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ROLE OF (INTERNET OF THINGS) IOT IN AGRICULTURE MONITORING SYSTEM

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Abstract

The demand for food is growing in terms of quality and quantity has increased day by day. The country like India that mostly depends on Agriculture. Agriculture is the primary source of livelihood for about 72% of India's population. The agriculture sector in India is facing a lot of problems due to lack of water supply. However, most of the old practices adopted in the agricultural field are not for profitable also favorable. Now a days there is vast enhancement in technologies, different tools and techniques are available in agriculture sector. To improve efficiency, productivity, global market and to reduce human interaction, time and cost there is a need to divert towards new technology named IoT. It should upgrade with current technologies to boost seed quality of soil, check soil infertility, check the water level suitable for crop, check Ph level, check temperature, check dampness of soil in terms of moisture, check humidity. Internet of Things (IoT) is a highly promising technology that is offering many innovative solutions for development and agricultural production growth. IoT to address different domains of agriculture.). Smart agriculture is a new edge concept, because IOT sensors used agriculture fields responds the input data provided.

Keywords: Internet of Thing (IoT); GSM Module; ARDUINO UNO, Farming, Agriculture.

1. Introduction

IOT can be adopted in our life in all possible aspects, In the field of health and wellness, automatic control of home appliances, logistics, Industries and smart cities. IoT and automation can be applied in the field of agriculture enormously to improve every aspect of it. Agriculture in India is the means of livelihood of almost two thirds of the work force in the country. India's most important economic sector has always been agriculture. Bringing more land under cultivation, expanding irrigation facilities, using better seeds, techniques, water management, and plant protection have all contributed to an increase in post-independence agricultural production. A farmer's job entails more than just ploughing and harvesting crops. To achieve good results, the farmer must remember to water the fields at regular intervals. To keep the field from drying out due to a lack of water and to keep the field owner informed about the weather conditions. In the field, to measure various weather parameters as well as soil moisture levels. It provides a simple and effective method for watering the fields when the soil moisture level drops. This system is completely automated. The setup includes an ARDUINO UNO microcontroller, as well as sensors, which are critical for controlling irrigation on the field. The ATMEGA 328P is a more advanced microcontroller that serves as the system's brain. We use various sensors, such as temperature and humidity sensors, to measure various climate parameters. As well as moisture sensor and pH sensor for checking soil condition. All of the measured sensor parameters are sent to the registered GSM module. And if any of the sensor activates, then the corresponding alert message will also send to the concerned person via SMS using the GSM module.

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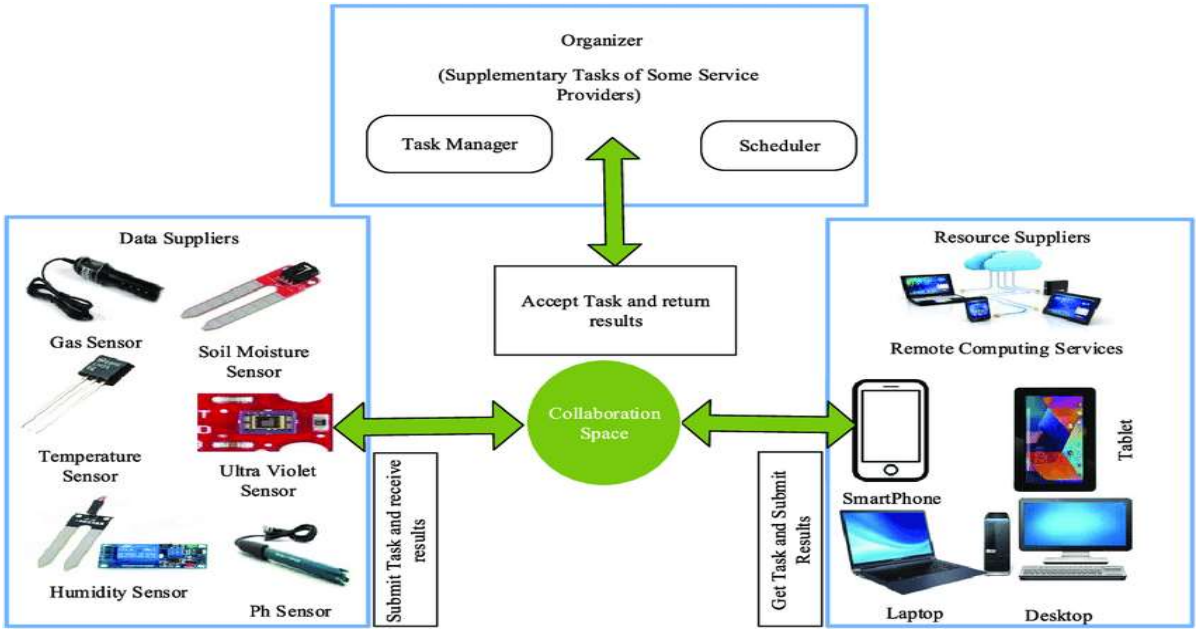

