

Review on Remote Multiparameters Monitoring and Controlling System for Solar panel Application

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Abstract: Sun is an important source of renewable energy which plays a keen role in the management of energy. The photovoltaic panel can last for 20 years and produce 80 percent of the rated power after 20 years of use. The few reasons responsible for the damage of solar panel are manufacturing defects and inconvenience condition of the environment which directly affects the productivity of the solar system. So, to improve the performance of the solar panel it is highly recommended to monitor the parameters and the condition of the panel continuously from the remote area using IOT as on spot monitoring of panel is difficult for the person. The parameters to be monitored are radiation intensity, voltage, current, dust. But the next thing is only monitoring of the solar panel is not feasible to prevent the panel defects. We should control the system reducing the factor causing defects. One of the main environmental factors is dust which reduces the light intensity of the panel. For this, a spray is installed in the system which will be also controlled remotely to remove the dust over the panel by giving an instruction when it exceed the prescribed limit an alert message is received to the authorised person and this leads to increase the productivity and performance of the panel. Controlling feature includes turn on/shutdown of solar system when the battery gets charged this prevents the battery from damage cause due to overcharging. All the parameters are going to be uploaded to cloud using ESP32 microcontroller and displayed on the webpage or application. We can also have record and reach database of the file if required in future to look and to analyze history of renewable energy source (RES) system. Antitheft application is also induced in this system as solar panels are expensive and remotely installed the rate of stealing the panel is high so magnetic contact switch sensor is used for antitheft application.

Keywords: PV Panels, Condition Monitoring and Controlling, RES, Sensors, ESP32, Cloud, IoT

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I. Introduction

Most renewable Energy comes either directly or indirectly from the sun. The gross electricity consumption in India was 1,149 kWh per capita in the year 2017-2018. India still faces an enormous need to meet the growing demand for electricity. The international Energy Agency projects that electricity demands in India will almost triple between 2018 and 2040. The increasing demand is mostly fulfilled by nonrenewable source of energy like thermal and hydal power plants which are adversely affecting our environment producing smokes and fumes and maintenance cost is also high. Hence solar panels are highly installed in homes, buildings, industry for various commercial and industrial uses with no electricity bills. But for better performance of panel it is necessary to monitor the solar panel continuously as some of the parameter will affect the panel inversely. The dust's particles deposits on the panel will reduce the amount of radiation falling on the PV cells from the sun light causing lack in performance. To increase the effectiveness controlling the parameters is also necessary by spraying the dust away from the surface of the panel.

Present trends

- An attractive approach to screen the sun oriented power plants in the nation.
- This venture will give a superior consumer loyalty of seeing the power they are sparing from their home PCs.
- Provides the capacity to investigate their sun powered Panel, all the more particularly when the residue affidavit increments on the outside of the board causing less force radiation by siphoning the splash.
- This venture will likewise give an alarm at whatever point any steal endeavor to take the sun powered board

II. Literature Review

Constant information are put away forever and it helps in foreseeing. With this IoT innovation, alarms are appeared on the page if any PV board is influenced by any disappointment so board is secured by taking fundamental activities. Message cautions additionally given to the specific individual who are related with that particular board. The normal life expectancy of sun oriented board is 20 years and it might lessen because of any disappointment. By the above activities, life range of sun based board can be broadened. In future there is a degree for the expansion of task that adjustment of disappointments in PV cell should be possible naturally [1].

Sun based Energy estimation and checking framework was planned and actualized. Tests were done on the structured framework and the outcomes acquired exhibited the best possible usefulness of the Solar Energy Measurement System. The framework in this way effectively confirms sun powered board parameters by stopping it to the sun oriented board at the privately indicated condition. Nonetheless, it is seen that there are slight contrasts between the deliberate and the maker's qualities, yet at the same time inside a passable range (under 5%). It is suggested, for future work, that the framework be made with higher exactness sensors and furthermore be made to be able to store information gotten from the estimations in order to guarantee appropriate checking and assessment. Additionally the framework can be made to utilize a DC supply from a battery and a charging circuit can be included so as the battery can be charged, this would make the framework increasingly versatile. One of the difficulties of inadmissible execution of sun powered controlled hardware in Nigeria is the importation of unsatisfactory sun based boards which in turns offer ascent to inappropriate rating of the sun oriented boards. A portion of the gear producers are known for naming the sunlight based boards with subjective appraisals in other to sell and make benefit. Since the sunlight based fueled gear relies upon the Sun for its vitality, there is have to screen and gauge the sun oriented board parameters like voltage, current, light force and temperature. This is important to affirm if the sun based board is performing to desire and giving great readings. This work goes for building up a Solar Energy Measurement System that will help in the estimation and checking of sun powered board parameters like voltage, current, light force and temperature. The structure work is isolated into two principle parts, equipment and programming areas. The equipment includes the advancement of significant units like the power supply unit, the control unit and the sensor units of the whole undertaking by utilizing strong state electronic parts, coordinated circuits and microcontroller. The product configuration includes the improvement of a program utilizing C programming language to empower the arduino microcontroller to work and execute as wanted. The fundamental contributions to the framework are the sensor units. They sense the required variable that will be estimated and the deliberate qualities are then shown. The outcomes got from the showcase unit are then contrasted and the producer's qualities that are found on the sun powered board. It is seen that there are slight contrasts between the deliberate and the maker's qualities, yet at the same time inside a middle of the road run (under 5%) [2].

