INTERNATIONAL JOURNAL OF ADVANCED INNOVATIVE TECHNOLOGY IN ENGINEERING

Published by Global Advanced Research Publication House Journal

Home page: www.ijaite.co.in

IoT Based Smart agriculture system with Solar monitoring : A Review

[1]Prof. Jayshree Gorakh, [2]Prof. Priyanka Chikhale, [3]Pratiksha Bele, [4]Grishma Shengole

[1,2,3,4]Computer Science and Engineering, Suryodaya College of Engineering & Technology, Nagpur, Maharashtra, India

[1] jayuborkar.coet@gmail.com, [2]priyankachikle0@gmail.com,

[3]pratikshabele14@gmail.com, [4]grishmashengole736@gmail.com

Article History

Received on: 05 May 2023

Revised on: 25 May 2023

Accepted on: 02 June 2023

Keywords: IOT, Smart farming, solar monitoring, ESP32

e-ISSN: 2455-6491

DOI:

Production and hosted by
www.garph.org

©2021|All right reserved.

ABSTRACT

The increasing demand for food production to feed the growing global population has led to the adoption of new technologies in agriculture. The Internet of Things (IoT) and solar power monitoring are two such technologies that have the potential to revolutionize agriculture by increasing efficiency, reducing costs, and improving yields. In this project, we propose an IoT-based smart agriculture system with solar power monitoring. The system will consist of various sensors and modules that will be used to monitor the soil moisture, temperature, humidity, and other environmental factors. The system will also include a solar power monitoring module that will measure the power generated by the solar panels used to power the system. The data collected by these sensors will be sent to a adafruit IO or Arduino IOT cloud (an IoT platform), where it will be stored and visualize. The system will be designed to be low-cost, easy to install, and operate, making it accessible to small-scale farmers. The use of solar power will also make the system more sustainable and reduce the dependence on traditional power sources. This project aims to demonstrate the potential of IoT and solar power monitoring in agriculture and to provide a roadmap for future research and development in this area.

1. INTRODUCTION

The agriculture industry has been rapidly adopting new technologies to improve crop yields, reduce costs, and increase efficiency. The Internet of Things (IoT) has emerged as a promising technology in this domain, offering the ability to monitor and control various aspects of the agricultural process. One such application is the development of an IoT-based smart agriculture system that uses sensors and actuators to monitor and regulate environmental factors such as temperature, humidity, soil moisture, and light intensity.

In this project, we have designed an IoT-based smart agriculture system that utilizes temperature and soil moisture sensors to monitor the environmental conditions of a farm. We have also included a 3V water pump that can used as a load. The system is used 12V solar panel, and we have incorporated current and voltage sensors to monitor the power generated by the solar panel. The data from the sensors is sent to an ESP32 microcontroller, which processes the data and send it to the IoT platform.

Additionally, we have included a light intensity sensor to measure the amount of sunlight received by the crops. The solar panel is used to charge a 3.7V li-ion battery, which can be used as a backup power source for the water pump. The system is designed to be low-cost, easy to install, and operate, making it accessible to small-scale use The goal of this project is to demonstrate the potential of IoT and solar power monitoring in agriculture and to provide a roadmap for future research and development in this area. The use of IoT technology can provide farmers with real-time information about the environmental conditions of their farms, enabling them to make data-driven decisions and optimize crop yields. Additionally, the use of solar power can reduce dependence on traditional power sources and make agriculture more sustainable.

2. LITERATURE REVIEW

[1]In developing countries, solar-powered systems are being favoured over other alternative energy sources due to their durability and potential for long-term economic benefits. Specifically, solar-powered water pumping systems may be the most suitable solution for rural areas without access to the grid and with high levels of solar radiation.

The proposed automated irrigation system is controlled by solar power. Sensors gather information about the water level in fields and transmit it to both the microcontroller and the farmer. The farmer can remotely turn the motor on and off based on the water level using a cell phone. If the water level reaches a dangerous level, the motor will start automatically to ensure that the field has sufficient water.

[2] This work aims to improve farming by using IoT technology for automation. By monitoring and controlling factors like water and humidity levels, the proposed system can increase productivity. It uses sensors, such as a humidity sensor, to address common farming problems. A Wi-Fi module is also included to send real-time data to users and alert them of any unwanted activity. The system is powered by a solar panel and has been tested under different environmental conditions, with the sensors performing well. This system is able to control the water pump based on the moisture of soil also this system also send the intensity of light, temperature , humidity to the user through the internet. For powering the system it uses a solar panel

[3] Smart agriculture is a new farming method that uses modern technology, such as wireless communication, IoT, and sensors, to monitor crops and land accurately. It can improve efficiency and increase output while reducing stress on farmers. This paper presents a solar-powered smart agriculture monitoring system with IoT devices and sensors. The system provides real-time data on soil moisture, water level, humidity, temperature, and crop conditions, accessible via smartphone. Our team believes this system will establish a trademark in the future of smart agriculture.

[4] The Internet of Things (IoT) is a growing technology that collects sensor data through embedded systems and uploads it to the internet. It connects internet-enabled devices and generates actionable data. Farming in India is still using old techniques and does not conserve resources.
The project proposes a cost-efficient technology that uses temperature, moisture, humidity, and pH sensors to monitor crops. The centralized control unit regulates the flow of water based on real-time data. This increases farm efficiency by providing the right amount of water. The Arduino NodeMCU is used to make irrigation decisions.