Fig. 1. **Conceptual illustration of IoT-based agricultural solutions**

2. Literature Survey

There are many successful IoT applications in agriculture sector implemented throughout the world including China, Taiwan, Thailand, Malaysia and other countries. In the next subsections, some of the applications will be discussed in detail.

In the field of environmental monitoring, China has created a low-cost, low-power environment monitoring system for use in greenhouses. The system's practical implementation demonstrates that it is dependable, lowering manpower costs by sending instructions remotely and on time. Fertilization rates were reduced by 60 percent, pesticides by 80 percent, and labor costs by 60 percent as a result of IoT implementation [2].

Taiwan has developed a low-cost Internet of Things (IoT) platform for precision farming that monitors soil conditions [3].

The platform was set up to keep track of the turmeric harvest. The amount of chlorophyll in Turmeric plants was increased by 40% to 60%, which is more than traditional methods, and 70% of water was saved by implementing the IoT system. Thailand has developed an IoT water control system to monitor water consumption. According to the findings, the humidity level for lemon growth should be between 70 and 80 percent, while the temperature for high productivity of vegetables and lemons should be between 29 and 32 degrees Celsius [4].

In Malaysia, an IoT system for fruit traceability was developed. Malaysia's Ministry of Science, Technology, and Innovation (MOSTI) developed Mi-Trace, an IoT-based solution. The developed system is a tracking platform for agricultural products, particularly musang king fruit, which benefits sellers and exporters by ensuring the fruit's origin and quality [5].

The newer scenario of declining water tables, dying rivers and tanks, and an unpredictable environment necessitates the proper use of water. To deal with this, a temperature and moisture sensor at suitable locations for crop monitoring is used, and an algorithm developed with temperature and soil moisture threshold values can be programmed into a microcontroller-based gateway to control water quantity is implemented. Photovoltaic panels can power the system, which can also have a duplex communication link based on a cellular internet interface via a web page [6].

The manual method of checking the parameters is an existing method and one of the oldest in agriculture. Farmers verify all of the parameters and calculate the reading using this method [7].

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It focuses on developing devices and tools that use the advantages of a wireless sensor network system to manage, display, and alert users. Its goal is to use automation and IoT technologies to make agriculture smarter. Smart GPS-based remote-controlled robot for weeding, spraying, moisture sensing, human detection, and vigilance [8] are some of the standout features.

The cloud computing devices can be used to build a complete computing system, including sensors and tools for observing data from the agricultural field. It proposes a novel methodology for smart farming by using wireless communication technology to link a smart sensing system and a smart irrigator system [9].

It proposes a low-cost, high-efficiency wireless sensor network technique for acquiring data from a variety of sensors. Depending on the needs of the crop controller, irrigation may or may not be enabled. It proposes a concept for how an automated irrigation system was developed to maximize agricultural water use [10].

