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DESIGN OF SMART FARMING SYSTEM

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Abstract: The Internet of Things (IoT) technology has revolutionized every aspect of the average person's life by making everything smart and intelligent. The Internet of Things (IoT) is a network of things that self-configures. Intelligent Smart Farming IoT-based devices are changing the face of agriculture production by not only improving it but also making it more cost-effective and reducing waste. The goal of this project is to propose an IoT-based Smart Farming System that will assist farmers in obtaining Live Data (Temperature, Soil Moisture) for efficient environment monitoring, allowing them to increase their overall yield and product quality. The loT-based Smart Farming System proposed in this paper is built with Arduino Technology, various sensors, and a WiFi module, and generates a live data feed that can be obtained online from Thingsspeak.com.

The product proposed in this paper employs an ESP32 Node MCU, a breadboard, a DHT11 Temperature, and Humidity Sensor, a Soil Moisture Sensor, jumper wires, LEDs, and a live data feed that can be monitored using a serial monitor and the Blynk mobile. This will enable farmers to manage their crops in the new farming era.

Keywords: IoT, Smart farming Systems, Moisture, Automated water pump, IoT in agriculture.

I. INTRODUCTION

The Internet of Things will be the foundation of Smart Computing in the future (IoT). It is critical to the transformation of "Traditional Technology" from homes to offices to "Next Generation Everywhere Computing.". “Internet of Things” is gaining an important place in research across the world and especially in the area of advanced wireless communications. Today IoT has started touching people everywhere and from the point of a normal user, IoTis laying the foundation for the development of various products like smart health services, smart living, smart education in schools, and automation. Figure 1 shows how it

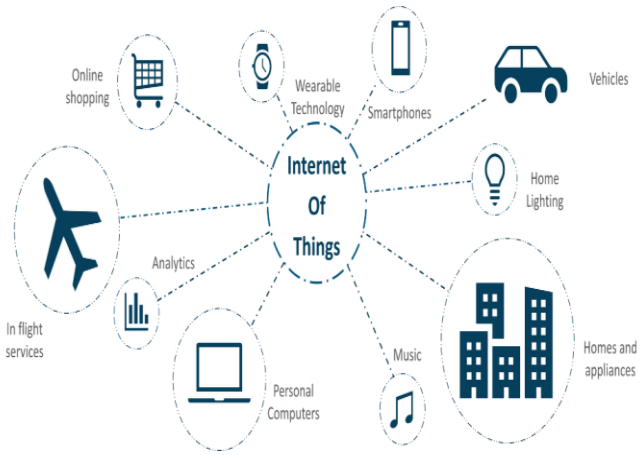

Figure 1. IoT in various fields

is used commercially in manufacturing, transportation, agriculture, business management, and many other fields. The most researched area of IoT in agriculture. Because it is a critical sector for ensuring food security as the world's population grows rapidly. Researchers first started applying ICT-based techniques in this sector, which were useful on some levels but were not going to solve our problem in long run. So now, they are exploring IoT as an option to ICT in

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agriculture. Agriculture products need applications like soil moisture monitoring, environmental condition monitoring for temperature, and moisture, supply chain management, and infrastructure management.[1]

The Internet of Things (IoT) is a system of interconnected devices which transfers data from one device to another without any human involvement. IoT technology brings numerous advantages and applications in agriculture, from remote monitoring to smart sensors to hardware device integration so that data be interconnected and stored. Internet-of-Things (IoT) based agriculture monitoring systems are potentially extremely useful for farmers.

II. METHODOLOGY

This project aims to resolve the issues for the farmers like animal intrusion, improper irrigation, and improper seasonal crop cycle in the agriculture field. So we have proposed an IoT-based farming system that consists of sensors and an android app with cloud technology. We have developed this project in a way that focuses to solve the issues and suggest to the farmers the traditional organic farming methods, and crop cycle patterns. This helps us reduce workload and manpower.

Organic farming seems impossible due to the change in climate conditions and global warming, flood, etc. Field agriculture is facing so many crises in producing more quality crops with fewer resources without affecting the quality of crops and the environment.

