IOT BASED SMART AGRICULTURE MONITORING SYSTEM

Muntimadugu Bhavya Sree[1], Sugali Gowri[2], Sannakki Haripriya[3], Devarinti Indhu[4], S.Siva Sankar[5]

[5]Guide
Department Of Cse
Tadipatri Engineering College,
Tadipatri.

Abstract:
A popular branch of pc science, the Internet of Things (IoT) is bringing smart farming to each agricultural region, enabling progressive inexperienced farming. IoT is taking form by using constructing a sequence of components. Effective implementation helps in agriculture, decreasing human exertions, increasing crop production and monitoring rainfall, soil moisture, animal detection or even fireplace detection.

Keywords: Solar Panel, Temperature, Agriculture, Smart Irrigation, Rain fall, Soil moisture.

I.INTRODUCTION

One of the most crucial elements of human existence is agriculture, which serves as the primary source of food. Sadly, the majority of farmers in our country practice conventional farming methods, which can be a cumbersome process for gathering data manually related to soil and crops. This issue can be addressed by adopting modern agricultural practices. The agriculture sector plays a significant role in the nation's economic development, making it essential to incorporate advanced technologies such as IoT, automation, etc., into agriculture, which can significantly enhance crop yields and aid in economic growth. The adoption of automation in farming leads to efficient monitoring of crop health without the need for human intervention in the fields. The Internet of Things refers to the network of physical devices equipped with sensors, software, and electronic components like microcontrollers, as sensors and microcontrollers cannot connect to the internet directly. Crop productivity relies on a good irrigation system and environmental conditions such as temperature and humidity. IoT technology is employed to gather data regarding conditions such as weather, rainfall, humidity, temperature, and soil moisture. Wireless sensor networks are utilized to monitor farm conditions, and microcontrollers are employed to control and automate farm operations while allowing remote observation of conditions through images and videos; wireless cameras are used for this purpose. A smartphone enables farmers to stay informed about their agricultural land's ongoing conditions using IoT at any time and from any location around the globe. IoT technology can reduce costs and increase the efficiency of traditional farming practices. Utilizing cloud services and creating a graphical user interface will make effective monitoring very straightforward. Farmers do not need to grasp the concept of data usage; the GUI will facilitate making accurate decisions.

II.RELATED WORK

One of the most important steps in the software development process is the literature review. Determining the time component, cost savings, and commercial business robustness is essential before expanding the gadget. After these are satisfied, the next stage is to identify the language and operating device that can be utilized to expand the device. Programmers require a lot of outside assistance once they begin building a device. This assistance can be obtained via websites, books, or senior programmers. The aforementioned issues are taken into account when constructing the system in order to expand the suggested device.

Examining and reviewing all of the challenge improvement's needs is the core function of the assignment improvement department. Literature evaluation is the most crucial stage in the software development process for any task. Prior to expanding the equipment and associated layout, time considerations, resource requirements, labor, economics, and organizational electricity must be identified and examined. The next phase is to determine the operating system needed for the project, the software program specifications of the particular computer, and any software that needs to be carried on after those factors have been met and thoroughly investigated. A step similar to expanding their tools and related capabilities.

The accessibility of daylight changes every day because of the day-night cycle and furthermore changes occasionally because of the World's circle around the Sun. The total populace is developing quickly consistently and energy request is additionally expanding as needs be. Oil and coal, two of the world's main energy sources, are in danger of running out in the coming decades. [1]. IoT advances were utilized in this review to follow sun based energy. Data can be collected and sent wirelessly without human intervention in the Internet of Things (IoT). In far off regions where sun powered energy is bountiful, this IoT-based innovation is appropriate [2]. The importance of solar energy as a source of renewable energy is growing rapidly. Following the sun permits you to produce more sun oriented energy in light of the fact that the sun powered charger can keep a profile opposite to the sun's beams. Albeit the underlying expense of introducing a sun oriented global positioning framework is high, this article gives a less expensive arrangement. [3].