3. Outcome of survey

The structure of the research article is organized as follows; Existing research articles on IoT-based smart farming. The complication for the implementation of revolutionizing agriculture and a solution is suggested for future trends processing. A explanation of various tests in real-time farming. From literature survey of other papers, we saw that the hardware and materials used to develop our porotype must be more efficient and accurate, as well as cheap for farmers. Which was economical and easily installable for farmers as well. Thus, we can conclude that our porotype will definitely help farmers in their grazing to successfully monitor their yields with the intelligible app and other alert means.

In general, IoT agriculture applications in above survey divided into precision agriculture (outdoor) and greenhouse monitoring (indoor).

4. Proposed System

By using different kinds of IoT sensors and IoT application in farming smart agricultural can be applied. Here are eight technologies for smart farming.

A. Keep Track of Climate Conditions

The most desired smart agriculture gadget is weather stations which combine various smart farming sensors. This is implemented by locating the sensors across the field which collects various data from the environment and sends it to the cloud . All the collected measurements can be used in mapping the climatic conditions and choosing the appropriate crops and collecting required measures to improvise their capacity. Here are few devices available for such agriculture using IOT: all Metro, Smart Elements and Pycno

B. Greenhouse Automation

There are several IoT sensors available to obtain data on soil, lighting, humidity and temperature which is required in the field of agriculture. Green IQ, Farmapp, Growlink are some of the farming products that uses the knowledge of smart farming, provided that clever irrigation and other smart services for agricultural.

C. Crop Management

There are several crop management devices which are placed in the field to obtain information specific to farming of crops. The crop growing can be checked to avoid any viruses that can harm the yield of crops. Arable and Seminos are good examples of crop management devices.

D. Cattle Monitoring and Management

IoT sensors can be attached to the cattle on the farm to understand their health conditions so that the sick animals can be identified and isolated. There are several smart agriculture sensors like cowlar to provide nutrition insights for the cattle on the field.

E. Precision Farming

Iot sensors can collect data regarding lighting, temperature, soil condition, humidity and pest infections that helps the farmers to collect data about optimal amounts of water, fertilizers to raise good quality crops. Cropx Mothive provides services to farmers to reduce wastage and increase yields.

F. Agricultural Drones

Agricultural drones is one of the most effective developments in the farming field. Drones are of great use for planting crops, fighting infections and pests and monitoring crops. DroneSeed, builds drones for planting trees in the areas that are deforested.

G. Predictive Analytics for Smart Farming

Farmers can make use of data analytics which helps them to use the real-time data and make predictions on crop harvesting time, how much yield the farmers can get. It also helps in analysis of climate situations. Crop Performance technology helps farmers

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to manage the supply of water and nutrients to improve the quality of crops. Irrigation processes can be enabled by using farming solutions like soil scout.

H. End-to-End Farm Management Systems

Distant farming techniques can be accomplished using FarmLogs and Cropio. There are several IoT devices and sensors placed on the agricultural fields to practice smart farming.