The proposed system is a hardware-software integration that includes sensors and cloud data technology working together with an IoT-based Android app.

The proposed system interfaces with IoT and mobile applications as shown in figure 2.[5]

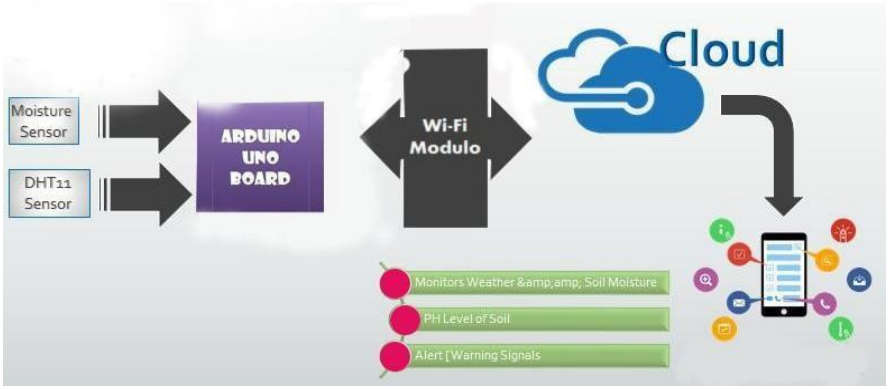

Figure 2. Proposed System Interface with IoT and Android

IoT-based Smart Farming System will enable farmers to have live data of soil moisture environment temperature and automation in irrigation, fertilization, and electric fencing at very low costs that live monitoring can be done.

Our automated/manual smart farming system measures the basic field data that are used in farming like field temperature, moisture, etc. It can collect diverse data from a large set of real-world data from trusted websites for the different crops as per season. As a result, the humidity of the field in the soil is using DHT11, Soil moisture, and PIR sensors. These sensors are the major part of this Smart Farming System.

The collected data from the Sensors the be analyzed for providing smarter solutions during real-time farming. The prediction is made using the data on soil humidity, temperature, and moisture and compared with data gathered from agricultural research institutes and provides suitable seasonal crop cycle patterns and maturity time.

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The DHT11 main purpose is to measure the temperature and humidity of the surrounding air. This sensor uses a capacitive humidity sensor and thermistor to measure the temperature and humidity by measuring the relative electrical resistance of the surrounding air in the field. This data is used to predict the crop cycle.

The soil moisture sensor helps to measure the moisture of the soil. It gives the data about water content and moisture by measuring the volumetric water content in which the crop is cultivated. The water content is measured by dielectric permittivity using capacitance and creating voltage proportional to permittivity. These sensors alert the farmer when the water content increases or decreases.

PIR sensors (passive infrared) is a motion detector sensors used to detect the movement of animals, birds, and other objects by measuring the infrared light or radiant heat emitted from the object by converting the wavelength into output voltage and triggering the alarm. It is added to the prevention the field from the cattle, and birds and it gives an alert to the farmer when a large group of insects starts affecting the crop. This is shown in figure 3 the process of sensors that detect intrusion of insects.

