

“SMART AGRICULTURE SYSTEM USING IOT TECHNOLOGY”

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ABSTRACT

The instantaneous growth of the internet of things (IOT) offers a solution through a network of connected devices that collect and transmit data. This technology in agriculture has revolutionized farming practices, leading to enlarge productivity, reduced resource wastage, and also by improved sustainability. This system also incorporates sensor networks to collect real-time data on soil moisture, temperature, humidity, and crop growth parameters. These sensors are utilized across the field and communicate wirelessly to a central hub, where data accumulation and analysis take place. The proposed smart agriculture system aims to, minimize environmental impact, and contribute to sustainable farming practices in the digital age.

Keywords: Internet of things (IOT), Smart Agriculture, Sensors.

1. INTRODUCTION

The agricultural sector is undergoing a revolution driven by the internet of things (IOT). Agriculture that is considered sustainable is characterized by long-term viability and ecological compatibility in its grain production practice. Sustainable agriculture serves to support techniques and methods that are beneficial to the long-term survival of humans and natural resources. The practice of sustainable farming plays a vital role in the protection of natural resources, the slowing of the loss of biodiversity, and the reduction of greenhouse gas emissions. Precisely when IOT is extended with sensors and actuators, the improvement modify into an occasion of the all the extra wide category of electronic physical structures, which in like manner incorporates headways, for instance, clever grids, splendid homes, canny moving and smart urban groups. All is especially specific through its introduced figuring configuration anyway can interoperate within the current Internet establishment. [1]

In the concept of IOT, billions of physical devices are connected through the Internet, and they are capable of collecting and sharing data. IOT devices have gained massive popularity in numerous systems, such as smart homes, smart healthcare, industrial systems, surveillance equipment, precision farming, and connected vehicles where they can communicate and interact as a cyber-physical system. The idea of IOT-based smart city applications by integrating them in different city places is increasingly becoming popular. For the fulfillment of the smart city vision, a considerable amount of different IOT devices are required for different sensing purposes throughout the city. Moreover, an IOT device needs to provide data depending on sensing time, location, and power. Hence, a framework is required to provide on-demand IOT-based services that can fulfill these requirements to enable different smart city applications. [2]

On the software side, the recent boom in AI and Big Data technologies supports not only the managing of large amounts of data accumulated by hardware modules but also to give this data as input to state-of-the-art, AI-based predictors, which can give more well-informed decisions to the farmer. They can efficiently analyze the latest trends in the data and provide several insights to the farmer. These benefits range from greater crop productivity, saving of tightly managed resources such as water for irrigation purposes, and minimization of the use of toxic chemicals such as those used in fertilizers, pesticides, and herbicides. Such a level of control over agriculture not previously possible gives the farmer greater flexibility and insight to plan his activities, such as determining what crops will result in optimum yield under existing and predicted climatic conditions. It keeps him well informed about his current and projected use of permissible fertilizer and pesticide use. It also helps him regulate the usage of tightly managed resources such as water for irrigation purposes. [3].

In agriculture, environmental monitoring is required to control specific plant conditions. By collecting approximate values of available data and making more accurate estimates, a WSN can be used to achieve this task. In addition, many agriculture researchers apply WSNs to monitor environmental criteria. In addition to standard environmental conditions such as temperature, humidity, and precipitation, data such as the ability to control the water level or temperature level are the subject of research in an agricultural environment. Water management and optimal water supply have become popular topics in the field of smart agriculture and are being studied and developed by many researchers. Over the years, prominent researchers in the field of smart agriculture have written many survey articles which introduce the research methodology for various communication technologies that control resources efficiently based on IOT technology. [4]

2. IOT FOR SMART AGRICULTURE

Smart Greenhouses In Agriculture: The Internet of Things may help enhance yield in smart greenhouses by allowing for the development of proportional control systems. They employ sensors to give a regulated environment for the crops that they grow. The system is monitored remotely, and the data processing is done via the use of cloud servers. While reducing the need for human interaction, the smart greenhouse keeps track of the quantity of temperature, light, and humidity in the environment.