The structure was viably executed using Raspberry Pi and sensors. The most outrageous partition estimated by the ultrasonic sensor is 187 centimeters while the base detachment is 13 centimeters. The development sensor perceives the proximity of a living being through the IR bars transmitted. In the midst of the day the most diminished estimation of the LDR security is 3.57 K ω , which identifies with high light power. Despite the fact that in the midst of the night time the LDR insurance rose upto 233.41 K ω which showed a low power of light. Light, movement and separation are the fundamental and most significant parameters. In this way estimation of such parameters is an essential errand in numerous frameworks. Traditional strategy incorporates human assessment which is non-precise, non-solid and moderate procedure. Along these lines so as to improve the frameworks unwavering quality, precision a framework which does not require human interference and can continue in any conditions is created in this investigation. The Raspberry Pi is interfaced with light sensor (LDR), movement sensor (PIR) and separation sensor (Ultrasonic) so as to frame a framework [3].

In this paper, we displayed general engineering of sun powered plant and sun oriented plant observing framework, Issues at sunlight based plants, Techniques utilized for sun based plant checking and Research patterns. This audit is helpful for growing new framework for remote sun based plant checking framework. The review of the sun powered boards on an occasional premise is critical to improve life span and guarantee execution of the nearby planetary group. To get the most sun based capability of the photovoltaic (PV) framework is conceivable through a smart checking controlling framework. The checking controlling framework has quickly expanded its prevalence as a result of its easy to use graphical interface for information securing, observing, controlling and estimations. So as to screen the execution of the framework particularly for sustainable power source application, for example, sun oriented photovoltaic (PV), information securing frameworks had been utilized to gather every one of the information with respect to the introduced framework. In this paper we have given a survey on sun oriented plant checking framework in that we have secured engineering of sun based plant, Issues at sun based plants, Techniques that are utilized for observing sun powered plants [4].

Lab VIEW gives simple apparatuses to structure any kind of graphical interface that is simple justifiable for everybody. The NI Lab VIEW Interface for Arduino Toolkit empowers to utilize minimal effort and viable equipment like Arduino with Lab VIEW along these lines utilization of costly DAQs has been maintained a strategic distance from . This paper examined proficient technique for controlling and checking sun oriented board control from remote territories utilizing Arduino, NI Lab VIEW and Web program. GUI is intended to give intelligent graphical interface to server just as for client for observing age and utilization of intensity. Usage of this proposed model will profit as far as insurance, task, checking and support of universes. This paper proposes a successful and productive graphical UI (GUI) to constant control and screens the DC control created by sun oriented boards and DC control devoured by burden locally and remotely. There are two GUIs given server and customer. Server PC should be introduced close to sun oriented boards for observing and controlling locally while customer GUI can be gotten to by utilizing an internet browser from any piece of world, approve individual can screen and control all activities. Server and customer GUI are planned by utilizing Lab VIEW and Lab VIEW UI manufacturer while equipment is created with Arduino Uno, current and voltage sensors, transfers and charge controller. Checking interface utilizes ongoing estimation results to set up the power, current and voltage diagrams, it is likewise conceivable to record and achieve database document to examine history of sustainable power source (RES) framework. This will likewise expand execution of the current nearby planetary group additionally other elective assets of vitality. In this framework checking interface contains control generation and utilization, voltage and current charts and meters on a GUI. Controlling element incorporates turn on/shutdown of close planetary system, increment or lessening vitality utilization, age and changing to other accessible framework [5].

Results demonstrate the framework functions as depicted in square outline in figure 6. It is a decent propose to oversee two distinctive vitality creating sources and defeat their disadvantages. It is additionally conceivable to have multiple kinds of inexhaustible sources, since the framework has more I/O ports and transfers left to control in excess of two power supplies from the equivalent or timid sort or source. Result results demonstrate that heap keeps stimulated at unequaled, half breed framework are reasonable for applications where having a steady vitality source is obligatory and there isn't access to the matrix, for example, some rustic medicinal offices, correspondence establishments, shrewd and self-supportable structures or when reinforcement frameworks are required. The utilization of perfect and sustainable power sources has turned into a matter of concentrate since mid 80s. The sunlight based plants and wind-turbines have introduced a huge development in electrical power age and cogeneration; be that as it may, their principle disadvantage, for example, no sun based power age is accomplished amid obscurity or no wind vitality age when wind speed is higher than rotor can deal with. This work introduces a half and half framework, which join two power creating frameworks, wind turbines and sun based boards, to spare vitality in batteries and conquer the principle issues these two frameworks appear. This shrewd propose can switch between both creating frameworks to keep up a consistent vitality generation and keep longer battery life. Plus, an utilization observing record is accomplished to consider the heap conduct [6].