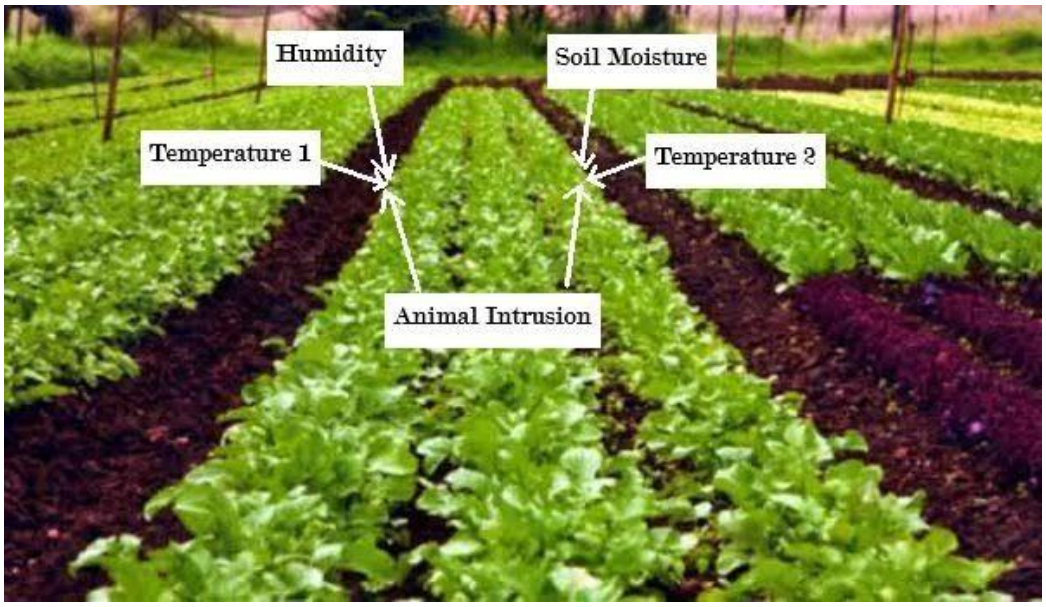

Figure 3. Sensor Processing

All of this data can be monitored by the IoT-based android application which will be present at the farmer. The app will show all the alerts and farmers can control the sensor as per need like controlling the water content in the field as per crop requirements.

III. LITERATURE REVIEW

The goal of IoT is to ensure the combination of electronic sensors and connecting them. IoT provides various services like “Wi-Fi, mobile, GPS, etc.” which makes its application smoother. Its main aim is to incorporate organizations so that they can communicate without interruption. The IoT is getting improved with time and covers all the essential areas like agriculture, health, education, households, etc.

For implementing the IoT there should be a proper strategy, proper management, and proper implementation because we design it for making life easier. With the help of IoT, farmers now can easily observe the climatic change and from the research data, they can easily maintain and change their crop cycle and maturity cycle. With the implementation, the farmer can control the required water content and fertilizer that varies from crop to crop and season to season.

IV. HARDWARE COMPONENTS

ESP8266 Node MCU
LCD16X2
Temperature sensor
Humidity sensor

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Moisture sensor
PIR sensor
Arduino UNO
Transistors
Resistors
Connecting Wires

V. SOFTWARE SPECIFICATION

Arduino IDE

VI. APPLICATIONS OF SMART FARMING SYSTEM

I. Crop Management
II. Smart Irrigation
III. Soil Management
IV. Field Monitoring using drones
V. Cattle Monitoring and Management
VI. Pesticides and fertilizer Management
VII. Water pump Monitoring and Management [2]

VII. BENEFITS OF SMART FARMING SYSTEM

Remote monitoring: It helps in the surveillance of fields and crops 24/7. In the case of an intrusion, it generates alerts for the farmer to manage the content.

Prevention: Smart sensors analyze the crop's health conditions and the surrounding of the field and alert anything change to the farmer, which will prevent any related consequences.

Reduction of workload and manpower costs: IoT has made monitoring and surveillance of an agricultural crop comparatively affordable and has removed the need for extra manpower.

Accuracy: It increases the accuracy of the report.

Management: It helps in the efficient management of agricultural fields and crop cycles based on the research institutes.