5. Block Diagram

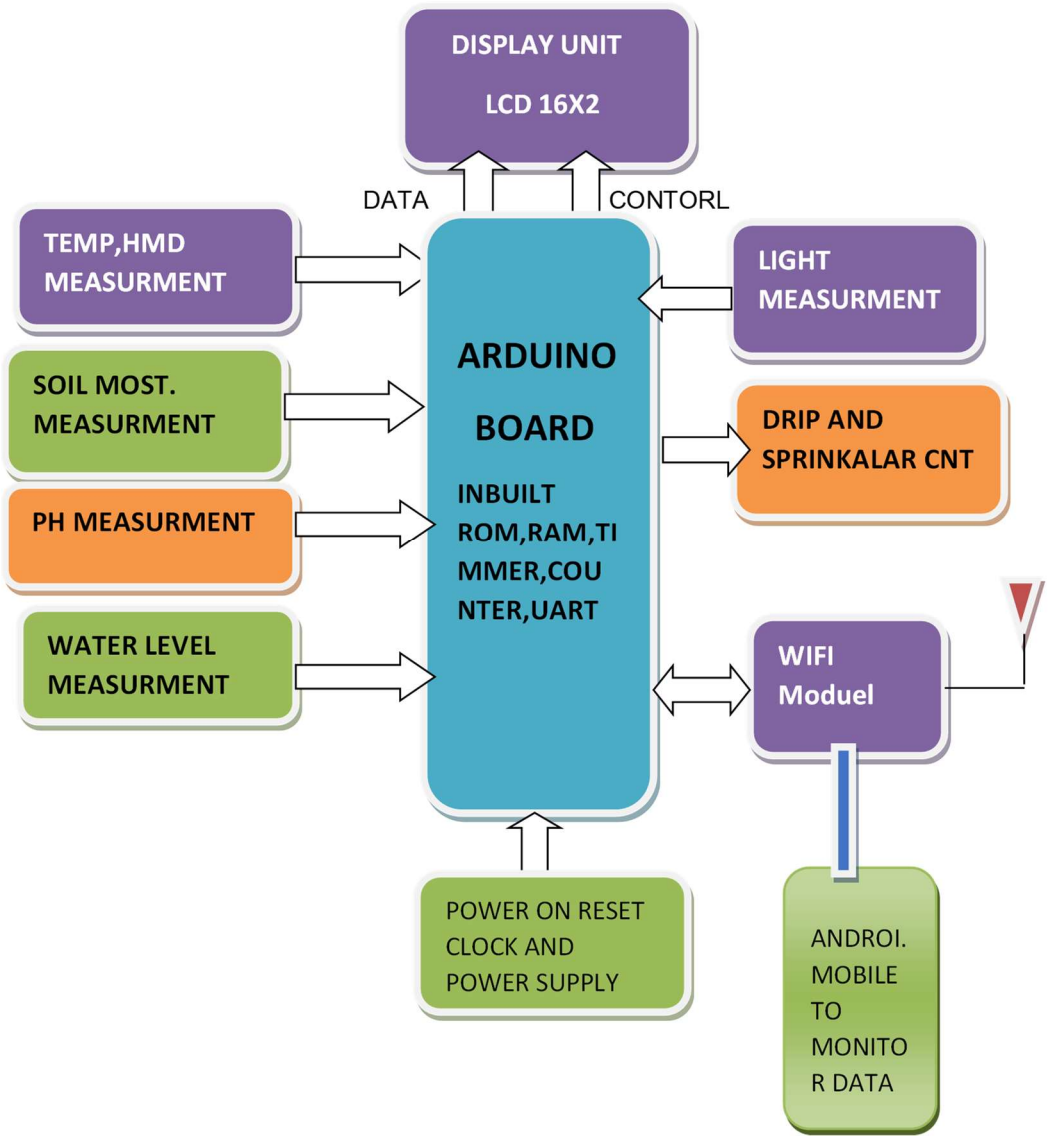

Fig. 2. Block diagram of IOT based agriculture.

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6. Expected outcome

The GSM and ARM based smart farming system consist of three phases namely the following,

- Sensing the outer environmental temperature in this Thermistor 103 is also a one of the parts of temperature sensor. This can sense room temperature and atmosphere temperature. This helps us to identify the temperature of the particular area where plant can grow.
- Sensing the water content(moisture) of the soil in order to get an accurate measurement, a moisture sensor is also needed for calibration. The moisture sensor senses the water content of the soil. If the moisture content in the soil reduces to 1000, the relay switches on the pump motor.
- Sensing the Outer Environmental Humidity When the moisture content in the atmosphere is low, then relay switches on the pump motor.
- Sensing the pH level of soil, User get update on his mobile application when the pH level is unbalanced (either low or high)

Conclusion

This paper presents a role of (Internet of Things) IoT in Agriculture monitoring System agriculture. IoT-based agricultural applications, open-source agricultural software, issues and challenges are discussed in detail. Furthermore, this paper provides an overview of how IoT technologies are going to change the agricultural sector and help the farmers to manage their farms more effectively and at the same time increase their revenues. Finally, it is expected that IoT technologies will help the agricultural sector and farmers to meet the food demand by 2050.