An online electronic checking framework is structured and executed for sunlight based PV board execution testing. The exhibited framework is described by straightforwardness and simple utilizing. The executed framework is dealing with estimating the dimensions of numerous physical parameters; light force, dust thickness, surrounding temperature and moistness. These parameters are influencing exclusively emphatically or contrarily on the board adequacy which thought about the yield intensity of the board. The adequacy of the board is investigated concerning every parameter independently. The drawn bends mirrored that a few parameters influence emphatically though the impact of the other is negative on the yield control. Picked up power from the photovoltaic sunlight based board is a primary factor mirrors the board execution. This factor is influenced by numerous parameters. Residue thickness, light force just as encompassing temperature have direct impact on the board execution. The point of this paper is to examine the impact of the referenced parameters on board adequacy through planning and actualizing a straightforward and simple utilize electronic observing framework. The framework offers persistent observing and estimating to the referenced parameters notwithstanding the yield intensity of the sun oriented board. The gathered records are reflecting and affirming the coordinating of the changing in the natural parameters as for the gathered power. The records are speaking to a viable reference of work states of sun based boards in the GCC district. Framework plan and usage notwithstanding the gathered records, investigation and end are exhibited in this paper [7].

III. Proposed Work

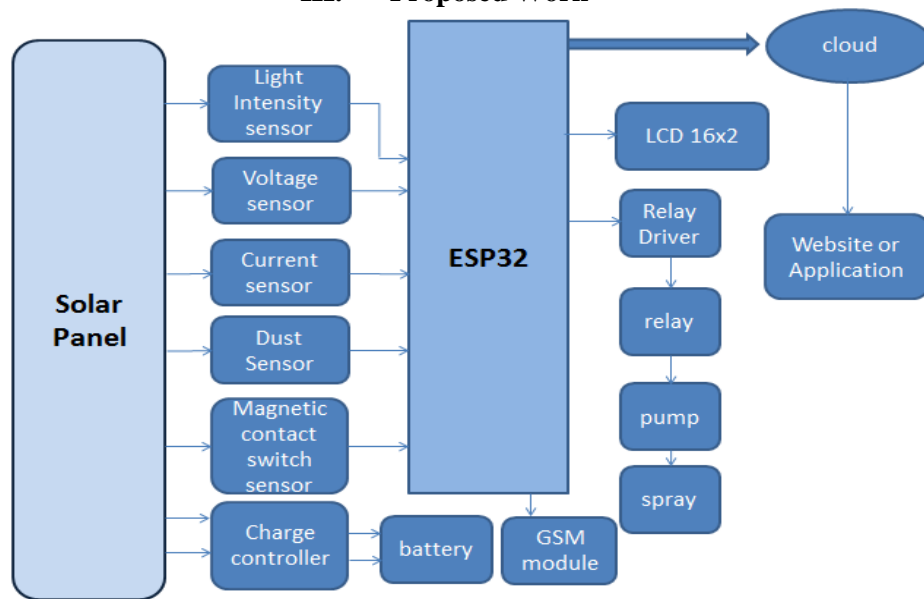


Fig. Block Diagram of System

In this project, the present system measures multi parameters continuously, such as voltage, current, intensity, dust and will be monitored on website or application. Each parameter is measured separately through the related sensor, and the collected records will be saved in excel data sheet. We are using ESP32 microcontroller board for solar panel monitoring and controlling. For that various sensors are mounted on the panel like light intensity sensor for exact calculations that is to detect light intensity. Next is voltage sensor, is going to determine and even monitor and measure the voltage supply. It is then able to take that measurement and turn them into a signal that one will then be able to read. Another sensor is the current sensor which will measure the current of the panel. Dust sensor is also mounted on the solar panel which will give a good indication of the air quality in an environment by measuring dust concentration over the surface of the panel. Another one is magnetic contact switch sensor which is used for an antitheft application. If someone cut any wire or tries to steal any components or solar panel then a message is going to be sending to the panel operator for which GSM module is used. Through solar panel a battery can be charged, between which a charge controller is mounted so that if the battery get fully charged then the supply to the battery will be automatically terminated which will prevent the battery from damage. All the reading of the above discussed sensor will be monitored in an website or application through cloud by using a wifi module and LCD 16x2 for on spot monitoring if any error occurs in internet for online monitoring and if the dust particles increases a particular level then an indication will be given to the operator and by giving a command the operator will switch ON the spray by using relay driver, relay and the panel surface will get cleaned again.

IV. Conclusion

Observed the ongoing information remotely with some controlling application through IoT. With this IoT innovation, alarms message will be given to the approved individual who are related with explicit board and in the event that any PV panel is influenced by residue, at that point it will be evacuated by showering. For antitheft, sensor is introduced which will caution the security. The normal life expectancy of sun oriented board is 20 years and it might lessen due to above disappointment. By the above activities, life expectancy of sun based board can be reached out alongside increment in security.

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