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IOT BASED DUST&OVER HEAT DETECTION SYSTEM OF PV MODULE

ANBUMANI.P1, DHIWICSHEN.M2, GOKUL.S3, GOKULNATH.S4
1 ASSISTANT PROFESSOR 2,3,4 UG SCHOLAR
COMPUTER SCIENCE ENGINEERING
V.S.B ENGINEERING COLLEGE, KARUR, TAMILNADU, INDIA

ABSTRACT

Energy is one of the major issues that the world is facing in India, the force of energy has been one of the major problems for both civic and pastoral homes. About 60 to 70 of the energy demand of the country is met by fuelwood and husbandry remainders. Solar energy is a renewable source of energy, which has a great eventuality and it's radiated by the sun. The solar PV modules are generally employed in fine surroundings which are the case tropical countries like India. The dust gets accumulated on the frontal face of the module and blocks the incident light from the sun. It reduces the power generation capacity of the module. The power affair reduces as important as by 50 if the module isn't gutted for a month. The cleaning system has been designed cleans the module by controlling the PIC microcontroller programming. To remove the dust in the PV modules to perfecting the power effectiveness. The water will be scattered on the solar panel, which is over hotted. The solar panel is measured with help of temperature detector.

Keywords: Solar energy, Sensor, positive voltage and Controller

1. INTRODUCTION

The use of solar PV panels is adding in the present days due to the ever adding energy demands, cost of energy and non-vacuity of nonstop power force in the energy system. Now a days wide variety of appliances grounded on solar PV is adding in the request at moderate prices videlicet, solar lanterns, solar heaters, boasters, coolers or suckers, networking instruments, net metering etc. The trend in using the solar PV is still anticipated increase in the near future as the exploration and choice of accoutrements is going on and could lead to solar power shops to induce sufficient electricity for the original and indigenous requirements. Considering the structure of the solar PV panel, it consists of transparent glass pane on its top which traps the solar radiations and reflects the radiations into the panel but if glass translucency gets
affected by physical means also the immersion rate reduces and leads to reduced conversion effectiveness(1),(2). drawing of solar panels after the installation on the roof of the house, assiduity, shops is veritably delicate as dust patches don't allow the solar radiations to enter in the panel duly performing reduced conversion effectiveness of the panel leading to increased charging duration of batteries. Because of the over said effect there's a need for the proper conservation and cleaning of solar panels to keep working efficiently. The cleaning of solar panel by using conventional styles like, vacuum cleaning or primer wipe/ cleaning is not easy and in some cases not doable because of typical underpinning and mechanisms. The accumulated dust forms a subcaste on the panel due to which the solar radiations cannot reach duly into the PV panel receiver indeed though sufficient exposure to the sun is made performing an hamstrung conversion. In this regard, electrostatic precipitator(ESP) conforming of fixed electrodes can be used to remove the dust patches accumulated.

The ESP is placed on the sides of the panel and the PV panel is mounted with weight detector which regularly senses the dust consistence in terms of change in weight of the , also the snap micro regulator signal the ESP to

start separating the dust and collect at appreciatively charged electrode for the final disposal, If the weight of dust goes further than the predefined value. In the ESP, the first electrode is charged to a veritably high negative voltage as the dirt patches move to the vicinity acquire negative charge and the alternate electrode charged to high positive voltage to attract the negatively charged dust patches. The dust patches which are accumulated at the appreciatively charged electrode are farther disposed by wobbling medium or a necessary brushing medium or gutted manually.

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However, also the Arduino micro regulator signal the ESP to start separating the dust and collect at appreciatively charged electrode for the final disposal, If the weight of dust goes further than the predefined value. In the ESP, the first electrode is charged to a veritably high negative voltage as the dirt patches move to the vicinity acquire negative charge and the alternate electrode charged to high positive voltage to attract the negatively charged dust patches. The dust patches which are accumulated at the appreciatively charged electrode are farther disposed by wobbling medium or a necessary brushing medium or gutted manually.

