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A Survey Paper on IoTAgroFlow Advancing Agriculture with Smart Monitoring and Irrigation Systems

Dr. Umesh B. Pawar[1], Prof. Daund Ramesh P.[2], Prof. Ravindra Pandit B.[3], Ms.Mayuri R.Bagul[4]
Professor and Head, Department of Computer Engineering[1]
PG Coordinator & System Admin, Department of Computer Engineering[2]
Asst. Professor, Department of Computer Engineering[3]
PG Computer Engineering Student, Department of Computer Engineering[4]
SND College of Engineering & Research Center, Yeola, Nashik, Maharashtra, India
umesh.pawar@sndcoe.ac.in, ramesh.daund@sndcoe.ac.in, ravindra.pandit@sndcoe.ac.in, mrb.codes20@gmail.com

Abstract: *Precipitation and climate change have fluctuated over the past ten years. As a result, a large number of Indian farmers have recently embraced climate-smart farming practices known as "smart agriculture." Among the most significant uses of IOT is smart agriculture. This boosts yield while wasting less water and fertilizer. Smart agriculture refers to the application of Internet of Things (IoT)-based automated and controlled information technology. IOT is widely used in all wireless communication environments and is growing quickly. Based on the actual circumstances of the agricultural system, this project studied and investigated the integration of IOT technology, sensor technology, and wireless networks. soil temperature, relative humidity, and pH are measured by temperature, humidity, and pH sensors. a hybrid strategy combining wireless and Internet connectivity.*

Keywords: Temperature Sensor, Humidity Sensor, IOT, PH Sensor, Agricultural, Environmenrt

I. INTRODUCTION

Since ancient times, agriculture has been practiced in every nation. Plant growth is the science and art of agriculture. One of the main causes of the rise of sedentary human civilization was agriculture. Hand labor has always been used in agriculture. It is imperative that agriculture adapt to the new technologies and applications that the world is moving toward. The Internet of Things is crucial to smart agriculture. Information about agricultural sectors can be obtained through IOT sensors. We developed an automated IOT-based smart farming system. Wireless sensor networks are used by this Internet of Things (IoT)-based agricultural monitoring system to gather data from sensors at different nodes and transmit it via a wireless protocol. Arduino powers this Internet of Things (IoT) smart agriculture system.

II. BACKGROUND

Since ancient times, agriculture has been practiced in every nation. Plant growth is the science and art of agriculture. One of the main causes of the rise of sedentary human civilization was agriculture. Hand labor has always been used in agriculture. It is imperative that agriculture adapt to the new technologies and applications that the world is moving toward. The Internet of Things is crucial to smart agriculture. Information about agricultural sectors can be obtained through IOT sensors. We developed an automated IOT-based smart farming system. Wireless sensor networks are used by this Internet of Things (IoT)-based agricultural monitoring system to gather data from sensors at different nodes and transmit it via a wireless protocol. Arduino powers this Internet of Things (IoT) smart agriculture system, which consists of temperature, humidity, water level, and DC motor sensors. The IOT-based agricultural monitoring system begins by keeping an eye on the humidity, moisture content, and water level. The water pump is initiated automatically by sensors that detect a drop in the water level. The fan turns on when the temperature rises above the threshold. The LCD display module shows all of this. All of this is also mirrored in the IOT, which shows date, time, and minute-by-minute data on humidity, water level, and humidity. A specific temperature can be achieved depending on the kind of

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crops that are grown. There is a button on IOT that can be used to forcefully stop the water pump in case we need to turn off the water.

III. LITERATURE SURVEY

[1] **Title** : An IOT-Based Sustainable Agriculture System, **Author** : Anandhi Tamilvanan and Ramya Venkatesan describe an IOT-based sustainable agriculture system. This project created a system that will keep an automated eye on the agricultural fields. In addition, a Raspberry Pi camera is used to stream live video to monitor the agricultural field directly from the server. The soil moisture sensor monitors the temperature and humidity in the agricultural fields. Using IOT and wireless sensor nodes reduces the amount of work required to observe agricultural fields. IOT also prevents agriculture parameter databases from being lost and stores them for a long time in a storage device or cloud.

[2] **Title :** A Framework for IOT-Based Smart Agriculture,**Author :** Prof. K.A. Patil and N.R. Kale offer an IOTbased model for smart agriculture. Over the past ten years, rainfall and climate changes have been unpredictable. As a result, many farmers are implementing climate-smart techniques known as smart agriculture. Village farmers may have grown the same crop for centuries under the current system, but over time, changes in weather patterns, soil composition, and pest and disease outbreaks have occurred. Through the use of the suggested system approach, which detects the local agricultural parameters, locates the sensor, transfers data about crop fields, and monitors crops. Farmers are able to adapt to these changes and even reap the benefits thanks to the updated information they have received.