References

1. Yadav, Ankit. (2016). Design and implementation of Smart Agriculture using Embedded System. International Journal of Engineering and Computer Science. 10.18535/ijecs/v5i12.13.
2. "A New Engine for Rural Economic Growth in the People's Rrepublic of China". Available: https://www.adb.org/sites/default/files/publication/455091/internet-plus agricultureprc.pdf. [Accessed: 15-July-2020].
3. Chen, W. L., Lin, Y. B., Lin, Y. W., Chen, R., Liao, J. K., Ng, F. L., & Yen, T. H. "AgriTalk: IoT for precision soil farming of turmeric cultivation", IEEE Internet of Things Journal, 2019.
4. Muangprathub, J., Boonnam, N., Kajornkasirat, S. Lekbangpong, N., Wanichsombat, A., & Nillaor, P. "IoT and agriculture data analysis for smart farm", Computers and electronics in agriculture, 156, 2019, 467-474.
5. "Digitization of Agriculture - The Next Chapter for Internet of Things in Malaysia". Available: http://www.mimos.my/wpcontent/uploads/2016/10/282016-0729- IDCAP41608216 Digitisation-of-agriMiTrace.pdf. [Accessed: 15-July-2020]
6. S. R. Nandurbar, V. R. Thool, "Design and Development Precision Agriculture System Using Wireless Sensor Network", IEEE International Conference on Automation, Control, Energy and Systems (ACES),2014
7. Joaquin Gutierrez, Juan Francisco Villa-Medina, Alejandra Nieto-Garibay, and Miguel Angel Porta-Gandara, "Automated Irrigation System Using a Wireless Sensor Network and GPRS Module", IEEE TRANSACTIONS ON INSTRUMENTATION AND MEASUREMENT,0018-9456,2013
8. Dr. V. Vidya Devi, G. Meena Kumari, "Real- Time Automation and Monitoring System for Modernized Agriculture", Interional Journal of Review and Research in Applied Sciences and Engineering (IJRRASE) Vol3 no.1. pp 7-12,2013
9. Basha, Elizabeth, and Daniela Rus. "Design of early warning flood detection systems for developing countries." Information and Communication Technologies and Development, 2007. ICTD 2007. International Conference on. IEEE, 2007
10. Danny Hughes, Phil Greenwood, Gordon Blair, Geoff Coulson, Florian pappenbeger, paul Smith and Keith Beven. An Intelligent and Adaptable Grid-based Flood Monitoring and Warning Sy
11. M. S. Farooq, S. Riaz, A. Abid, K. Abid and M. A. Naeem, "A Survey on the Role of IoT in Agriculture for the Implementation of Smart Farming," in IEEE Access, vol. 7, pp. 156237-156271, 2019, doi: 10.1109/ACCESS.2019.2949703.
12. Rajack, B. & Subramanian, N. & Pragadesh, N. & Suvanesh, R. & Vignesh, S. (2021). Implementation of IoT in Agriculture. 10.3233/APC210258.
13. Visithra. K, Anilraj. M. I, Jerald John James. S, Pavithra. L, Kiruthika. S. V, 2021, Implementation of IOT based Communication on the Agriculture Field using TCP/IP Protocol, INTERNATIONAL JOURNAL OF ENGINEERING RESEARCH & TECHNOLOGY (IJERT) Volume 10, Issue 04 (April 2021)
14. M. Ayaz, M. Ammad-Uddin, Z. Sharif, A. Mansour and E. -H. M. Aggoune, "Internet-of-Things (IoT)-Based Smart Agriculture: Toward Making the Fields Talk," in IEEE Access, vol. 7, pp. 129551-129583, 2019, doi: 10.1109/ACCESS.2019.2932609.