There's a demand of perfecting the effectiveness of solar power generation in diligence moment. The maximum effectiveness of a large solar panel is over to 32. This effectiveness drops down drastically due to dust accumulation, unwanted accoutrements, atmospheric conditions etc. Current solar panels setups suffer a major power loss when unwanted inhibition covers the face of the aero plane. The inhibition turns the shadowed cell into a resistor, causing it to heat up and consume redundant power. To address this issue, we've successfully finagled an automatic cleaning of the solar panel. Our medium to combat the power loss laterally performing into effectiveness loss is unique, tone- reliant and easy to use. In this design we use a solar panel on which a cleaning medium is placed which cleans the panel with a slicking fluid and wiper medium. Motor is involved for make the movement of the wiper where power is supplied by the battery to run this as well as the motor to pump the fluid on to the panel. The calibrated voltage of the battery connected to the solar panel will integrated to a TV to display the voltage and integrated through IOT to read and cover the battery charging wirelessly also. The microcontroller tackle is involved which formerly programmed makes the cleaning process readily, duration wise and need not bear any homemade backing towards it.

2. PROBLEMS WITH SOLAR GENERATION AND ITS SOLUTION

Solar energy is veritably utmost promising unborn power generation energy resource. still, there are numerous problems associated with its use; the main problem is that it's dilute source of energy. Indeed, in the hottest regions on the earth, the solar radiations flux available infrequently exceeds 1 KW/ m, which is a low value for technological application. Problem associated with the use of solar energy is that its vacuity

varies extensively with time and place. The variation in vacuity occurs daily because of the day night cycle and also seasonally because of the earth's route around the sun and due to irradiance in temperature due to changing atmospheric conditions. lately, exploration and development of low cost flat panel solar panel, thin film bias, concentrators systems and numerous further invention generalities have increase. In the future, the cost of small solar modular unit and small mongrel solar & wind or solar & hydro power shops will be economically doable for large scale product and use of solar energy. In this paper we've presented the photovoltaic solar panel operation. The foremost way to increase the effectiveness of a solar panel is by using

A mechanical solar shadowing system which tracks the sun from east to west for maximum point of light intensity.

Use of maximum power point shamus (MPPT) which is an electronic device regulates the affair to get maximum effectiveness. To amend these above problems, the solar panel should be similar that it always receives maximum intensity of light.

For being solar panels, which are without any control systems typical position of effectiveness varies from 10 to 4- a position that should ameliorate measurably if the present interest continues. For mechanical shadowing system we've named a single axis mechanical shadowing system using a bipolar stepper motor for our design. In addition, we tried to design the system by using an algorithm of named MPPT system which is undo and Observe system and apply it by using a DC- DC convertor and we've named Buck- Boost motor.

3. OBJECTIVE

Dust accumulation on solar panels can significantly reduce their power affair. To ameliorate solar panel effectiveness with help of dust detector.
We give wireless solar panel condition monitoring system that measures electrical parameters of all of the solar panel collectively and also it monitors the condition of solar panel continuously using IoT module. Avoiding solar panel overheat using robotization cooling system.
This micro-controller grounded system is also cost-effective Solar Photovoltaic(PV) System Components. A PV system factors incorporate PV modules (groups of PV cells), which are generally called PV panels; one or further batteries; a charge controller or regulator for a stage-alone system; an inverter to covert solar power from direct current(DC) to the interspersing current(AC) of the mileage grid- connected system; wiring; and mounting tackle or a frame. The individual solar cells are grouped in a PV module, and the modules are also assembled together in a cluster. Some of the arrays are put on special shadowing widgets to follow sun throughout the day and ameliorate solar effectiveness. Being methodology includes a lot of inquiries in the sphere of solar power.

Remote monitoring of solar power inverter (An operation of IoT)

Solar energy analytics using internet of effects

Smart power monitoring and control system through Iot using pall data storehouse

operation of solar power in micro grids using iot grounded reliable control

Design and development of a remote monitoring and maintenance of solar factory administrative system

Solar powered green house monitoring and controlling using AWS pall by android operation.