[3] **Title :** An IOT-based smart agriculture system IOT technology is used by **Author :**Muthunoori Naresh, P. Muna swamy to explain the Smart Agriculture System.In the current system, farmers would determine the soil's ripeness and make assumptions to produce particular kinds of goods. They failed to consider the water level, moisture content, and weather. The final stage of the harvest is all that matters to the profitability. They increased the product's efficiency in this suggested system, which evaluates the harvest's characteristics. IOT is used to provide accuracy and conservative cultivation in order to meet the challenges in the field.

[4] **Title :**"An IOTbased model for smart agriculture", **Author :** N.R. Kale, Prof. K.A. Patil .Over the past ten years, rainfall and climate changes have been unpredictable. As a result, many farmers are implementing climate-smart techniques known as smart agriculture. Village farmers may have grown the same crop for centuries under the current system, but over time, changes in weather patterns, soil composition, and pest and disease outbreaks have occurred. Through the use of the suggested system approach, which detects the local agricultural parameters, locates the sensor, transfers data about crop fields, and monitors crops. Farmers are able to adapt to these changes and even reap the benefits thanks to the updated information they have received.

[5] **Title :** “N, P, K Detection and Control for Agriculture Applications using PIC Controller”, **Author :** Laxmi C. Gavade, A.D Bhoi, International Research Journal of Engineering and Technology (IRJET). Volume: 6 Issue: 4 | April 2017

In this paper, a model for using sensors in agricultural fields to detect soil humidity, temperature, sunlight, and N, P, and K contents is proposed. Farmers can identify nutrient deficiencies in the soil and improve soil productivity by measuring these parameters. India's productivity is below the global average, and this paper outlines a strategy for achieving ten "evergreen revolutions" in agriculture. While fertilizers are essential for high yields, improper application of P, K, and N results in lower crop yields. The three techniques of chemical analysis presented in this paper are optical method, conductivity measurement, and electrochemical methods. Conventionally, soil sampling is done manually. These techniques aid in the measurement of the main nutrients.

[6] **Title :**“IoT Based Agriculture Monitoring and Smart Irrigation System Using Raspberry Pi” ,**Author :** Mrs.T.Vineela, J. NagaHarini, Ch.Kiranma, G.Harshitha, B.AdiLaksh International Research Journal of Engineering and Technology (IRJET). Volume: 5 Issue: 1 | Jan 2018

In a lot of research papers, it is suggested that data be gathered from various sensors and that real-time monitoring be carried out, but in this one, the emphasis is on automating processes. The authors of this paper want to use various technologies to increase crop yields. Additionally, it offers a low-cost WSN for obtaining data from temperature, humidity, and soil moisture sensors. An automated system is suggested in this paper to improve crop productivity. The

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authors propose an intelligent data sensing methodology and an intelligent irrigation system. An effective wireless sensor network is created in the suggested model by connecting a variety of sensors to a Raspberry Pi.

[7] Pawar, U.B., Bhirud, S.G., Kolhe, S.R. (2020). Light Scattering Study on Protocols and Simulators Used in Automotive Application(s). In: Iyer, B., Deshpande, P., Sharma, S., Shiurkar, U. (eds) Computing in Engineering and Technology. Advances in Intelligent Systems and Computing, vol 1025. Springer, Singapore. https://doi.org/10.1007/978-981-32-9515-5_16.

Industry demands rapid application prototyping and simulations of the protocols to save time, money and energy. Use of intelligent systems with high speed communication, the sector is moving towards the standardizations.

IV. PROPOSED METHODOLOGY

The proposed methodology for implementing an IoT-Based Smart Agricultural Monitoring System involves a systematic approach to address specific agricultural needs and requirements. Here's a step-by-step guide:

1. **Define Objectives and Requirements:** Clearly outline the objectives of the smart agricultural monitoring system. Identify the specific parameters to monitor, such as soil moisture, temperature, humidity, crop health, and environmental conditions.Understand the unique needs of the agricultural environment, considering factors like crop types, climate, and available resources.
2. **Site Survey and Sensor Selection:** Conduct a site survey to determine the optimal locations for sensor deployment across the farm. Consider the size and layout of the field.Choose appropriate sensors based on the identified parameters and the environmental conditions. Ensure that selected sensors are compatible with the communication infrastructure.
3. **Communication Infrastructure:** Select suitable communication protocols and technologies for connecting sensors to a central system. Options include Wi-Fi, Bluetooth, Zigbee, LoRa, or cellular networks.Design a reliable and scalable communication network to ensure seamless data transmission from sensors to the central monitoring system.
4. **Gateway Devices and Edge Computing:** Implement gateway devices to collect and preprocess data at the edge before transmitting it to the central system. This reduces latency and optimizes bandwidth usage.Incorporate edge computing capabilities for initial data analysis and filtering to reduce the volume of data transmitted to the cloud.
5. **Cloud Platform Integration:** Integrate the system with a cloud platform for data storage, processing, and analysis. Popular cloud services like AWS, Azure, or Google Cloud can be utilized.Establish secure and scalable connections between edge devices and the cloud platform for seamless data flow.
6. **Data Analytics and Decision Support:** Apply data analytics techniques to extract meaningful insights from the collected data. Implement algorithms for predictive analytics and anomaly detection.Develop decision support mechanisms that provide actionable recommendations to farmers based on the analyzed data.
7. **Automation and Control Systems:** Integrate actuators and control systems to enable automated responses based on the analyzed data. For example, automate irrigation based on soil moisture levels or control temperature and humidity in controlled environments.Implement machine learning models for adaptive and intelligent automation.
8. **User Interface Development:** Design a user-friendly interface, which could be in the form of a mobile application or web dashboard, to enable farmers to monitor and control the system.Include visualization tools, real-time alerts, and historical data analysis features to empower users with actionable information.
9. **Security Measures:** Implement robust security measures to protect the system from cyber threats. This includes encryption of data in transit and at rest, authentication mechanisms, and access controls. Regularly update and patch software to address security vulnerabilities.
10. **Testing and Validation:** Conduct thorough testing of the entire system in both controlled environments and realworld agricultural settings.Validate the system's performance against predefined objectives, making adjustments as necessary.

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11. **Deployment and Training:** Deploy the system on the farm and provide comprehensive training to farmers and operators on system usage, interpretation of data, and troubleshooting.Establish a support and maintenance plan to address any issues that may arise post-deployment.
12. **Monitoring and Continuous Improvement: Implement monitoring tools to track the performance of the system over** time. Gather feedback from users and stakeholders to identify areas for improvement and implement updates to enhance system functionality

By following this proposed methodology, the development and deployment of an IoT-Based Smart Agricultural Monitoring System can be executed systematically, leading to an effective and efficient solution for precision agriculture.

V. MODULE ARCHITECTURE

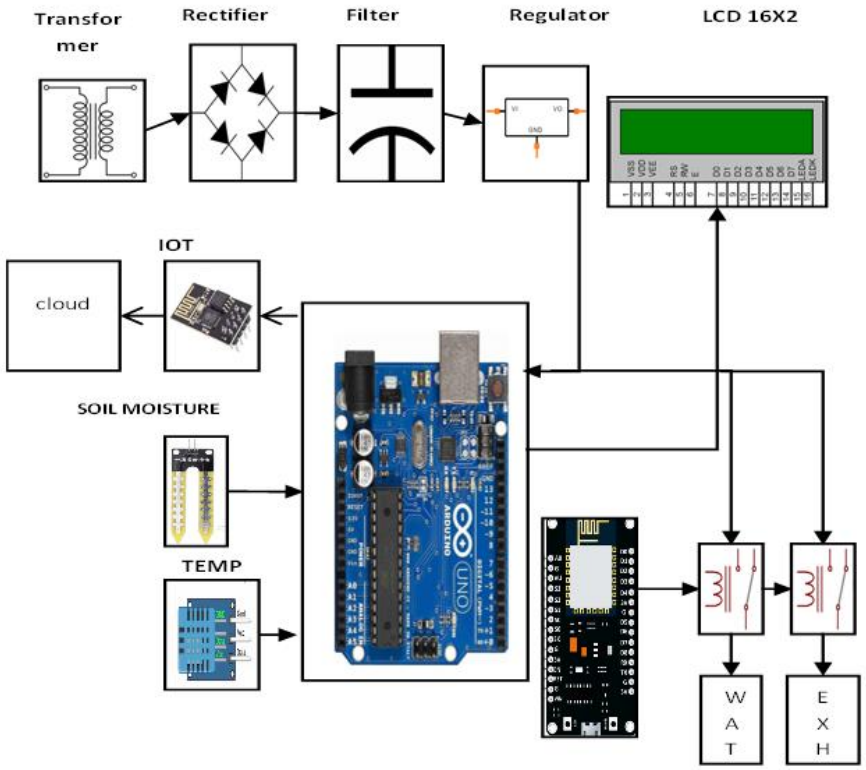

Fig: Architecture of system

VI. CONCLUSION

An IoT-based agricultural monitoring system is useful for monitoring various farm parameters such as soil temperature, humidity, stored water flow, etc. This allowed for improvement activity in agricultural activities. This system helps to use resources like water when needed in a controlled manner. The IoT-based system was developed by the authors and the results are presented here paper It is observed that the system can monitor ground conditions in real time and accordingly demand The agricultural sector of developing countries is one of the most important sectors contributing to development economy With the development of technology, the agricultural sector is growing at a good rate.

VII. ACKNOWLEDGMENT

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