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Dual Axis Solar Tracking System

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ABSTRACT: The demand for stable and clear forms of electricity obtained from renewable energy sources has increased in recent decades. The goal of this project is to adjust the position of a solar panel to match the movements of the sun. As the price of fossil fuels varies, renewable energy is fast gaining relevance as a source of energy. It is consequently vital for engineering and technology students to grasp and appreciate the technologies related with renewable energy at the educational level. The main aim of this proposed project is to design a low-cost monitoring system for the maximum power point tracking in photovoltaic (PV) systems. The designed monitoring board consists of an and performances evaluation. The main aim of this proposed project is to design low-cost monitoring system for the maximum power point tracking in photovoltaic (PV) systems. In addition, the monitored real time data will be sending to the concerned person's mobile app through IoT. Here LDR is use to find the light intensity of sun and makes the photovoltaic cell to turn to the respected side. Based on the monitored data the users can check easily if the system works well or not.

KEYWORDS: Solar panel, LDR, ESP32, Servo motor, Blynk app

I. INTRODUCTION

Now, these days every human being needs electrical power for their quality of life. The consumption of power is increasing everyday lives, and at the same time, other energy sources are depreciating day by day PV monitoring system is required to diagnose and maintain the performance of the installed PV system. Various commercial PV monitoring products have been introduced to track the PV system, assess its performance, and detect system problems. Those PV monitoring products monitor the PV system at inverter level or string level. They cannot localize abnormal PV panels or help repair them for high performance. Several previous studies proposed various panel-level PV monitoring schemes presented a low-cost smart multisensory architecture equipped with voltage, current, irradiance, and temperature to monitor a PV system at panel level. The acquired data at PV panels is transferred to a central server based on wireless sensor networks for continuous performance assessment. Guerriero et al. presented an innovative sensor to measure voltage and current at panel level. Additionally, a simple and easy fault detection scheme is needed to decide which PV panel is abnormal. Therefore, to meet the demand for power, other sources of power is required. For the Generation of Electricity, there can be two ways first one is from Non-Renewable Sources, and another one is Renewable Sources.

II. PROPOSED METHODOLOGY

In the Proposed system, ESP32 microcontroller is used here to interfacing with solar panel and sensors. Panel voltage is obtained by applying in voltage sensor in voltage divider circuit. The current is sensed by current sensing circuit and temperature by temperature sensor. All the data is then transmitted to remote server with the help of microcontroller which transfers the data to cloud through Internet of Things. The cloud data is retrieved by user using mobile application called Blynk. The proposed system for monitoring the solar module using IoT, helps to implement a low cost monitoring system. The parameters voltage, current and temperature are monitored by using the sensor mounted on PV panel and Power Conditioning Units (PCU). For sensing the voltage, voltage sensor is used in the methodology, we can see that the power flow of the model is explained in that the solar radiance energy. This electrical energy is then sensed by various sensors such as voltage generated by solar panel is sensed by voltage sensor for measuring voltage with the help of voltage divider principle and current produced by solar panel is measured by current sensor module and temperature or heat energy available or fall on solar panel is tracked by the temperature sensor .All collected data of voltage, current and temperature sensor is then fed to ESP 32 microcontroller which converts the signals into digital