Improving monitoring and fault discovery of solar panels using arduino mega in WSN This system is dependent on installing WSN bumps with some needful detectors for more generally occurring faults on forty-five solar panels set on the roof of IT faculty.

An intelligent solar energy harvesting system for wireless detector networks.

Design and optimization of photovoltaic solar energy in a small tamed establishment.

4. LITERATURE SURVEY

Agbetuyi Ayoade Felix et al proposed "Design and Implementation of a Solar Energy Measurement and Monitoring System" Conferences on, 2018.

The Being system necessary to confirm if the solar panel is performing to anticipation and giving good readings. This work aims at developing a Solar Energy Measurement System that will prop in the dimension and monitoring of solar panel parameters like voltage, current, light intensity and temperature. The design work is divided into two main corridors, tackle and software sections. The tackle involves the development of major units like the power force unit, the control unit and the detector units of the entire design by using solid state electronic factors, integrated circuits and microcontroller. The software design involves the development of a program using C programming language to enable the arduino microcontroller to serve and perform as asked. The introductory inputs to the system are the detector units. They smell the

needed variable that's to be measured and the measured values are also displayed. The results attained from the display unit are also compared with the manufacturer's values that are set up on the solar panel. It's observed that there are slight differences between the measured and the manufacturer's values, but still within a tolerable range (lower than 5).

D Saravanan Felix et al proposed "Monitoring of Solar Panel Based On IOT" Conferences on, 2019.

Being system On adding in the operation of the power and over mining from the earth wealth makes so hamstrung to use the power. similar that monitoring of the solar panel regards to the sun's direction with effective gain of energy. Consumption and application of electric energy increases statistically. Hence that for effective use of this energy solar power is used with solar shadowing and monitoring. In utmost being system shadowing of solar energy is defined by photovoltaic cell, adruino, jeer- pi as with IOT module which makes further cost as well as further power consumption. But in this system we define to use low range of detectors along with stepper motor to define high outturn.

Preeti Kagale et al proposed "Development and Testing of IoT based Monitoring Interface for Solar Box Cooker" Conferences on, 2020.

Being system presents development and testing of an IoT grounded monitoring operation for Solar Box Cooker. Arduino UNO, ESP8266 Wifi module and Android app are connived with solar box cooker to make it not only smart but also stoner friendly. The android app, developed for smart phones, not only monitors the food cuisine time but also indicates completion of cuisine process to the stoner. The advanced device is tested on a solar box cooker at Basaveshwar Engineering College(Autonomous) Bagalkot, Karnataka state, India. The proposed monitoring unit can be effectively used to save conventional energy coffers.

Peerawoot Rattanawichai et al proposed "Monitoring System of Smart Cassava Farm with Solar Energy by Using Internet of Things" Conferences on, 2021.

The Being system of this exploration we studied the watering and not soddening of cassava. For watering, we used a monitoring solar smart agrarian ranch to manage solar energy that harvests from sun by polysilicon solar cells about 8 panels for operating the water pump 2hp that enough for factory ranch with low cost of the system. The factor that has affected the growth rate of cassava we used numerous detectors for detecting similar as soil humidity senor time-sphere reflectometry(TDR) at depth 10 cm and 20 cm, moisture detector, and temperature detector(DHT22). The factor that has affected to light- harvesting of the solar panel we used numerous detectors for detecting similar as BGT-JYZ2 solar radiation detector, current detector, and voltage detector by PZEM- 017 anthology communicate. The capacity of battery we use PZEM- 017 anthology communicate for monitoring of battery voltage for prognosticate battery percent. All detectors have connected with Esp8266, and it'll shoot the data to NETPIE pall for keeping the data in the system and show on mobile phones in real- time. The demand for water for crops ranch is maximum in May about,000 L and many in April about,800 L with water drop head about,400. The product of cassava that got from used this monitoring system provides storehouse root number normal about 9 per factory, weigh average about 9 kg per factory. For not soddening give storehouse root number normal of about 6 per factory with 4 kg per factory.

