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A REVIEW ON IOT AND ARTIFICIAL INTELLIGENT BASED SMART FARMING SYSTEM USING CLOUD COMPUTING AND WIRELESS SENSOR

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Abstract
The current world population is 7.9 billion and is projected to reach 12 billion by 2050, and it is difficult to support such a population in the future. In order to feed the entire population, agriculture should be equipped with the latest technologies. People living in urban cities will be covered by their work and daily activities, making it difficult to travel around the village and regularly monitor their cultivation. Without proper maintenance of farms, it is difficult to achieve the desired results, so with the help of cloud computing, IOT, networks, wireless sensor networks and many other technologies, crops, weather, water and fertilizer application can be easily maintained and monitored. need. This Smart Farming System is designed using Iot and artificial intelligent system as the main microcontrollers to control various sensors using wireless technologies with the help of cloud computing.

Keywords:
IoT,Wireless Sensor Network,Cloud computing,Artificial intelligent

- **Introduction**

Agriculture is the primary occupation in India and is the backbone of the Indian economic system. Apart from food, agriculture also provides employment opportunities to rural people on a large scale in underdeveloped and developing countries. It is the process of producing food, fiber and many other desired products by growing and raising domestic animals. Agriculture is the primary source of livelihood for more than 58% of India`s population. Climate change will have a significant impact on agriculture by increasing water demand and reducing crop productivity in areas where irrigation is most needed. Irrigation system, rainfed agriculture, groundwater irrigation are some of the methods introduced to produce healthier crops that may not use water efficiently. A smart system is designed for efficient use of water. In the system, the farmer does not have to force the water to flow to the field manually, but the system does it automatically efficiently. Traditional methods practiced by humans can lead to huge wastage of water.

The automation of agriculture began with information technology and crop harvesting. Data collection requires a sensor to collect environmental and growth data and a server to store data, and a farmer adjusts the environment and grows plants based on the collected data [1]. Since the current smart farm is developed based on the greenhouse environment, the farmers`s environment can be controlled by controlling devices such as fans, heaters, and air conditioners installed in the greenhouse. However, most smart farm systems still have difficulty installing additional equipment such as cable communication systems, and environmental sensing andcontrol are limited to greenhouses. Wired communication systems have limitations in distance and location [2, 3], so sensors cannot be installed in large areas of arcs, mountains, seas, or animals in shelter. [4] We want to improve the scalability and usability of the new smart farm system by overcoming the problem of the

application limitations of wired devices in agriculture using a wireless communication module. However, since the current level of wireless
communication system technology suffers from the problem of lack of power, the development of low-power wireless communication module is activated, and with the development of battery technology, the speed changes from the wired system to the wireless system is used.

- **Literature**

This article focused on the use of modern technology to help manage animal husbandry, which means automating farm management in various ways. Manakant Intarakamhaeng et al. [4] studied a farm management automation technology model with RFID, the result; adoption of RFID or radio frequency identification of objects and animals including 5 types of animals: cattle, buffalo, sheep, pigs and rabbits were successfully individually identified and automatically recorded. During the rain, the moisture content can be several times. A raindrop sensor notifies the controller of rain and causes the water supply to decrease or stop depending on the current moisture content. Crop requirements such as moisture quantity, temperature and moisture content need to be studied and can be retrofitted into the controller to suit its circumstances. In this paper, the system uses several sensors that indicate the amount of moisture in the soil, the humidity and temperature of the region, and a sensor that detects rain, which can be used to decide whether a crop is suitable for cultivation. All these sensors along with the NodeMCU are connected to the internet and smartphone [5].

In this paper, the development of information technology (IT) has led to various studies not only in industry but also in agriculture. In particular, IoT technology can overcome the distance and limitations of wired communication systems used in existing farms, and can expect the development of agricultural IT from the automation of agricultural data collection. In this paper, a smart farm system was constructed using Bluetooth Low Energy and Low Power Wide Area Networks (LPWAN) communication modules, including the wired communication network used in the existing farm. In addition, the system implements monitoring and control functions using the MQ Telemetry Transport (MQTT) communication method, which is a protocol dedicated to the Internet of Things, thereby increasing the possibility of the development of the agricultural Internet of Things[6]. In the transitional period of wired and wireless communication in agriculture, this paper implements sensor monitoring and control functions, such as the use of low energy Bluetooth and LPWAN communication modules, as well as existing Arduino-based wired communication methods, and uses the MQTT communication protocol, which is a dedicated IoT[6] leading to a goal that is based on software package engineering and information systems approaches[6].

The article proposes a system for working with four main parts. The first part is the smart sensors, the second is the connecting mechanism, then the actuators that act on the crops and finally the smart board providing the interface for managing the sensors and actuators. The Internet of Things can be seen as a system of interconnected computing devices, mechanical objects, digital devices and living beings with the ability to transmit data within a network without the aid of a physical connection. Accurate farm management based on the Internet of Things consists of smart devices that use embedded processors, smart sensors. Smart sensors can communicate and collect, transmit and react to the data they collect from the environment. Sensors are an essential and integral element in precision agriculture, as this is an increasingly widespread environment in which most devices that collect crop status must be equipped with
unique identifiers and must be able to transmit data over a specific network. A smart sensor consists of at least a sensor, a microprocessor and any communication technology. The three-part design of the smart sensor enables more accurate and automated data sets to be collected with minimal variability. Actuators are a type of mechanical devices that control a mechanism or system by moving itself or by controlling the trigger point of any other device. The paper proposes a precision agriculture system

where several actuators perform agricultural processes based on instructions from farmers via a smart board or sensor output signals[7].