VIII. RESULT

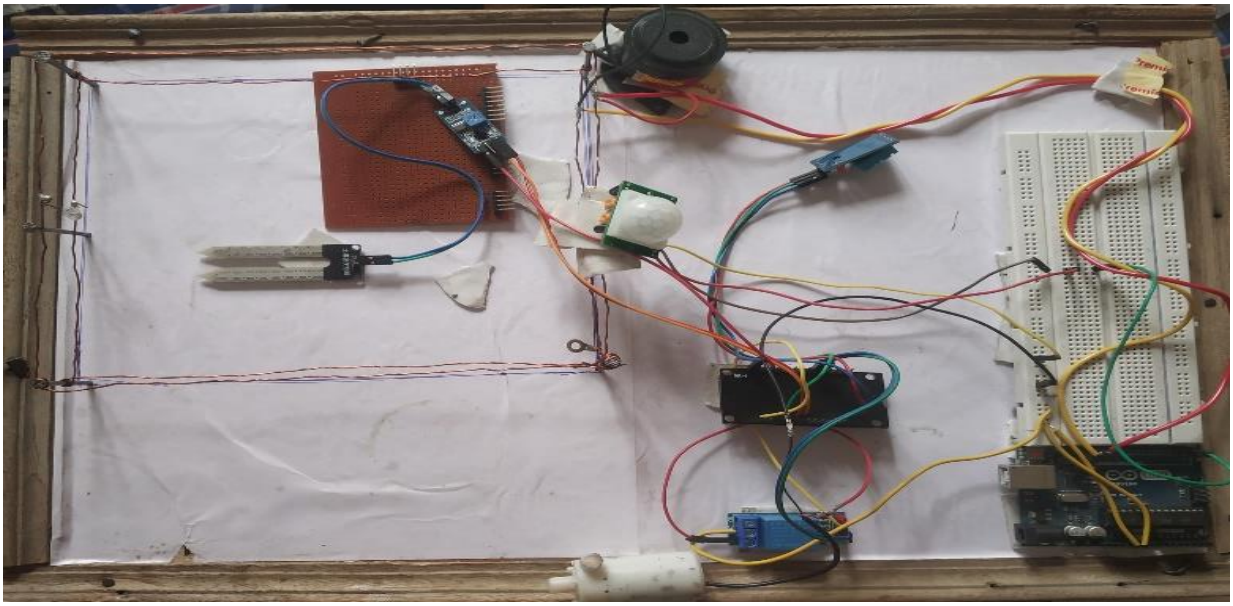

Figure 4. Proposed System

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Figure 4 .The Proposed system shows the connection between the sensors and the hardware that has been used. The system is implanted in the field to receive the outcome that the system is capable of delivering.

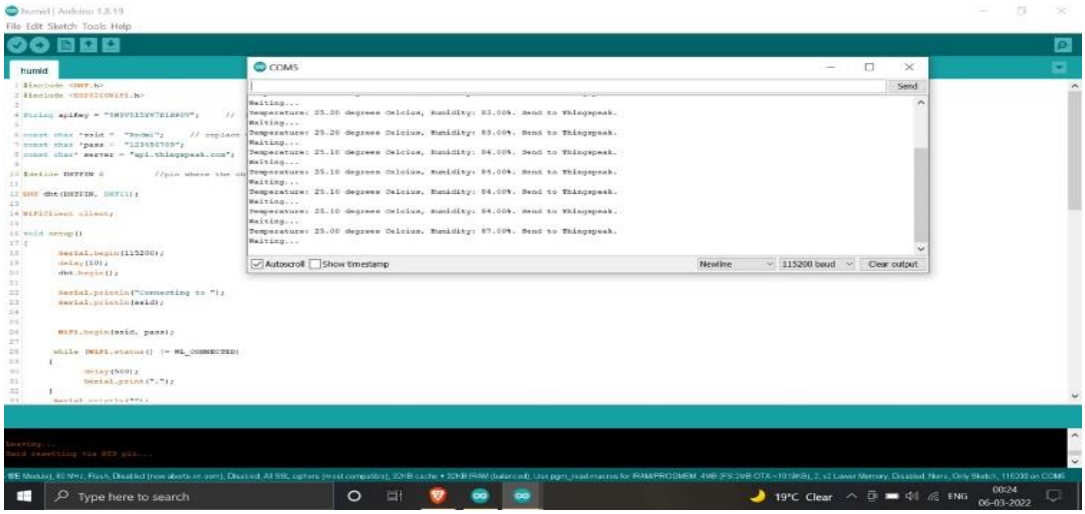

Figure 5. Humidity and temperature detection through Arduino interface

Figure 5. In this figure the result is showing that the sensor is detecting the humidity and temperature of the soil through DHT11 which includes both temperature and humidity sensor then it further sends to the blynk app interface or android app interface.