Cover Page

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DOI: http://ijmer.in.doi./2022/11.06.17

15. S. R. Prathibha, A. Hongal and M. P. Jyothi, "IOT Based Monitoring System in Smart Agriculture," 2017 International Conference on Recent Advances in Electronics and Communication Technology (ICRAECT), 2017, pp. 81-84, doi: 10.1109/ICRAECT.2017.52.
16. I. M. Marcu, G. Suciu, C. M. Balaceanu and A. Banaru, "IoT based System for Smart Agriculture," 2019 11th International Conference on Electronics, Computers and Artificial Intelligence (ECAI), 2019, pp. 1-4, doi: 10.1109/ECAI46879.2019.9041952.
17. G. S. Nagaraja, A. B. Soppimath, T. Soumya and A. Abhinith, "IoT Based Smart Agriculture Management System," 2019 4th International Conference on Computational Systems and Information Technology for Sustainable Solution (CSITSS), 2019, pp. 1-5, doi: 10.1109/CSITSS47250.2019.9031025.
18. M. Lee, J. Hwang and H. Yoe, "Agricultural Production System Based on IoT," 2013 IEEE 16th International Conference on Computational Science and Engineering, 2013, pp. 833-837, doi: 10.1109/CSE.2013.126.
19. IoT Applications in Agriculture: A Systematic Literature Review. In: Valencia-García R., Alcaraz-Mármol G., Cioppo-Morstadt J., Vera-Lucio N., Bucaram-Leverone M. (eds) ICT for Agriculture and Environment. CITAMA2019 2019. Advances in Intelligent Systems and Computing, vol 901. Springer, Cham. https://doi.org/10.1007/978-3-030-10728-4_8
20. M. R. M., "IoT Applications in Smart Agriculture: Issues and Challenges," 2020 IEEE Conference on Open Systems (ICOS), 2020, pp. 19- Literature Survey on IOT based agriculture 24, doi: 10.1109/ICOS50156.2020.9293672.
21. N. V. Uma Reddy, "Survey on IoT and its Applications in Agriculture," 2018 International Conference on Networking, Embedded and Wireless Systems (ICNEWS), 2018, pp. 1-5, doi: 10.1109/ICNEWS.2018.8903969.
22. R. Dagar, S. Som and S. K. Khatri, "Smart Farming – IoT in Agriculture," 2018 International Conference on Inventive Research in Computing Applications (ICIRCA), 2018, pp. 1052-1056, doi: 10.1109/ICIRCA.2018.8597264.
23. M. Abbasi, M. H. Yaghmaee and F. Rahnama, "Internet of Things in agriculture: A survey," 2019 3rd International Conference on Internet of Things and Applications (IoT), 2019, pp. 1-12, doi: 10.1109/IICITA.2019.8808839.
24. Singh, Ajit. (2020). Applications of IoT in Agricultural System. International Journal of Agricultural Science and Food Technology. 6. 041-045. 10.17352/2455-815X.000053.
25. Kim, Wan-Soo & Lee, W. S. & Kim, Yong-Joo. (2020). A Review of the Applications of the Internet of Things (IoT) for Agricultural Automation. Journal of Biosystems Engineering. 45. 10.1007/s42853-020-00078-3.
26. Jash Doshi, Tirthkumar Patel, Santosh kumar Bharti, Smart Farming using IoT, a solution for optimally monitoring farming conditions, Procedia Computer Science, Volume 160, 2019, Pages 746-751, ISSN 1877-0509, https://doi.org/10.1016/j.procs.2019.11.016.(https://www.sciencedirect.com/science/article/pii/S18770509193171
27. Navya B S ,IoT in Agriculture, International Journal of Advanced Research in Science, Communication and Technology (IJARSCT) Volume 6, Issue 1, June 2021 ISSN (Online) 2581-9429