Review Article on Internet of Things in Smart Cultivation

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Abstract: In olden days Farmers used to find out the maturity of soil and influenced suspicions to establish what kind of yield They did not think about the humidity, water level and especially climate conditions that are increasingly terrible for a farmer The Internet of Things (IoT) is reshaping the agribusiness that empowers farmers through a wide range of strategies, Types include precision as well as realistic farming to tackle field challenges. IoT modernization assists in gathering information on conditions such as climate, humidity, temperature and soil fertility, Crop web-based analysis enables wild plant discovery, water level, Bug location, and disturbance of creatures in the field, production of trimmings, horticulture. IOT uses farmers to communicate with their residence from anywhere and everywhere. Remote sensor systems are used to track homestead conditions and tinier scale controls are used for monitoring and mechanizing the home shapes. Mobile cameras were used to monitor the conditions remotely as picture and video. Developing IoT will reduce costs and upgrade traditional technology effectiveness.

Keywords: Humidity sensor, IoT, Temperature sensor, Soil moisture sensor, Water level sensor

INTRODUCTION

Farming has become more common and important because of the enormous growth in technology. There are various tools and techniques available for agriculture development. According to the UN Food and Agriculture Organization, the planet will need to produce 70% more food in 2050 than it did in 2006 to feed the increasing population of the Earth. Farmers and agricultural companies are turning to the Internet of Things for analytics and expanded production capacities to meet this demand. The Internet of Things (IoT) will play a major role in improving production, gaining a huge global audience, an understanding of recent crop patterns [1]. IoT is a network of interconnected machines that can effectively transmit data without human involvement.

Today many agricultural industries have switched to adopting smart farming IoT technology to improve production, Productivity, global market and other characteristics such as minimal human intervention, time and cost, etc. The technological advancement means that the sensors are becoming smaller, more powerful and more economical [2]. The networks are also easily accessible internationally, so that it is possible to achieve smart farming with full commitment. Focusing on fostering creativity in agriculture, smart farming is the answer to the current challenges facing this field. Using smartphones and IoT apps can do all of that. Farmers may obtain any data or information needed, as well as track their farming sector.

The Internet of Things (IoT) is the most efficient and important techniques for the problem solving. IoT develops from numerous building blocks including

many sensors, software, network elements, and other electronic devices. It's also making data more effective. IoT allows the data to be shared over the network without human involvement. We should reflect things in the Internet of Things in a natural way just like normal human beings, like sensors, like car drivers etc. An IP address is allocated to this device, so that it can transfer data across a network. According to Garner's study, there will be a 30 percent increase in the number of connected devices compared to 2015 by the end of 2016. He further says that, this count will increase to 26 billion by 2020. The IoT technology is more efficient due to following reasons:

- Global Connectivity through any devices.
- Minimum human efforts
- Faster Access
- Time Efficiency
- Efficient Communication

SMART AGRICULTURE USING IoT

Agriculture is the main pillar of India's Economic growth. Climate change is the most significant challenge that exists in conventional farming. The amount of climate change impacts involves heavy rainfall, most extreme storm and heat waves, less rainfall etc. Because of these, productivity is falling to a significant extent. Climate change also raises environmental impacts, such as seasonal changes in plant life cycles. To improve efficiency and reduce the obstacles in the field of agriculture, innovative technology and techniques called the Internet of Things need to be used. The Internet of Things (IoT) is today expanding into the agricultural industry and allowing farmers to cope with the huge challenges they face. Using IoT, farmers can receive tremendous information and knowledge about recent trends and technology.

Figure 1: Role of IoT in Agriculture

In 2022, the demand for smart agriculture is expected to reach $18.45 billion, at a CAGR of 13.8%. BI estimates that in 2020 75 million IoT devices will be shipped for agricultural use at 20% CAGR IoT devices can be of great help to boost production and yield in the agricultural sector as they can be used to track soil acidity, temperature and other variables. In addition, IoT devices can be of great help in boosting agricultural production and yield as they can be used to monitor soil acidity, temperature and other variables, Pest infestation and soil nutrition are important for growth, and provide accurate data that can be used over time to enhance farming techniques. The Internet of Things, with its real-time, reliable, shared functionality, It will bring in major changes to the agricultural supply chain and will provide vital infrastructure for the smooth flow of agricultural logistics. The key advantages of using IoT in enhancing farming are as follows:

- Water conservation can be carried out effectively using IoT without the use of sensors for water wastage.
- IoT helps to track the land constantly, so that steps can be taken early.
- It increases productivity, decreases manual labor, cuts time and makes agriculture more productive.
- Crop monitoring can be achieved with ease to track crop growth Soil management such as PH

Recently, the Internet-of-Things (IoT) has started to affect a wide range of industries and sectors, ranging from manufacturing, health, communications, and electricity to the agricultural industry, to eliminate inefficiencies and improve performance across all markets If one looks closely, one thinks the current applications are only scratching the surface and the real impact of IoT and its uses is not yet being observed.

Figure 2: Major Hurdle's in Technology Implementation for Smart Agriculture

Nonetheless, given this development, especially in the near past, we can expect that IoT technologies will play a key role in various agricultural sector applications. This is due to the capabilities provided by IoT, including the basic communication infrastructure (used to connect smart objects — from sensors, cars, mobile user devices — using the Internet) and the range of services, such as local or remote data acquisition, Intelligent cloud-based knowledge analysis and decision-making, user interfacing, and farm process automation will revolutionize the agriculture industry, which is

currently one of the most inefficient sectors of our economic value chain today. To summarize this discussion, figure 2 highlights the major hurdles of technology implementation in smart agriculture. Researchers and engineers around the globe propose different methods and architectures on the basis of which they recommend a variety of equipment to track and collect crop status information at different stages, taking into account multiple crop and field types. Several leading manufacturers, based on market demand, provide a range of sensors, unmanned aerial vehicles (UAVs), robots, communication devices, and other heavy machinery to deliver sensed data [3]. Furthermore, numerous committees, food and agriculture associations, and government bodies are establishing policies and guidelines for monitoring and controlling the use of these technologies to ensure food and environmental safety.