Silicon mono crystalline particles not only have a perfect lattice structure, a high level of material purity, low grain boundary energy, low internal resistance, and high efficiency, but they also have a uniform color and no flaws, which makes them look good. The system's efficiency can be improved by positioning solar panels at precise angles and in the direction of the sun's movement. [4]. This article presents the plan and execution of a biaxial sun based tracker that permits an introduced photovoltaic board to catch most extreme sun powered energy during the day. This gadget tracks the azimuth and rise points of the sun as it gets across the sky to situate the photovoltaic board opposite to the sun for all time. [5]. To generate maximum power throughout the day, this project uses an Arduino Uno platform to implement a dual-axis solar photovoltaic (SPV) tracking system. [6].

For the Windows platform, a solar tracking system with live Internet of Things (IoT) data is being studied. A method for creating a dual-axis tracking system is described in detail in this article. In addition, the design, implementation diagrams, and suitable software suite for the Arduino Mega 2560 microcontroller are presented in this study. [7]. Sun oriented power is a type of environmentally friendly power created from sunlight based chargers. Nonetheless, since sun powered chargers are by and large fixed, they don't necessarily in all cases match the place of the sun, which changes over the course of the day. This can diminish energy creation. [8].

Sun oriented trackers can incredibly expand the proficiency of photovoltaic (PV) frameworks for energy creation, the most encouraging type of sustainable power. A double pivot sun oriented tracker is proposed here to show the proficiency of sun powered trackers [9]. Sun based energy is a clean, effectively open and normally plentiful elective energy. There are many benefits of involving this energy for power creation. [10].

III.EXISTING SYSTEM

Our country's foundation is agriculture. In the past, farmers would make educated guesses about the soil's fertility and determine what kind of crop to plant. They were unaware of the moisture content, water level, and weather conditions, which are the things that scare farmers the most. They apply pesticides based on presumptions, and if those presumptions are incorrect, the crop may suffer greatly. The final stage of the crop, which the farmer depends on, determines productivity.

Disadvantages:

- Productivity could be higher or lower.
- Because pollution is steadily rising, we are unable to predict the weather.

REQUIREMENT ANALYSIS

Evaluation of the Rationale and Feasibility of the Proposed System

Use integrated sensors to monitor temperature, humidity, and soil moisture in real time. Create a system that uses machine learning approaches to identify plant diseases. Make agricultural data accessible from a distance using cloud-based technologies. Send out automated notifications and suggestions to improve crop management. Make sure the solution is scalable and affordable for widespread use.

IoT technology is used to gather data regarding environmental factors that are conducive to the growth of different microorganisms and the development of crop diseases, such as soil moisture, air temperature, and humidity. Farmers are encouraged by IoT to connect their farms from any location at any time. Wireless network-connected sensors are used to monitor farm conditions, and microcontrollers are utilized to automate and regulate farm operations so that conditions may be viewed remotely. Using IoT, a smartphone enables farmers to stay informed about the ongoing state of their land at any time and from any location in the world. IoT technology can improve traditional farming's productivity and lessen its difficulties. Farmers have real-time access to the information, which helps them identify the diseases that are caused by the favourable environmental conditions. As a result, farmers can promptly take the necessary actions to protect their crops from additional disease-related harm.

IV.PROPOSED SYSTEM

The system is made up of a solar panel that uses a power supply module to power the complete structure. The main controller, which interfaces with several sensors and modules, is the ESP32 development board. To keep an eye on environmental conditions, it gets data from a temperature and humidity sensor (DHT22) and a soil moisture sensor. Additionally, the board manages a relay module that uses sensor data to drive a motor. For remote monitoring and analysis, the gathered data is sent over Wi-Fi to a Thing Speak server and shown on an LCD display. Effective real-time data monitoring and automation are made possible by this IoT-based configuration in applications like smart agriculture.

Advantages:

- Gives thorough insights into every stage of crop growth, facilitating accurate crop management.
- Machine learning models for disease detection.
- Cloud-based platform for real-time agricultural data.