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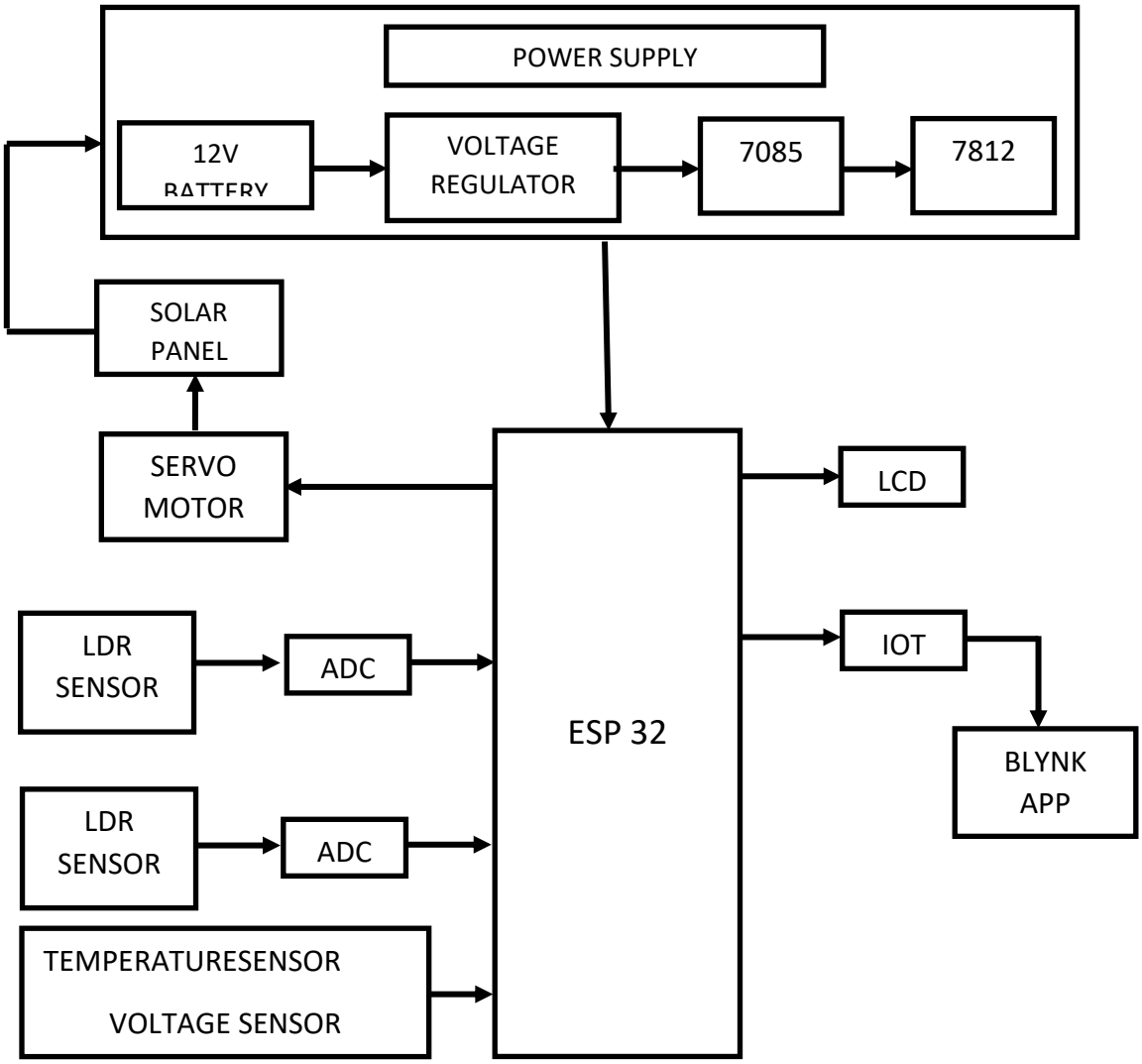
using serial interface and microcontroller unit acts as a gateway and sends this data over the cloud server and then this data is accessed via user over the thing speak mobile application. Solar tracking is a also a major feature attached with this system. Which helps to track the solar panel automatically to concerned direction. This has been done with the help of LDR. This helps to store high amount of renewable energy to the battery.



III. BLOCK DIAGRAM

It is relatively easy to understand the basics of how an LDR works without delving into complicated explanations. It is first necessary to understand that an electrical current consists of the movement of electrons within a material. An LDR or photo resistor is made any semiconductor material with a high resistance. It has a high resistance because there are very few electrons that are free and able to move - the vast majority of the electrons are locked into the crystal lattice and unable to move. Therefore in this state there is a high LDR resistance. As light falls on the semiconductor, the light photons are absorbed by the semiconductor lattice and some of their energy is transferred to the electrons. This gives some of them sufficient energy to break free from the crystal lattice so that they can then conduct electricity. This results in a lowering of the resistance of the semiconductor and hence the overall LDR resistance. The process is progressive, and as more light shines on the LDR semiconductor, so more electrons are released to conduct electricity and the resistance falls further.

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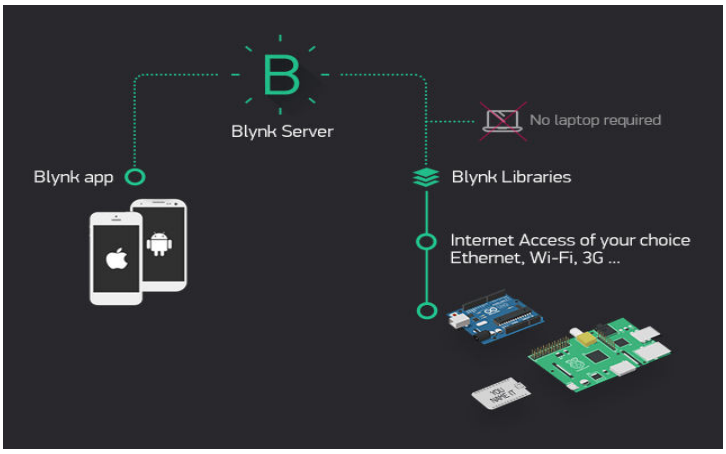
IV. BLYNK APP

Blynk was designed for the Internet of Things. It can control hardware remotely, it can display sensor data, it can store data, visualize it and do many other cool things. There are **three** major components in the platform:

Blynk App - allows to you create amazing interfaces for your projects using various widgets we provide.