In this Arduino, code conditions have been set for the humidity and temperature according to the research institute of India. If the humidity is less than the given data it will automatically start to increase the humidity. If the temperature is high it will automatically start the pump to decrease the temperature to avoid the dryness of the seeds.

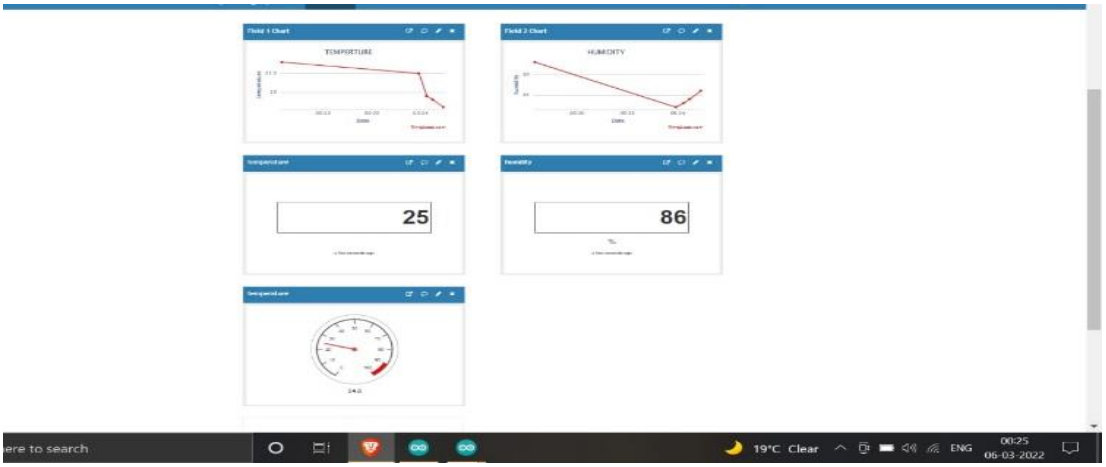

Figure 6. Application interface

Figure 6. In this data collection and comparison has been shown. This is a blynk application interface which accessible on the computer as well as on the android device. This is a user interface where the farmer will get to know his soil condition and humidity and temperature and also will get alerts when unwanted motion takes place near the field and it is capable to make run away the stray animal when they approach the field.

In this app, the user will get to know the current status of the field and the user can closely observe if the user cannot feel satisfied with the automatic interface the user can take charge anytime and can manipulate the reading according to himself.

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The testing of the device was done and data was collected to check the functional validity of the concept of real-time monitoring. The system generated promising results; the data collected from it is measured and stored quickly.

IX. CONCLUSION:

In this paper, we have discussed key features, applications, and working of a Smart Farming system. We have also discussed the significant benefits of our project.

The system has tremendous potential and is reliable in sending field data to the farmer as per season so the farmer can adjust the field for different crop cycles, especially in this time when we all are facing different types of issues like COVID-19 and Global Warming, Due to that climate changes occurring abnormally and it affecting the crop cycle and their maturity cycle due to that the crop quality is decreasing day by day. This proposed system will help the farmers to do traditional organic farming and help to adjust the crop cycle to climate change and will help to deliver quality food in the necessary amount to people.

X. ACKNOWLEDGMENT

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XI. REFERENCES

[1] Jash Doshi, Tirthkumar Patel, Santosh Kumar Bharti, "Smart Farming using IoT, a solution for optimally monitoring farming conditions", The 3rd International workshop on recent advances on IoT: Technology and Application approaches(2019).

[2] K.Komal Devi, Dr.Josephine Premkumar, K.Kavitha, P.Anitha, M. Satish Kumar, R.Mahaveerakannan, "A Review Smart Farming Using IoT in the area of crop Monitoring" Vol. 25 issue 5 (2021).

[3] V Dankan Gowda, Sandeep Prabhu, Ramesh, Jayashree M Kudari, Ansuman Samal "Smart Agriculture and Smart Farming Using IoT Technology", IOP Publishing, ASME 2021.

