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# IOT based Fault Detection System in Solar Power plant

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**ABSTRACT:** Using the Internet of Things Technology for supervising solar photovoltaic power generation can greatly enhance the performance, monitoring and maintenance of the plant. With advancement of technologies the cost of renewable energy equipment's is going down globally encouraging large scale solar photovoltaic installations. This massive scale of solar photovoltaic deployment requires sophisticated systems for automation of the plant monitoring remotely using web based interfaces as majority of them are installed in inaccessible locations and thus unable to be monitored from a dedicated location. The discussion in this paper is based on implementation of new cost-effective methodology based on IoT to remotely monitor a solar photovoltaic plant for performance evaluation. This will facilitate preventive maintenance, fault detection, historical analysis of the plant in addition to real time monitoring.

**KEYWORDS:** Internet of things (IoT), solar panel, ATMEGA, voltage sensor

## I. INTRODUCTION

The “things” of the real world shall integrate into the virtual world, enabling anytime, anywhere connectivity. The number of everyday physical objects and devices connected to the Internet was around 12.5 billion in 2015. The number of values expected to double to 25 billion in 2025 as the number of more smart devices per person increases, as far as to a further 50 billion by 2030. The Web of Things vision to successfully emerge, the computing criterion will need to go beyond traditional mobile computing scenarios that use smart phones and portables, and evolve into connecting everyday existing objects and embedding intelligence into our environment. A huge amount of users in internet makes IoT (Internet Of Things) easier and smarter to implement communications quickly [1].

IoT means storing all those related things since early days solar energy are in use and also human believe that solar energy provides energy for future. Solar panel consists of more number of solar PV cells for energy consumption and reuse during this process if there may be any fault occurrence in solar PV cells that tend to entire system to failure so detecting those cells to work in an normal way the monitoring process is done. The main aim of this project is based on implementation of new cost-effective methodology based on IoT to remotely monitor a solar photovoltaic plant for performance evaluation [2].

This will facilitate preventive maintenance, fault detection, historical analysis of the plant in addition to real time monitoring. The main aim of this project is to monitor the status of the solar photovoltaic system like voltage, current, light intensity and power values and send those parameters to the Thing Speak IOT platform via Esp8266 WiFi Module. The visualization of the collected data in the control station has been done using website ThingSpeak IOT. To manually determine what system measurement value is suitable for appliance users, the user must use a multimeter, which is challenging for the larger System. The main goal of a PV monitoring system is to provide an affordable option that continuously displays remote energy yields and its performance on a computer or through a smart phone. To test the suggested system, a 10-watt solar module was used to measure the string voltage, string current, temperature, and irradiance. A sophisticated Wi-Fi capable ESP8266 microcontroller with a modern integrated ARM CPU is used to create this PV monitoring system. It interfaces with the Blynk application and uploads data to a cloud platform. A graphical user interface allows the user to view the current, past, and average values of parameters including voltage, current, temperature, and sunlight [3][4].

Paper is organized as follows. Section II describes automatic text detection using morphological operations, connected component analysis and set of selection or rejection criteria. The flow diagram represents the step of the algorithm.

After detection of text, how text region is filled using an Inpainting technique that is given in Section III. Section IV presents experimental results showing results of images tested. Finally, Section V presents conclusion.

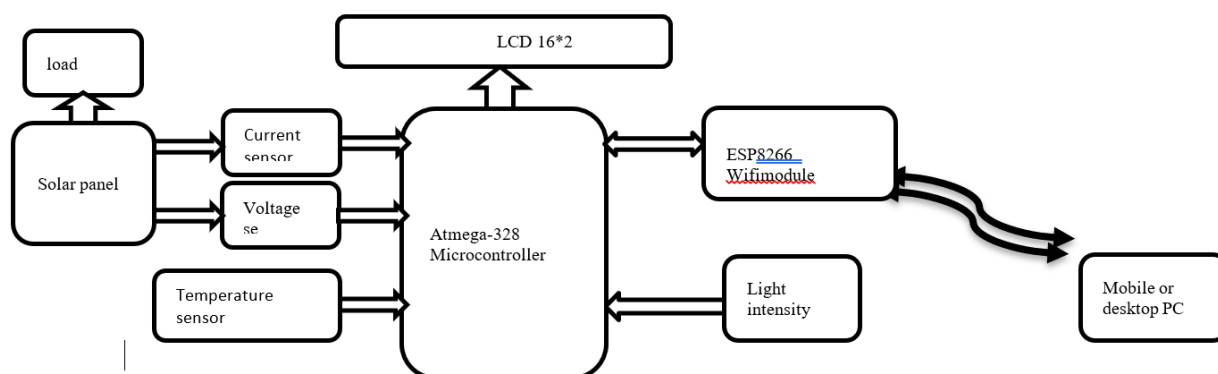
## II. RELATED WORK

The concept of image inpainting was first introduced by Bertamio et al.[1].The method was inspired by the real inpainting process of artists.The image smoothness information interpolated by the image Laplacian is propagated along the isophotes directions, which are estimated by the gradient of the image rotated by 90 degrees.Exemplar Based method proposed by Criminisi et al. [2] used a best exemplar patch to propagate target patch including missing pixels. This technique uses an approach which combine structure propagation with texture synthesis and hence produced very good results. In [3], the authors decompose the image into sum of two functions and then reconstruct each function separately with structure and texture filling-in algorithms. Morphological technique is used to extract text from the images presented in [4]. In [5], the inpainting technique is combined with the techniques of finding text in images and a simple algorithm that links them. The technique is insensitive to noise, skew and text orientation. The authors in [6] have applied the CCL (connected component labelling) to detect the text and fast marching algorithm is used for Inpainting[5], [6].