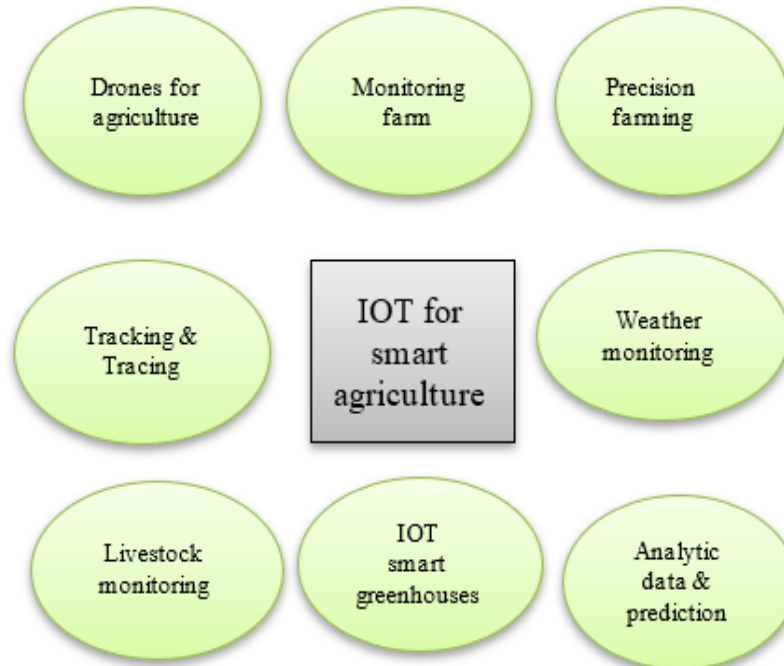


Fig. 1 specification requirements

Drones For Agriculture:

The drones that can operate both on the ground and in the air can help in the evaluation of crop health, the monitoring of infestations, and the examination of soil more efficiently. In addition, they may be used for the collection of real-time field data, the sowing of seeds, the management of irrigation systems, and the spraying of crops. The information that was acquired may be used to make production forecasts, evaluate nutrient levels, and map external impact.

Systems For Precision Farming:

One of the most common applications of agricultural technology is precision farming. It provides services such as variable rate irrigation (VRI) optimization, soil moisture testing, and cloud-based centralized water management. Through the use of sensors, autonomous equipment, and an internet connection, the system makes efficient use of the resource water.

Solutions For Tracking And Monitoring Livestock:

Wireless Internet of Things networks and linked devices may reduce the amount of labours required at the ranch by keeping an eye on the cattle. IOT devices are able to determine the location of an animal and even monitor its overall health. On big farms, the farmers are able to quickly detect the animal and even halt the spread of illness by unscrambling sick animals from the rest of the herd. This helps safeguard the product and keeps the cost of cattle down.

Sensors For Crop And Soil Monitoring:

Robots and unmanned aerial vehicles armed with thermal or multispectral sensors are used to conduct continuous assessments of the state of crops and soil. This makes the application of fertilizer spray and controlled watering easier. The sensors analyze the levels of the various biomes in the soil in order to ensure that the crops have a high nutritional value. Additionally, in order to select the most profitable crops, AI analyses the features of the soil.

Current Weather Monitors:

Smart sensors connected to the Internet of Things can assist gather real-time weather and climate data. Farmers are able to better analyze their crop requirements with the help of a thorough projection. Farmers may also get alerts from some systems, allowing them to safeguard their crops in the event that severe weather strikes.

Robots For Agriculture:

Agricultural robots lessen the need for manual work and save time by performing a number of tasks simultaneously on farms. They assist in agricultural monitoring and harvesting in a way that is more effective than using humans. They have received instruction in AI in order to maintain the crop's quality while also preventing the spread of weeds. These devices are able to sift the produce according to quality and pack it in a far more expedient manner than traditional procedures. The use of AI in agriculture provides assistance to farmers with the goals of enhancing their output and minimizing negative impacts on the environment.

Devices For Estimating Future Harvests And Prices: When estimating the yield of their crops, farmers are using a variety of new technologies, including AI, ML, and big data. When harvest time comes around, it is important to make price predictions by looking at historical data to analyze price fluctuations.

TECHNOLOGY:

Advanced Sensors:

- Sensors for real time monitoring
- Precision farming with data analytics:
- Data driven decisions
- Automation for efficiency:
- Automated fertilization
- Smart Irrigation Systems
- Aerial Monitoring with Drones:
- High-Resolution Imaging
- Livestock Management:
- Wearable Sensors for Animals
- The Future of Smart Agriculture:
- Integration with Robotics

ADVANTAGES

- Increased yields and production
- Reduced labor requirement.
- A large amount of waste can be resisted by this smart farming mechanism.
- Improved sustainability: This will empower the firm remotely to be analyzed adequately.
- Reduced costs.

APPLICATIONS

- They can be used on stairs.
- Used in colleges.
- Shopping complexes.
- Produce energy in remote locations.
- Home usage.
- Street illumination
- Energy source remote locations

3. CONCLUSION

This study has shown that the use of contemporary and modern computer technologies, notably AI and IOT, is crucial to the success of the agricultural industry. Agriculture is often regarded as an essential component to the sustained existence of humans. Improving the efficiency, quality, and quantity of produce in conventional farming by incorporating more contemporary IOT and AI technology into existing farming processes is possible.

In this study, an analysis of the current IOT and AI technologies was carried out using primary research journals in the field of agriculture. In addition to this, it provided a categorization of the most important aspects of intelligent and sustainable agriculture.

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