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IOT BASED SMART IRRIGATION MONITORING SYSTEM

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ABSTRACT

The internet of things (IOT) describes the network of physical objects that are embedded with sensors, software, and other technologies for the purpose of connecting data with other devices and systems over the internet. Agriculture is the one of the most dominant sectors that nothing can match its importance and the work of it. We here implemented our thoughts and worked on Modern Agriculture technology which is an IOT based agriculture monitoring system. Compared to the previous results, here LDR module along with fuzzy logic are used as it helps in using the parameter of light, In this project the intelligence of the proposed system is based on a smart algorithm, which considers sensed data along with the parameters like air, temperature, humidity, moisture. The complete system where the sensor node data is wirelessly collected over the cloud using web-services and a web-based information visualization and decision support system provides the real-time information insights based on the analysis of sensors data and weather forecast data, if the sensed value goes beyond the threshold values set in the program, the water pump will be automatically switched on/off .We will provide basic Software Prototype and Hardware Model for data visualization. Conventional farming is labor-consuming and the need to continuously monitor crops can be a burden for farmers. By realizing the concept of smart farming based on Internet of Things (IoT) technology, farmers can use a mobile application to observe and monitor air humidity, air temperature, and soil moisture – factors that can affect plant growth. Furthermore, the use of timers to control the pumps in conventional watering systems is not always practical in real-life cases. This paper proposes a framework that enables advanced fuzzy logic to control a pump's switching time according to user-defined variables, whereby sensors are the main aspect of and contributor to the system. Our proposed idea offers great potential for excellent performance as an interface between the sensors as the input and the IoT as the output medium. A comparison is made between the proposed system and manual handling. The results prove that the water consumption and watering time has been reduced significantly.

Keywords : Agriculture, Fuzzy Logic, Prototype, Smart Farming, Visualization

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I Introduction

The Internet of Things, or IoT, refers to the billions of physical devices around the world that are now connected to the internet, all collecting and sharing data[1-5]. Thanks to the arrival of super-cheap computer chips and the ubiquity of wireless networks, it's possible to turn anything, from something as small as a pill to something as big as an airplane, into a part of the IoT[6,7]. Connecting these different objects and adding sensors to them adds a level of digital intelligence to devices that would be otherwise dumb, enabling them to communicate real time data without involving a human being[8-11]. The Internet of Things is making the fabric of the world around us more smarter and more responsive, merging the digital and physical universes[12].The Internet of Things (IoT) is the network of physical objects or "things" embedded with electronics, software, sensors, and network connectivity, which enables these objects to collect and exchange data[13].

Figure 1: Internet of things

1.1 History of IOT

1. The concept of a network of smart devices was introduced in 1982, with a modified coke machine that became the first internet connected appliance [14,15].
2. Between 1982 to 1999 many companies were working on IOT. But in 1999 IOT was introduced by British technology pioneer Kevin Ashton who coined the term in his work at Procter and gamble. But the term IOT did not step up till 2011 later in 2014 it reached mass market[16].
3. IOT allows the objects that will connect through the internet with RFID (Radio Frequency Identification) communication methods that include wireless technology and sensors which can identify themselves uniquely[14].

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1.2 Structure of IOT

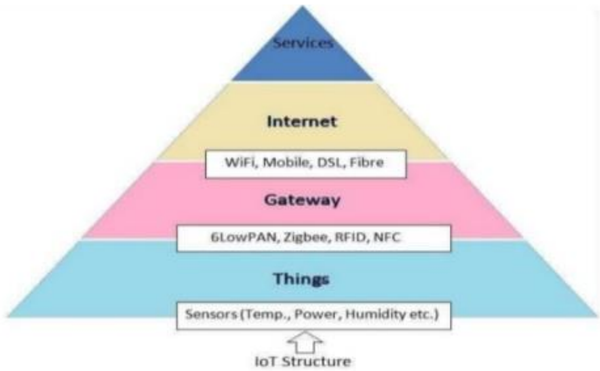

Figure 2 : Structure of IOT

IoT system architecture is often described as a **four-stage process** in which data flows from sensors attached to "things" through a network and eventually on to a corporate data center or the cloud for processing, analysis and storage[13]. In the Internet of Things, a "thing" could be a machine, a building or even a person[16]. Processes in the IoT architecture also send data in the other direction in the form of instructions or commands that tell an actuator or other physically connected device to take some action to control a physical process[3]. An actuator could do something as simple as turning on a light or as consequential as shutting down an assembly line if impending failure is detected[1].

II Literature Review

2.1 IoT-Based Smart Irrigation System for Agriculture

This paper discusses the design and implementation of a smart irrigation system using IoT technology. The system employs sensors to monitor soil moisture, temperature, and humidity, allowing for precise irrigation control. Results show improved water efficiency and crop yield[17].