Thohidul Islam et al proposed "IoT Based Solar System Monitoring and Load Management for Small Farm" Conferences on, 2021.

This paper represents the operation of IOT in small scale business (flesh- ranch) covering the renewable solar energy and controlling the power consumption associated with grid and renewable energy source. The data of power product and consumption will be covered by using IoT grounded voltage and current detector which will be recorded in real time. All information is available through the Sinric pro pall garçon and displayed on mobile bias and by assaying, stoner will be suitable to manage the cargo. Also, arrangement will be made via relay according to the situation. For this exploration, PV cell, solar charge regulator, battery, inverter, bus transfer switch(ATS), voltage and current detector, NodeMCU 12E, relay module and Sinric pro app were used. The result shows that the use of IoT with voltage and current detectors improves the smart ranch model as a volition and green energy source. This will grease real- time monitoring in addition to literal ranch analysis.

5. SYSTEM DESIGN

5.1 EXISTING SYSTEM

We propose to model the solar discovery problem in a machine learning setup grounded on labeled data, e.g., supervised literacy. still, the challenge for utmost serviceability is limited markers or markers on only one type of druggies. Thus, we design new semi-supervised literacy and one- class bracket styles grounded on auto encoders, which greatly ameliorate the nonlinear data representation of mortal geste and solar gets. The proposed styles have been tested and validated not only on synthetic data grounded on an intimately available data set but also on real-world data from mileage mates. The numerical results show robust discovery delicacy, laying down the foundation for managing distributed energy coffers in distribution grids.

5.2 PROPOSED SYSTEM

The automated cleaning system for PV modules is developed considering the dust discovery or over heat monitoring fashion and the cleaning medium. The proposed abstract system in this work is to cover the state of a photovoltaic system through an IoT grounded network in order to control it ever. The information from the detectors is transmitted via the mobile radio network. The starting with the seeing subcaste at bottom which comprises of voltage detectors and other detectors, this subcaste also includes microcontroller grounded data processing of data acquired from the detectors. The microcontroller communicates with wireless module to initiate and transmit data to garçon and also the network subcaste where data logging from the factory for real time processing is done which includes database for storehouse. The dust detector is used to measure the dust position as well as temperature detector is used to smell the panel overheats. A Microcontroller is used to read the analog value of dust detector as well as temperature detector value and convert it to digital via Analog to Digital Convertor(ADC) that's bedded inside it. Grounded on dust position and temperature range, the snap regulator will activate the water pump as well as drawing medium motor ON which is connected to the snap(16F877A) microcontroller via control with circuit of the ULN 2003 motor motorist. The software perpetration was written in Bedded C and uploaded to a microcontroller using an IDE handed by microchip.

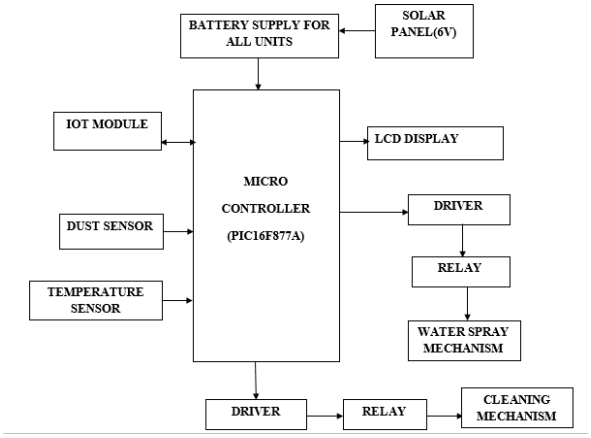

FIG: 1 BLOCK DIAGRAM

6.1 HARDWARE DESCRIPTION

Solar panel
PIC microcontroller (16F877A)
IOT Module
Temperature sensor
Dust sensor
Water pump
DC motor
Relay
LCD display
Battery

