma, Mayamiko, Marco Zennaro [2], and Antoine Bagula. describes recent work on the development of a wireless based remote monitoring system for renewable energy plants in Malawi.
The main goal was to develop a cost effective data acquisition system, which continuously presents remote energy yields and performance measures. The project output gives direct access, to generated electric power at the rural site through the use of wireless sensor boards and text message (SMS) transmission over cellular network.
Preliminary experimental results reveal that the performance of renewable energy systems in remote rural sites can be evaluated efficiently at low cost.

Nkoloma, Mayamiko, Marco Zennaro, and Antoine Bagula. [3] are proposes a novel monitoring, control system for achieving real time monitoring and control of a hybrid 'wind PV battery' for renewable energy system.
The proposed system constitutes a supervisory control and data acquisition (SCADA) system,which employs campus network of National Cheng Kung University integrated

with a programmable logic controller (PLC) and digital power meters.
The proposed system is capable of performing real time measurement of electrical data that can be effectively transferred to remote monitoring center using intranet.
It can be concluded from the simulated and experimental results that the proposed monitoring and control system can achieve real time supervisory controland data acquisition of remote various forms of renewable energy system.

Jiju, K., et al.[4] describes the development of an online monitoring and control system for distributed Renewable Energy Sources (RES) based on Android platform.Thismethod utilizes the Bluetooth interface of Android Tablet, as a communication link for data exchange with digital hardware of Power Conditioning Unit (PCU).

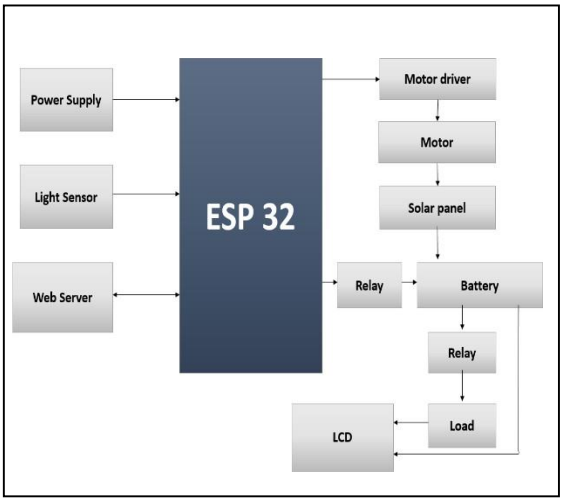
III. METHODOLOGY

[1] The LDR sensors placed on the solar panel plays the importantrole ,they will sense the solar energy from the sun and as the sensor's output is given to the controller(i.e. ESP32)and accordingly it will adjust the solar panel directing towards the sun to get maximum output using the motor.
[2] The solar panels output is approximately 18V which will charge the battery of 12V.
[3] Battery status will be indicated. Such as

1.	Charging
2.	Fully charged
3.	Discharged
4.	Load connected
5.	Load not connected

[4] Using the Wi-Fi module (which is in-build in the controller)the information such as battery status is send to the web page and LCD.

IV. BLOCK DIAGRAM



Power supply of 5v and 3.5v are designed for solar panel and for ESP32 controller respectively.

Photo conductivity is the main working principle of a light dependent resistor (LDR). They are used to sense the maximum light from sun. Two LDR are placed on the solar panel and according to the maximum output, the solar panel will rotate with the help of motor.

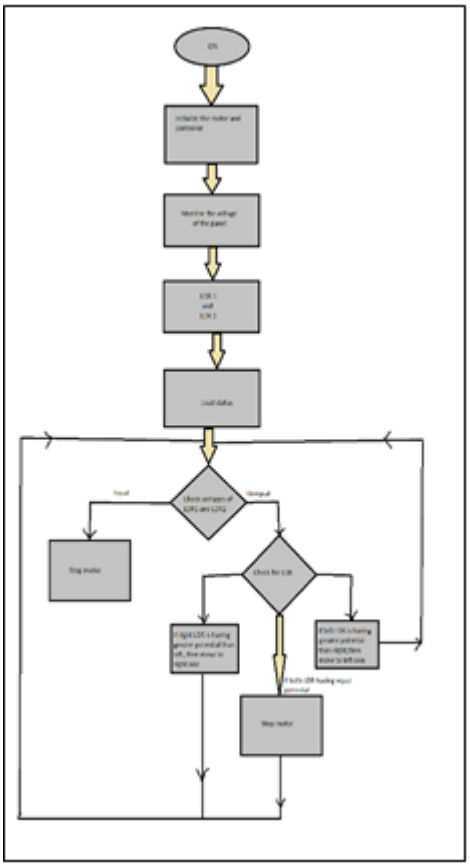
ESP32 is a single chip 2.4 GHz Wi-Fi and Bluetooth combo chip. We need Wi-Fi to display status on web server.

Solar panel converts thermal energy into electrical energy.

ESP32 controller gives commands to the motor and accordingly the solar panel will rotate to get maximum energy.

By using IOT, the all required status will be displayed on the web server.

V. WORK FLOW



VI. SOFTWARE SETUP

Arduino Integrated Development Environment (IDE) isemployed in system for transfer the code on to board.
The sensor and circuit are connected to the ESP 32 controller for communicate with them to sense current

and voltage. We tend to write the code in c programing for the sensing and calculating the power and energy.
The monitoring page displays the table contains voltage, current, power, energy values and status of the load.

VII. CONCLUSION

ESP32 controller based system to monitor solar panel parameters. Our system constantly monitors the solar panel and transmits the power output to IOT system over the internet.

The innovation in this project is, we can analyse and control the use of solar energy for domestic as well as for industrial purpose

VIII. REFERENCES

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[3]] Jump up to:"April 25, 1954: Bell Labs Demonstrates the First Practical Silicon Solar Cell". APS News. American Physical Society. 18 (4). April 2009.

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