IoT AGRICULTURAL RELEVANT TECHNOLOGIES

A large number of technologies are being used in IoT agricultural solutions, which makes it difficult to clarify all those because of which our discussion centered on several core technologies that played a vital role in modernizing IoT agricultural services.

Cloud and Edge Computing:

IoT and cloud computing integration in agriculture offers omnipresent access to shared resources. Cloud computing plays a vital role in meeting various agricultural needs on request over the network and conducting operations [4]. Cloud-based software architecture has been proposed which more accurately processes and retrieves information and agricultural tasks. In the field of IoT edge computing, sensors, actuators and many other embedded devices are considered as a solution for facilitating the data

processing at the root of data generation [5]. The foundation of cloud computing is evaluated by edge computing or fog computing. This technology is implemented according to the smart farming features and specifications.

**Big Data Analytics and machine learning:**

Big data consists of a large quantity of critical that agricultural sensors produce. Big data analyzes have multiple and effective methods for tracking crops at different stages. A strong systematic review was given on Big Data Analysis in agriculture [6]. Neural networks are known for offering optimal solutions at a very high speed. Detection of intrusion was conducted using advance concepts and neural network technology. On the other hand, the most important feature of the neural network is that they provide module for detection and training in data. An IoT based hydroponic device has been developed through the use of deep neural networks.

Communication Networks and Protocols:

IoT agricultural network consists of various types of long ranges and short range communications networks. Different IoT network technologies help to develop sensors and tools for a crop or field monitoring. Communication protocols are the backbone for the system and applications of IoT agricultural networks. They are used for the sharing over the network of all agricultural data or information.

Robotics:

Multiple agribots have been developed for smart farming purposes which minimize the number of farmers by increasing the speed of labor through advance techniques [8]. Agribots perform basic tasks such as weeding, spraying, and sowing etc. All these robots are managed with the use of IoT to improve crop production and efficient use of resources. For characterization and ground mapping a multi-sensor robotics approach has been suggested.
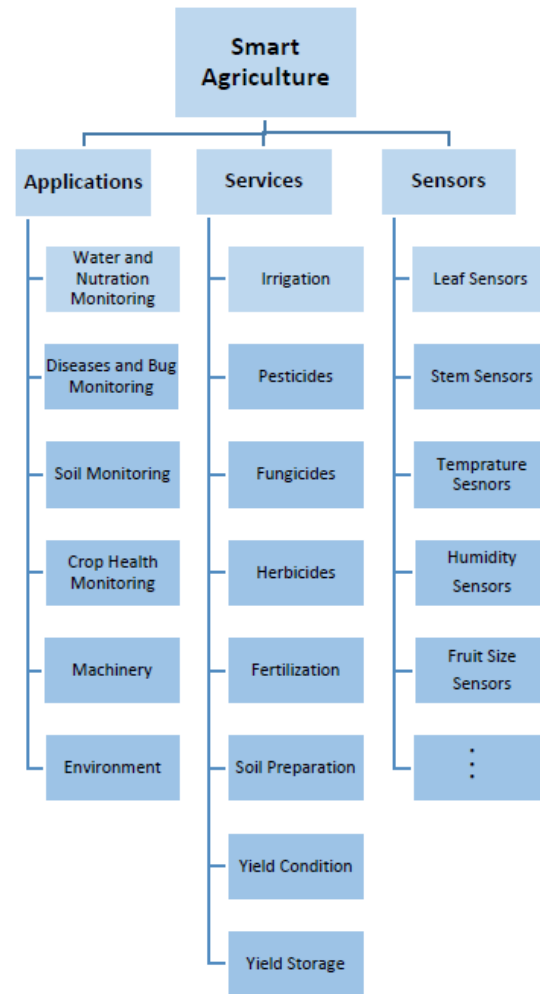
Figure 3: General Hierarchy of Possible Applications, Services and Sensors for Smart Agriculture

MAJOR APPLICATIONS

Each aspect of traditional farming methods can be fundamentally changed by incorporating the new sensing and IoT technologies in agricultural practices. At present, seamless integration of wireless sensors and IoT in smart agriculture will lift farming to levels previously unimaginable [9]. By adopting

smart farming practices, IoT will help to improve the solutions to many conventional agricultural problems, such as drought response, Optimization of yields, suitability for ground, irrigation and management of pests [10]. Figure 3 describes a hierarchy of the main devices, facilities and wireless sensors used for smart applications in agriculture.

CONCLUSION

In the next few years farming will play a vital role in the region. While smart farming is required. The Internet of Things will help to strengthen smart agriculture. IoT works in various fields of agriculture to increase time efficiency, water management, crop tracking, soil conservation, insecticides and pesticides control etc. It also minimizes human resources, simplifies farming methods and helps to achieve smart agriculture. Smart farming, along with these apps, will help grow the farmer's market with single touch and minimal effort. Focusing on smarter, cheaper, and more effective methodologies for growing crops is required to meet the growing food demand of the increasing world population in the face of ever-shrinking arable land. Developing new methods of increasing crop yield and handling can be readily seen at the moment: technology-weaned, creative young people taking up farming as a profession, farming as a way of liberation from fossil fuels, Tracking crop growth, labeling for safety and nutrition, collaborations between farmers, suppliers and retailers and buyers; This paper looked at all those aspects and highlighted the position of different technologies, IoT in particular, with a view to making agriculture smarter and more competitive to meet future standards.

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