6.2 SOFTWARE REQUIREMNTS

MP LAB IDE Software
ARDUINO IDE – ATMEGA 328P Module programming software

7. RESULTS

Solar Energy converts heat from the sun into electricity, either directly making use of Photovoltaic(PV) or Compressed Solar Panel(CSP). It's a clean green electricity which is the Earth's most available source of energy. Solar energy is the future of power generation due to its renewability nature. It has gained a wide acceptance across the world. numerous exploration workshop is going on to harness the maximum power from sun, but many of the main hindrances in employing maximum power are dust accumulation on solar panels and air pollution, which cuts solar cell energy affair by over 25- 40 in some portions of globe in which one among tropical countries like India. Since our Indian government has set an ambitious target of installation of grid connected rooftop solar photovoltaic design with the capacity of 40GW out of the total target of 175GW of renewable energy capacity over the coming five times by 2022, it's also our responsibility to be as a part in achieving nation's target. This proposed paper

describes the perpetration of a Smart Solar panel cleaning system with primary focus on making use of Internet of effects(IoT) technology. This enables dust monitoring capability, advanced analysis and system control which prompts to increase the total effectiveness of the solar PV panel. Dust Monitoring System Dust Sensor is a simple air monitoring module with onboard Sharp GP2Y1010AU0F. It's able of detecting fine flyspeck larger than0.8 µm in periphery, indeed like the cigarette bank. Analog voltage affair of the detector is direct with dust viscosity. The dust settled over the face of solar panel diminishes the solar radiation reaching the PV module. therefore, there's a loss in power generated. The temperature LM35 series are perfection integrated- circuit temperature bias with an affair voltage linearly-commensurable to the Centigrade temperature on solar panel glass. The low- affair impedance, direct affair, and precise essential estimation of the LM35 device makes interfacing to readout or control circuitry especially easy. Hence this subsystem would be detecting the presence of dust patches or panel over heat impacting on power generation from solar PV panels and proceeds with the turning on of water pump. This subsystem involves operations like dust seeing and water pumping. Cayenne is an IoT platform which can control outfit ever, it can show detector information and also shows the solar panel voltage as well as battery voltage position, and it can store information and do multitudinous different effects. There are three noteworthy corridors in the stage cayenne operation, cayenne Garçon and cayenne Libraries. Cayenne App permits to make interfaces for gambles exercising different contraptions to cover the detector voltage with graphical representation with date and time. Cayenne Garçon is in charge of the considerable number of underpasses between the cell phone and outfit. Either Cayenne Cloud can be employed or private Cayenne garçon can be run locally. Its open source, could without important of a stretch handle a great numerous widget. Cayenne Libraries empower commerce with the garçon and process all the approaching and out coming instructions.

The detectors measure their separate parameters which would be uploaded to the pall. The needed operations are performed further and streamlined. These data could be penetrated at any point of time from stoner through mobile operation. The stoner can turn water pump on or off through mobile operation ever from anywhere within its range.