SYSTEM ARCHITECTURE

The description of the overall traits of the software is linked to the definition of the requirements and the established order of a high degree of the gadget. During architectural design, numerous web pages and their relationships are described and designed. Key software components are defined and decomposed into processing modules and conceptual records systems, and relationships between modules are described. The proposed system defines the following modules.

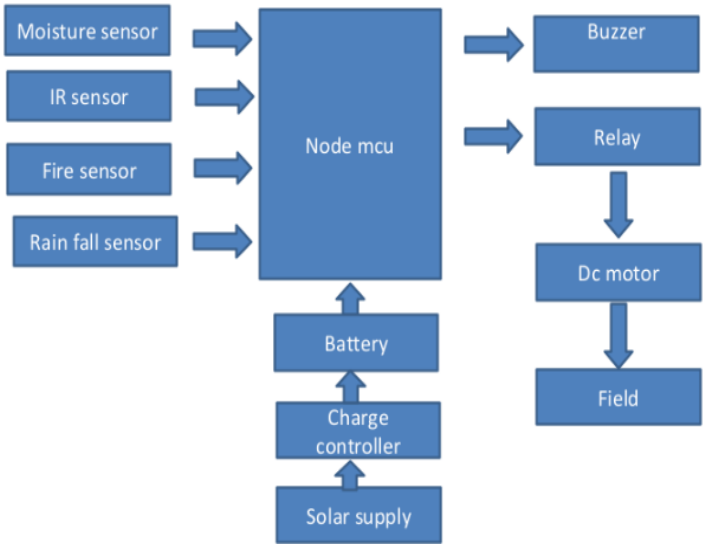

Fig 1: System Architecture.

V.SYSTEM MODULES

- Solar panel
- Soil moisture sensor
- Relay module
- Lcd display
- Wi-Fi module
- Temperature sensor

Modules Description

1. Solar Panel:

Devices that capture solar radiation and transform it into heat or power are called solar panels. In reality, a solar panel is a group of solar (or photovoltaic) cells that work together to produce electricity via the photovoltaic effect. Photovoltaics, another name for solar panels, are devices that use sunlight to gather energy from the Sun and transform it into electrical power for homes and businesses. These panels can be used to supply power in isolated areas or to augment the electricity in a building.

2. Soil Moisture Sensor:

The amount of water in the soil is measured or estimated by soil moisture sensors. Both stationary and movable sensors, including handheld probes, are possible. While portable soil moisture probes can test soil moisture at many places, stationary sensors are positioned at specific locations and depths in the field.

3. Relay Module:

Relay modules are switching devices, which are circuits that need low-power impulses to function. It makes it possible for a circuit with a low power supply to control or turn on a circuit with a high power supply without integrating the two circuits or electrical appliances.

4. Lcd Display Module:

The LCD module is a device that combines LCD displays, video connections, and signal output devices. The term "LCD display module" describes the modular parts that are put together by putting together the integrated circuit, backlight, driving circuit, liquid crystal display panel, and other relevant parts.

5. WIFI module:

Data transmission and reception over Wi-Fi are accomplished by Wi-Fi modules or Wi-Fi microcontrollers. Additionally, they are able to receive commands via Wi-Fi. Device-to-device communication is accomplished by Wi-Fi modules. The Internet of Things is where they are most frequently utilized.

6. DHT 11 sensor:

A simple and incredibly affordable digital temperature and humidity sensor is the DHT11. It measures the ambient air using a thermistor and a capacitive humidity sensor before emitting a digital signal on the data pin (no analog input pins are required).