2.2 Wireless Sensor Networks for Precision Agriculture: A Review

This review paper provides an overview of wireless sensor networks (WSNs) in precision agriculture, including smart irrigation systems. It covers various sensor types, communication protocols, and applications. The authors discuss the potential benefits of IoT-based irrigation systems in optimizing water usage and enhancing agricultural productivity[18].

2.3 IoT-Based Smart Irrigation Systems: A Review of Literature

This review paper examines existing literature on IoT-based smart irrigation systems. It analyzes the design, implementation, and performance of different systems, highlighting their effectiveness in conserving water and improving crop yield. The paper also identifies challenges and future research directions in this field[19-21].

2.4 A Survey on IoT Applications in Agriculture

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This survey paper explores the use of IoT technology in agriculture, with a focus on smart irrigation systems. It discusses the integration of sensors, actuators, and communication networks to create intelligent irrigation solutions. The authors review various IoT-based approaches and their impact on water management and agricultural sustainability[22].

2.5 Smart Irrigation Management Using IoT

This paper presents a case study of a smart irrigation management system based on IoT technology. It describes the deployment of sensors in agricultural fields to monitor soil moisture levels and weather conditions in real-time. The system utilizes data analytics to optimize irrigation scheduling, resulting in water savings and improved crop health[23].

III Methodology

The below block diagram consists of temperature humidity sensor, rain drop sensor, light, methane sensor, node MCU, relay module.so these all sensors are given as inputs to the node MCU. The sensor interfaces with Arduino Uno such as DHT11 Temperature, Humidity, Soil moisture and Rain detection sensor. The data acquired from sensors are transmitted to the web server using wireless transmission (WIFI moduleESP8266).The data processing is the task of checking various sensor data received from the field with the already fixed threshold values.

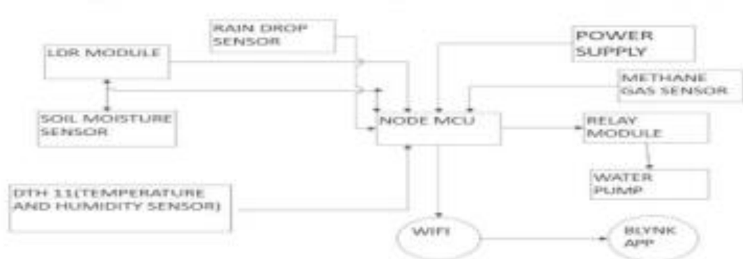

Figure 3: BLOCK DIAGRAM OF IOT BASED SMART IRRIGATION MONITORING SYSTEM

The above diagram represents temperature, humidity sensor,rain drop sensor,light,methane sensor,node mcu, relay module.so these all sensors are given as inputs to the node mcu The detailed proposed method works on below hardware successive components.
Rain Drop Sensor , Methane Gas Sensor , Node MCU , Soil Moisture Sensor , Temperature Humidity Sensor , LDR Module , Relay Module , Water Pump

IV Results and Discussions

(i) The app connects your home to your phone in HD video so you can see and protect what matters most. With multi-system support, you can use Blink to watch your home, vacation home, or business all at the same time. Plus, you can control multiple camera systems within one single app.
(ii) An interface can fail its users in several areas, but the data dashboard seems to carry with it a particular risk. Maybe because it's easy to produce a page that looks impressive through the use of fancy gauges, graphs, and charts yet still misses the mark with users. Not that there's anything wrong with making a dashboard visually appealing; it's a key part of the user experience. But I'd suggest an approach to designing dashboards that begins with the what before getting into the specifics of how to present the display.
(iii) "A single-screen display of the most important information needed to do a job, designed for rapid monitoring."
(iv) More specifically, the mission of a dashboard should be to provide an overview of what's going on and highlight what needs attention . Provide easily discoverable ways to drill down into details as necessary
(v) A dashboard is often designed as the initial view when logging into a system.

V Conclusion

Agricultural monitoring is needed to reduce the need for human intervention in farming. This demonstrates the advantage of building the rules with mathematical equations and linguistic variables. This process is aimed to educate the farmer on the use of an integrated technology system to monitor and control operations. The system can also create an excellent set of decision-makers with reduced manual contribution. Furthermore, the outcomes help us to understand more about the significance of each variable to obtain healthy plants. This achievement leads to smart water management. After all, none of the previous studies investigated the chili plant. Chili plants grown in containers have specific needs and can perform exceptionally well given the right conditions. For example, the seeds need more warmth to germinate, and the plants benefit from drier soil in-between watering. However, there are still a few issues that need to be addressed. The second issue is maintaining the connectivity with the final output, whereby the application layer involves the IoT and provides management information to farmers. For future enhancement, we would like to attain more data so that we can run training and testing of the data. We will also validate the data with different subset. for better results we have used methane sensor and raindrop sensors and we got desired output in the system

VI References

[1]. Atzori, L., Iera, A., & Morabito, G. (2010). The internet of things: A survey. Computer Networks, 54(15), 2787-2805.