[4] Muhammad Ayaz (Senior Member IEEE), Mohammad Ammad-Uddin(Senior Member IEEE), Zubair Sharif (Senior Member IEEE), Ali Mansour (Senior Member IEEE), El-Hadi M. Aggoune (Senior Member IEEE), "Internet of Things(IoT)-Based Smart Agriculture: Toward Making the Fileds Talk", July 7, 2019.

[5] Sangeetha, Narmada, Moneeshram, Karishma, Kishore Karthi, "Special issue of second International Conference on advancement in Research and Development(ICARD 2021)", " Smart Farming Using IoT", Volume 03 issue 03S March 2021.

[6] Ritika Srivastava, Vandana Sharma, Vishal Jaiswal, Sumit Raj, "A Research Paper on Smart Agriculture using IoT", (ITJET), volume 07 issue 07 July 2020.

[7] Adithya Vadapalli, Swapna Peravali, Venkatarao Dadi, " Smart Agriculture System using IoT Technology" Publisher: International Journal of Advance Research in Science and Engineering (2319-8354).

[8] A.Vani, N. Sukesh Reddy, M. Parsharamulu, n. Mahesh, "Implementation of Smart Farming using IoT", volume 5, issue 2, April-June 2021, (AJAST).

[9] Nayyar, Anand & Puri, Vikram, "Smart Farming: IoT based smart sensors agriculture stick for live temperature and moisture monitoring using Arduino, cloud computing & solar technology, The international conference on communication and computing (ICCCS-2016)", 2016.

[10] Gorli, Ravi & Yamini G, " Future od smart farming with the internet of things, Journal of information technology and its applications, Volume2, issue 1, page 27-38, 2017.

[11] A. A. N. and K.D, "Experimental investigation of remote control via android smartphone of Arduino-based automated irrigation system using moisture sensor", 3rd International conference on electrical energy systems (ICEES), 2016.

DOI: 10.17148/IJARCCE.2022.114169

[12] A. H. Deepak, A. Gupta, M. Choudhary, and S. Meghana, "Disease Detection in tomato plants and remote monitoring of agricultural parameters." 11th international conference on advanced computing (ICoAC), Chennai, India, 2019

[13] I. Mat, M. R. Mohd Kassim, A.N. Harun, and I. M. Yusoff, "Smart agriculture using internet of things," 2018 IEEE conference on the open system (IOCS), 2018.

[14] R. Dagar, S. Som, and S. K. Khatri, " Smart Farming – IoT in agriculture," 2018 international conference on inventive research in computing applications (ICIRCA), 2018.

[15] C. Yoon, M. Huh, S. Kang, J. Park, and C. LEE, "Implement smart farm with IoT technology," 2018 20th international conference on advanced communication technology (ICACT), 2018.

[16] S. Navulur and M.N. Giri Prasad, " agriculture management through wireless sensors and internet of things," Int. J. Elect. Comput. Eng., vol. 7 no. 6., 2017.

[17] Prem Prakash Jayaraman, Ali Yavari, Dimitrios Georgakopoulos, Ahsan Morshed & Arkady Zaslavsky, Internet of ThingsPlatform for Smart Farming: Experiences and Lessons Learnt, Sensors 2016, 16, 1884; doi:10.3390/s16111884

[18] Janna Huuskonen, Timo Oksanen, Soil sampling with drones and augmented reality in precision agriculture, Computers, andelectronics in agriculture, Volume 154, Pages 25-35

[19] T. Baranwal, N. and P. K. Pateriya, 2016. Development of IoT-based Smart Security and Monitoring Devices for Agriculture. 6th International Conference – Cloud System and Big Data Engineering (Confluence), 2016.

[20] SUMA, D. N., SAMSON, S. R., SARANYA, S., SHANMUGAPRIYA, G., AND SUBHASHRI, R. IoT based smart agriculture monitoring system. International Journal on Recent and Innovation Trends in Computing and Communication 5, 2 (2017), 177–181.

[21] Shruti A Jaishetty, Rekha Patil, IOT sensor network-based approach for agricultural field monitoring and control , IJRET: International Journal of Research in Engineering and Technology, Volume: 05 Issue: 06 | Jun-2016