VI.CONCLUSION

Regularly checking on the health of the plants will enable farmers to boost output on a huge scale with little work. In terms of plant health, the cloud technology will provide farmers with a suitable environment. The IoT-based Crop Health Monitoring System is an embedded system based on the Internet of Things that has the capability to monitor the crop's health efficiently and provide the information to the agriculture professionals to strengthen the agriculture sector by e-Agriculture or Agriculture Informatics. If the crop's health is continuously monitored, the crop in farms can be yielded very efficiently. Therefore, the project suggests integrating the newest technology into the agricultural sector to convert conventional irrigation techniques into contemporary ones, making cropping simple, effective, and affordable. A certain amount of automation is implemented, enabling the idea of employing cloud services to monitor the industry and, consequently, the crop conditions over great distances. Sensors that are configured to operate automatically are used to start the benefits, such as labour and water savings. This idea of modernizing agriculture is straightforward, practical, and reasonably priced.

REFERENCES:

[1] Bhagwan Deen Verma, Anurag Gour, and Dr. Mukesh Pandey, "A Review Paper on Solar Tracking System for Photovoltaic Power Plant," Int. J. Eng. Res., vol. V9, no. 02, pp. 160166, 2020, doi: 10.17577/ijertv9is020103.

[2] J. Rani, N. R, and S. B, "Solar Tracking System," SSRN Electron. J., no. May, 2022, doi: 10.2139/ssrn.4032309.

[3] S. Racharla and K. Rajan, "Solar tracking system–a review," Int. J. Sustain. Eng., vol. 10, no. 2, pp. 72–81, 2017, doi: 10.1080/19397038.2016.1267816.

[4] M. T. A. Khan, S. M. S. Tanzil, R. Rahman, and S. M. S. Alam, "Design and construction of an automatic solar tracking system," ICECE 2010 - 6th Int. Conf. Electr. Comput. Eng., no. December, pp. 326–329, 2010, doi: 10.1109/ICELCE.2010.5700694.

[5] G. R. Chandra, S. P. Howji, M. V Sumadeepthi, and K. E. Vignesh, "Sun Tracking Solar Panel," Int. J. Res. Adv. Dev., vol. ISSN, no. 6, pp. 2581–4451, 2023.

[6] G. Prinsloo and R. Dobson, Solar Tracking - sun position, sun tracking, sun following. 2015.

[7] S. Racharla and K. Rajan, "Solar tracking system–a review," Int. J. Sustain. Eng., vol. 10, no. 2, pp. 72–81, 2017, doi: 10.1080/19397038.2016.1267816.

[8] Balaji Bhanu, Raghava Rao, J.V.N. Ramesh, and Mohammed Ali Hussain, "Agriculture Field Monitoring and Analysis using Wireless for improving Crop Production", 2014 Eleventh International Conference on Wireless and Optical Communications Networks(WOCN).

[9] LIU Dan, Cao Xin, Huang Chongwei, JI Liang Liang, "Intelligent agent greenhouse environment monitoring system based on IOT technology",2015 International Conference on Intelligent Transportation, Big Data &Smart City.

[10] Joseph Haule, Kisangiri Michael, "Deployment of wireless sensor networks (WSN) in automated irrigation management and scheduling systems: a review", Science, Computing and Telecommunications (PACT), 2014, Pan African Conference.

[11] S. Vijayakumar, J. Nelson Rosario, "Preliminary Design for Crop Monitoring Involving Water and Fertilizer Conservation Using Wireless Sensor Networks", Communication Software and Networks (ICCSN),2011 IEEE 3rd International Conference.

[12] G. Nisha, J.Megala, "Wireless Sensor Network Based Automated Irrigation and Crop Field Monitoring System", 2014 Sixth International Conference on Advanced Computing (IcoAC).

[13] Meng Ji-Hua, Wu Bing-fang, Li Qiang-zi, "A Global Crop Growth Monitoring System Based on Remote Sensing", 2006 IEEE International Symposium on Geoscience and Remote Sensing.

[14] Alan Mainwaring, Joseph Polastre, Robert Szewczyk, David Culler John Anderson, "Wireless Sensor Networks for Habitat Monitoring" International Conference.

[15] Lei Xiao, Lejiang Guo, "The Realization of Precision Agriculture Monitoring System Based on Wireless Sensor Network", 2010International Conference on Computer and Communication Technologies in Agriculture Engineering.

.