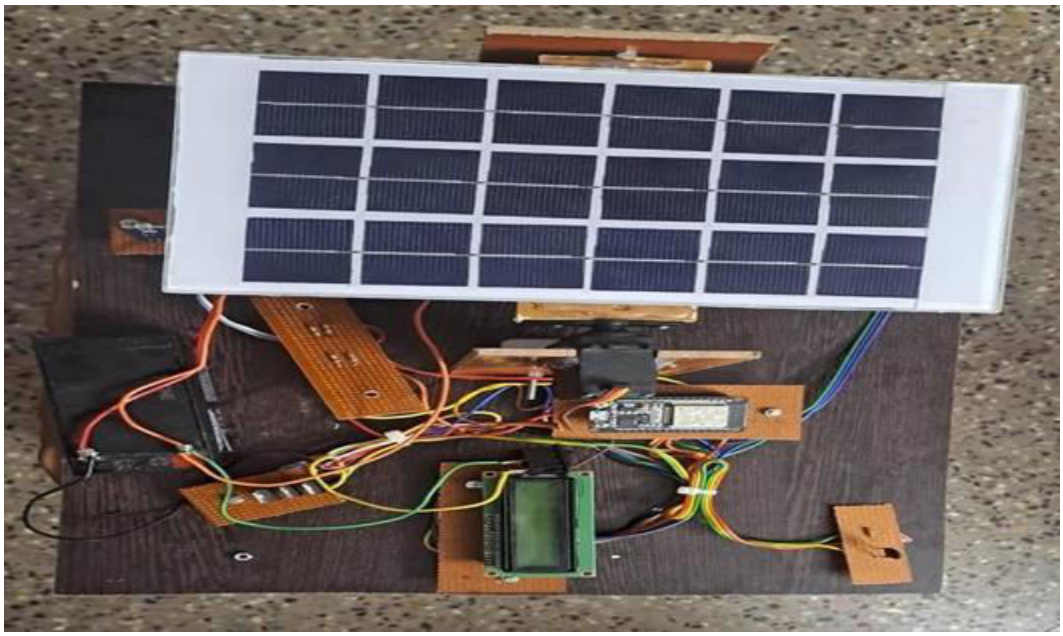
Blynk Server - responsible for all the communications between the smartphone and hardware. You can use the Blynk Cloud or run your private Blynk server locally. It's open-source, could easily handle thousands of devices and can even be launched on a Raspberry Pi.

Blynk Libraries - for all the popular hardware platforms - enable communication with the server and process all the incoming and out coming commands. Now imagine: every time you press a Button in the Blynk app, the message travels to the Blynk Cloud, where it magically finds its way to your hardware.



V. RESULT & DISCUSSION

Dual Axis Solar Tracking System



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In this Dual Axis Solar Tracker, when source light falls on the panel, the panel adjusts its position according to maximum intensity of light falling perpendicular to /it. The objective of the project is completed. This was achieved through using light sensors that are able to detect the amount of sunlight that reaches the solar panel. *The values obtained by the LDRs are compared and if there is any significant difference, there is actuation of the panel using a servo motor to the point where it is almost perpendicular to the rays of the sun. This was achieved using a system with three stages or subsystems. Each stage has its own role. The stages were; An input stage that was responsible for converting incident light to a voltage .A driver stage with the servo motor. It was responsible for actual movement of the panel. The input stage is designed with a voltage divider circuit so that it gives desired range of illumination for bright illumination conditions or when there is dim lighting. The potentiometer was adjusted to cater for such changes.
The LDRs were found to be most suitable for this project because their resistance varies with light. They are readily available and are cost effective. The microcontroller is programmed to ensure it sends a signal to the servo motor that moves in accordance with the generated error. The final stage was the driving circuitry that consisted mainly of the servo motor. The servomotor had enough torque to drive the panel. Servo motors are noise free and are affordable, making them the best choice for the project.

VI. CONCLUSION

In this project a low-cost monitoring system for maximum power tracking in a photo voltaic module is designed. The IoT technique is used in order to monitor data such as voltage, current and temperature level of solar photovoltaic system. This technology makes it possible in particular to improve the monitoring, the performance and the maintenance of the photovoltaic system. The designed system can analyses and /or check the status of parameters being measured in a photovoltaic system. Solar tracking also done successfully.

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