[5] Smart agriculture is a new idea that uses sensors to gather data about agricultural fields and take actions based on user input.
This project aims to use IoT and automation technology to develop a system that monitors temperature, water level, moisture, and movement in the field using an Arduino UNO board. As technology evolves, the hardware and software need to be updated and tested to ensure that changes work correctly and don't cause issues in other parts of the system.

[6] Technology can be very helpful in agriculture. When starting a new farm, it's important to know about the soil in order to grow crops successfully and avoid financial loss.
This project explains how to use sensors to monitor the soil. The sensors can measure important soil parameters like temperature, moisture, light, humidity, and pH value. The information collected by the sensors is sent to the cloud through a device called Raspberry pi. This information is then sent to user’s mobile phones or laptops. By analyzing this information, we can figure out which crops are suitable for the specific soil. This technology helps farmers to know the exact parameters of the soil, making soil testing easier.

The architecture of IoT Smart soler farming system

Farm-side:

Temperature sensor: measures the temperature of the soil and surrounding environment to provide information about the growing conditions.

Soil moisture sensor: measures the moisture content of the soil, which is critical for plant growth and helps farmers determine when to water their crops.
Water pump: a 3V water pump is used to deliver water to the crops

Solar Panel Side:

Current sensor: measures the electrical current flowing through the solar panel to provide information about how much energy is being produced.

Voltage sensor: measures the electrical voltage output of the solar panel to provide information about how well the solar panel is performing.

Light intensity sensor: measures the amount of light hitting the solar panel to provide information about the conditions that affect its performance.

Light intensity sensor: measures the amount of light hitting the solar panel to provide information about the conditions that affect its performance.

Power Source:
12V solar panel: It provides power to the system and charges a 3.7V li-ion battery that is used to store energy for powering the water pump.

3.7V li-ion cells: Two 3.7V li-ion cells are used to power the microcontroller and other sensors, and they are not charged by the solar panel we have only add one 3.7V li-ion cell for storing the charge of solar panel.

The ESP32 microcontroller is a powerful and versatile device that serves as the brain of the system. It is equipped with dual-core Tensilica LX6 microprocessors that can run up to 240MHz, providing high processing power and efficiency. It also features integrated Wi-Fi and Bluetooth capabilities, which allow for wireless communication with other devices and the internet. Additionally, the ESP32 has a wide range of peripheral interfaces, including ADCs, DACs, UARTs, SPI, I2C, and more, which make it compatible with various sensors and other components.

The microcontroller is responsible for receiving data from the various sensors, processing it, and controlling the water pump through a relay. It is also programmed to monitor the battery levels and ensure that they are within safe limits. The ESP32 microcontroller plays a critical role in the overall functioning of the system, providing real-time data analysis and control.

Visualization layer:
Adafruit IO is a cloud-based platform that provides easy and secure ways to collect, store, and visualize data from sensors and other internet-enabled devices. It is an open-source platform that is designed to help developers, makers, and hobbyists to connect their devices to the internet and easily collect and analyze data.
We'll sending temperature, humidity, intensity, voltage, current and power reading to adafruit IO platform and then user can see this visualization and information from anywhere in real time.

CONCLUSION

In conclusion, the system we have developed for smart agriculture using IoT technology and automation can provide valuable information to farmers regarding the conditions of their crops and soil. By using various sensors such as temperature sensors, soil moisture sensors, light intensity sensors, and current and voltage sensors, the system can monitor the important parameters of the soil and the environment. This information is then sent to the ESP32 microcontroller, which processes the data and sends it to the Adafruit IO platform for visualization.

REFERENCES

[1] Rumane Sanket,Sabne Mayuresh , Salve Sahil, Sahane Jaykrishna,Mr.G.D. Katale "Solar Based Smart Agriculture System Using IoT Technology" International Journal ofAdvanced Research in Science, Communication and Technology (IJARSCT) Volume 6, Issue 1, June 2021

[2] Anita Shukla and Ankit Jain, "Smart Automated Farming System using IOT and Solar Panel" Science and technology journal Volume 7, issue 2 , july 2019

[3] Rupayan Dirghangi, Arindam Roy, Aditya Routh, Subhomoy Das, Sujoy Dutta, Surajit Basak "Solar Powered Smart Agriculture System Using WSN Via IoT" International Research Journal of Engineering and Technology (IRJET) Volume 10, Issue: 01, Jan 2023

[4] M. Manoj Venkata Sai, K. Subba Rao, N. Vamsi Krishna, M. Vasantha Lakshmi,"IoT Based Smart Agriculture" Iconic Research and Engineering Journals (IRE) Volume 1,Issue 8

[5] Ritika Srivastava, Vandana Sharma, Vishal Jaiswal, Sumit Raj "A Research Paper On Smart Agriculture Using IoT´ International Research Journal of Engineering and Technology (IRJET) , Volume: 07, Issue: 07 ,July 2020

[6] Akshay Badhe, Sandeep Kharadkar, Rushikesh Ware, Pratik Kamble, Prof. Shilpa Chavan, "IOT Based Smart Agriculture And Soil Nutrient Detection System" International Journal on Future Revolution in Computer Science & Communication Engineering , Volume 4, Issue 4