## III. METHODOLOGY

### Proposed System

In the proposed system, we are using the ESP8266 Wi-Fi Module, through which we are sending the parameters of the solar photovoltaic cell to the predefined web page ThingSpeak IOT. Then the user can monitor the status from anywhere in the world by just login into the web page. To do this we are using the Atmega8 microcontroller.



### Working

The block diagram of IoT based solar monitoring system is shown in Fig This illustrates the outline of our proposed work. Poly Crystalline silicon of 10-watt solar panel is used for a monitoring system.The voltage and current sensors are used to measure the respective voltage and current from the panel. The temperature sensor is placed on the solar PV module to measure the current temperature which greatly affects the efficiency of the solar panel. The Microcontroller plays a pivotal role in handling the measured data for processing and forwards the data to the cloud platform through Wi-Fi module for concurrent observation and decision making

**3.1 SOLAR PANEL (20W)** -In these projects we use 20 w solar panel to measure current, voltage and temperature. The electricity generated by capturing the sunlight is called as solar energy which is use for industrial purposes and in domestic purpose also. These solar panel plays a very crucial role in these setups. It is the main organ of these project.

**3.2 NODE-MCU ESP8266-** The NODE-MCU act as a key processing element in these proposed systems which is developed by ESP8266 it is a one sort of microcontroller on single board that can be programmed using the NODE IDE. Having a operated voltage of 3.3 to 5 volts and it has inbuilt wife module system in it.

3.3 VOLTAGE(10.1V) AND CURRENT SENSOR(5A) As 5 A is a current power sensor which gives the total power consumed by the load and gives respective reading .in digital form to NODE-MCU ESP 8266 .NODE-MCU ESP 8266 is with loaded programing help us to calculate the exact reading of current and voltage of connected inductive load .

3.4 TEMPERATURE SENSOR (NTC) Negative temperature Coefficient (NTC)p/n 1600-10k works by translating temperature into resistance with Resistance decreasing as temperature increases .It has maximum temperature upto-150

3.5. WI-FI MODULE All the calculated data from NODE-MCU ESP 8266 is further processed to Wi-Fi module .These Wi-Fi module store the information in IoT server or Cloud .In order to analyze the data on daily monthly and weakly basic.

#### ADVANTAGES

1. Real time monitoring
2. Simplicity of the system.
3. Accuracy of the system
4. Emergency alerts when parameters exceed their threshold values

#### Application

1. It is used for agricultural or Green House security systems.
2. Useful for Weather monitoring systems.
3. Useful in solar power plant monitoring system.

#### Future scope

In future, instead of the Atmega8 microcontroller, we will use the raspberry pi 4 board. The raspberry pi 4 has in-built WI-FI module. So, there is no need of external Wi-Fi module.

#### IV. CONCLUSION

These methods have continues tracking of solar energy weekly, monthly and daily basis. The analysis became simpler and more convenient and economically additional. Non-conventional energy which can be endlessly relished by process.As this system keeps continues track of solar power plant, the daily weekly and monthly analysis becomes easy and efficient also with the help of this analysis it is possible to detect any fault occurred within power plant as the generated power may show some inconsistency in data of Solar power plant.

#### REFERENCES

- [1] V. Kavitha and V. Malathi, "A Smart Solar PV Monitoring System Using IoT," pp. 19–33, 2019, doi: 10.5121/csit.2019.91502.
- [2] S. Madadi, "A Study of Solar Power Monitoring System Using Internet of Things ( IOT )," *Int. J. Innov. Sci. Res. Technol.*, vol. 6, no. 5, pp. 347–350, 2021.
- [3] R. L. R. L. Babu, D. Rambabu, A. Rajesh Naidu, R. D. Prasad, and P. Gopi Krishna, "IoT enabled solar power monitoring system," *Int. J. Eng. Technol.*, vol. 7, no. 3.12 Special Issue 12, pp. 526–530, 2018, doi: 10.14419/ijet.v7i3.12.16172.
- [4] S. Patil, M. Vijayalashmi, and R. Tapaskar, "SOLAR ENERGY MONITORING SYSTEM USING IoT," *Indian J.Sci.Res*, vol. 15, no. 2, pp. 149–155, 2017, [Online]. Available: [https://www.ijsr.in/upload/1455558654Chapter\\_26.pdf%0Ahttps://www.mendeley.com/catalogue/solar-energy-monitoring-system-using-iot/](https://www.ijsr.in/upload/1455558654Chapter_26.pdf%0Ahttps://www.mendeley.com/catalogue/solar-energy-monitoring-system-using-iot/).
- [5] P. Sekar, P. Sabde, and G. Patil, "IoT-based Solar Energy Monitoring," *Int. Res. J. Eng. Technol.*, no. June, pp. 1905–1908, 2022, [Online]. Available: [www.irjet.net](http://www.irjet.net).
- [6] A. B. -Dinesh Kumar Sahu, "IRJET- A Review on Solar Monitoring System," *Irjet*, vol. 8, no. 1, pp. 111–113, 2021.



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