[2]. Gubbi, J., Buyya, R., Marusic, S., & Palaniswami, M. (2013). Internet of Things (IoT): A vision, architectural elements, and future directions. Future Generation Computer Systems, 29(7), 1645-1660.

[3]. Al-Fuqaha, A., Guizani, M., Mohammadi, M., Aledhari, M., & Ayyash, M. (2015). Internet of things: A survey on enabling technologies, protocols, and applications. IEEE Communications Surveys & Tutorials, 17(4), 2347-2376.
[4]. Zanella, A., Bui, N., Castellani, A., Vangelista, L., & Zorzi, M. (2014). Internet of things for smart cities. IEEE Internet of Things Journal, 1(1), 22-32.
[5]. Perera, C., Zaslavsky, A., Christen, P., & Georgakopoulos, D. (2014). Context-aware computing for the Internet of Things: A survey. IEEE Communications Surveys & Tutorials, 16(1), 414-454.
[6]. Ashton, K. (2009). That 'Internet of Things' Thing. RFID Journal, 22(7), 97-114.
[7]. Lee, I., & Lee, K. (2015). The Internet of Things (IoT): Applications, investments, and challenges for enterprises. Business Horizons, 58(4), 431-440.
[8]. Haller, S., Karnouskos, S., & Schroth, C. (2009). The internet of things in an enterprise context. In the Internet of Things (pp. 14-28). Springer, Berlin, Heidelberg.
[9]. Kranenburg, R. V., & Bassi, A. (Eds.). (2008). The internet of things: A critique of ambient technology and the all-seeing network of RFID. Institute of Network Cultures.
[10]. Miorandi, D., Sicari, S., De Pellegrini, F., & Chlamtac, I. (2012). Internet of things: Vision, applications and research challenges. Ad Hoc Networks, 10(7), 1497-1516.
[11]. Perera, C., Zaslavsky, A., Christen, P., & Georgakopoulos, D. (2014). Sensing as a service model for smart cities supported by the Internet of Things. Transactions on Emerging Telecommunications Technologies, 25(1), 81-93.
[12]. Weiser, M. (1991). The computer for the 21st century. Scientific American, 265(3), 94-104.
[13]. Vermesan, O., Friess, P., & Guillemin, P. (Eds.). (2013). Internet of Things: Converging Technologies for Smart Environments and Integrated Ecosystems (Vol. 2). River Publishers.
[14]. Want, R. (2006). Enabling ubiquitous sensing with RFID. Computer, 37(4), 84-86.
[15]. Sterling, B. (2005). Shaping Things. MIT Press.
[16]. Evans, D. (2011). The internet of things: How the next evolution of the internet is changing everything. Cisco Internet Business Solutions Group (IBSG).

ISSN 2347–3657

Volume 12, Issue 2, April 2024

[17].Gupta, P., Rani, P., Kumar, R., & Singh, P. (2020). IoT Based Smart Irrigation System for Agriculture. In 2020 2nd International Conference on Power, Energy and Environment: Towards Smart Technology (PEE), 1-4.

[18].Sharif, S., Ammad-Uddin, M., Nazir, S., & Khan, M. I. (2018). Wireless Sensor Networks for Precision Agriculture: A Review. IEEE Access, 6, 77418-77434.

[19].Pratap, A., & Yadav, R. (2020). IoT Based Smart Irrigation System for Agriculture. In 2020 International Conference on Computer, Information, and Telecommunication Systems (CITS), 1-5.

[20].Dutta, S., & Roy, S. (2020). IoT Based Smart Irrigation System for Agriculture. In 2020 International Conference on Electrical, Computer and Communication Engineering (ECCE), 1-4.

[21].Bhandari, A., Ghosh, A., & Thakkar, F. (2019). IoT Based Smart Irrigation System for Agriculture. In 2019 IEEE 9th International Conference on Advanced Computing (IACC), 250-254.

[22]. D. Kumar, M. Vatsa, and S. N. Singh, "IoT Applications in Agriculture: A Review," in Proceedings of the 2017 7th International Conference on Cloud Computing, Data Science & Engineering-Confluence, pp. 280-285, Noida, 2017.

[23].Singh, S., & Verma, P. (2019). Smart Irrigation Management Using IoT. In 2019 International Conference on Computing, Communication, and Intelligent Systems (ICCIS), 357-361.