In this paper,the author proposes an IoT based smart farming architecture founded on new EDGE-Fog-IoT-Cloud platform. After giving the design of the overall architecture, we detail the implementation part (hardware and software components). The aim of this platform is to demonstrate the effectiveness of AI techniques to help in making effective irrigation decisions with optimum water usage in smart farming.The main objective of this paper was to design a new EDGE-Fog-IoT-Cloud based architecture dedicated to smart farming. We showed that AI techniques play a pivotal role in agriculture of precision by using machine learning and open sources technologies. One of future research directions related to experiments is to collect the physical parameters of our own farming system in order to collect our dataset and the use of these sensors data along with weather forecast information for developing an algorithm for prediction of soil moisture of the upcoming days. There is also the need to measure the hardware performance at the server level when ingesting data. Meanwhile, we spotlighted the limitations of AI techniques especially in training speed and accuracy balance that may hamper the integration of ML. Thus, more research efforts in this direction are required to fulfill the potential of transfer learning. [8].

- **Proposed System**

The research problem that this study aims to address is the lack of efficient and cost-effective methods for monitoring and managing crop growth in the agricultural industry. Specifically, the problem can be stated as follows:

a) How can IoT, AI, cloud computing, and wireless sensor networks be integrated to create a Smart Farming System that improves crop growth, increases efficiency, and reduces costs for farmers?

b) The proposed solution is to develop an IoT and AI-based Smart Farming System that uses cloud computing and wireless sensor networks to gather real-time data on environmental factors such as temperature, humidity, and soil moisture, and then utilizes AI algorithms to analyze this data and provide predictions and recommendations on crop growth. The system will also provide remote monitoring and control capabilities, enabling farmers to manage their farm from anywhere at any time.

In this research, we will investigate the feasibility and effectiveness of this solution by evaluating the system's ability to improve crop growth, increase efficiency, and reduce costs for farmers. We will also examine any challenges and limitations that may arise in the implementation and use of the system.

- **Methodology**

The methodology is based on three main modules

1) Applications
2) Services
3) Sensors

1) Applications: - The proposed system provides applications like Water monitoring, Disease monitoring, Monitoring of Soil, Crop Health, Equipment used, and other environmental impacts, etc. to the farmers for precision farming.

2) Services: - Services like irrigation, pesticides/fungicides/herbicides, fertilization, preparation soil, etc. are provided to farmers as per the processed data collected from various sensors.

3) Sensors: - For the collection of live data proposed system used various sensors like Leaf Sensor, stem sensor, Temperature sensor, Humidity sensor, Fruit size sensor, pH sensor, etc.

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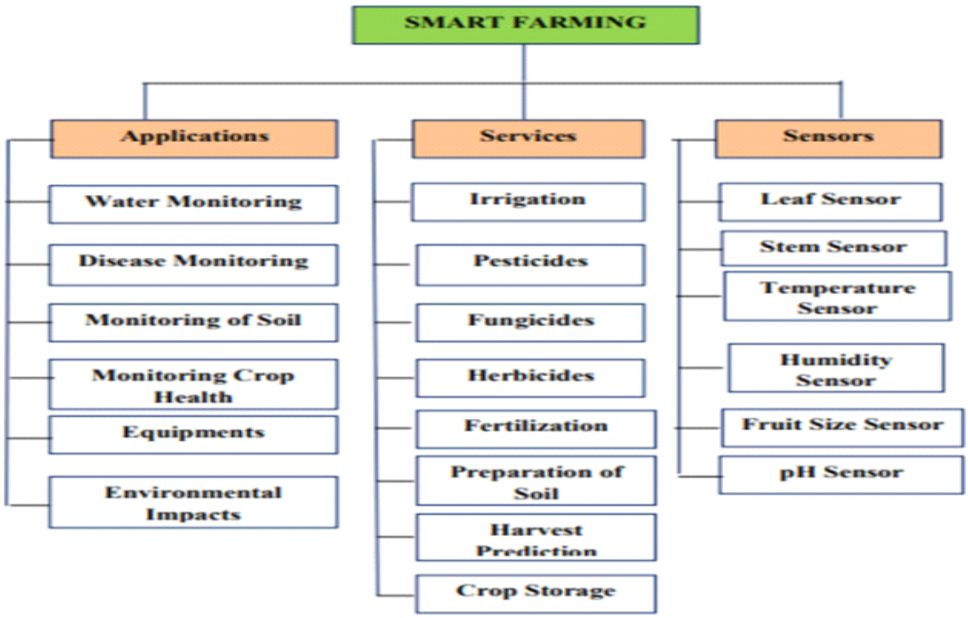

IOT & AI Smart Farming

• Conclusion

In this article, we talk about smart farming using different tools. We also care about how we will achieve this in cloud infrastructure. Different algorithms are used to provide wireless sensor networks. Explore smart farming in a variety of ways. Collect environmental conditions such as soil measurement, temperature, using wireless sensor networks and IoT-based sensors.

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