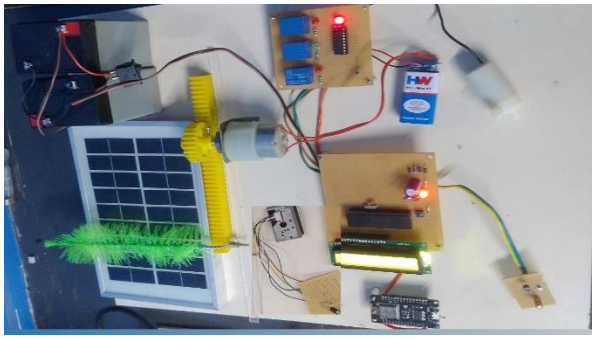

FIG 2. SOLAR PANEL COMPLETE DESIGN

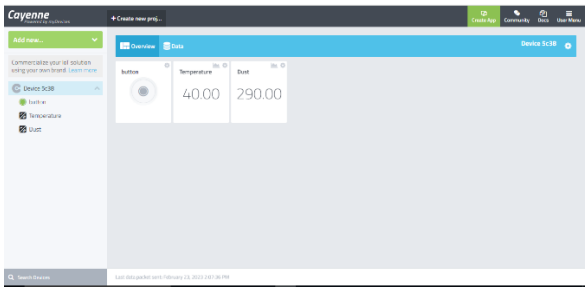

FIG 3. CAYENNE APP PAGE

FIG 4. DUST SENSOR GRAPH

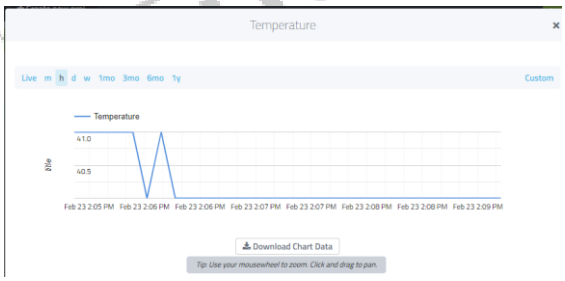

FIG 5. TEMPERATURE SENSOR GRAPH

8. CONCLUSION

By using this system, the solar shamus can be triumphant in sustaining a solar array at a vertical angle to the sun. In future, downfall detectors could be maneuvered to keep the system active during raining. either, in henceforth, when conventional energy may not be sufficient for us, there will be a number of manipulating non-conventional energy source. By using this straightforward figure, it is doable for a single person to make the contrivance themselves.

9. REFERENCES

[1] D. L. Donaldson and D. Jayaweera, "Effective solar prosumer identification using net smart meter data," Int. J. Elect. Power Energy Syst., vol. 118, 2020, Art. no. 105823.

[2] M. C. Di Piazza, A. Ragusa, and G. Vitale, "Identification of photovoltaic array model parameters by robust linear regression methods," in Proc. Int. Conf. Renewable Energies Power Qual., 2009, pp. 143–149.

[3] V. Schwarzer and R. Ghorbani, "Transient over-voltage mitigation and its prevention in secondary distribution networks with high PV-to-load ratio," Hawai'i Natural Energy Inst., Tech. Rep., HNEI-02-15, Feb. 2015, Accessed: Aug. 2020.

[4] KHON2, "HECO customers asked to disconnect unauthorized PV systems," Youtube, Accessed: Nov. 2021. [Online]. Available: https://www.
youtube.com/watch?v=cx3UwhlUJkQ

[5] Z. Chi et al., "Research on the impacts of grid-connected distributed photovoltaic on load characteristics of regional power system," in Proc. Int. Conf. Green Energy Appl., 2017, pp. 95–99.

[6] D. Cheng, B. A. Mather, R. Seguin, J. Hambrick, and R. P. Broadwater, "Photovoltaic (PV) impact assessment for very high penetration levels," IEEE J. Photovolt., vol. 6, no. 1, pp. 295–300, Jan. 2016.

[7] A. Argüello, J. D. Lara, J. D. Rojas, and G. Valverde, "Impact of rooftop PV integration in distribution systems considering socioeconomic factors," IEEE Syst. J., vol. 12, no. 4, pp. 3531–3542, Dec. 2018.

[8] H. Tribak and Y. Zaz, "Remote solar panels identification based on patterns localization," in Proc. Int. Renewable Sustain. Energy Conf., 2018, pp. 1–5.

[9] S. Lee, K. E. An, B. D. Jeon, K. Y. Cho, S. J. Lee, and D. Seo, "Detecting faulty solar panels based on thermal image processing," in Proc. IEEE Int. Conf. Consum. Electron., 2018, pp. 1–2.

[10] K. Liao and J. Lu, "Using matlab real-time image analysis for solar panel fault detection with UAV," J. Phys., Conf. Ser., vol. 1509, 2020, Art. no. 0 12010.