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Role of IoT in Intelligent Agriculture Network System

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Abstract. Using an IoT system in precision agriculture removes the need for direct spraying by people, which is the focus of this study. When it comes to better managing agricultural needs, the Internet of Things plays a significant role. Currently, insecticides and fertilizers are sprayed by hand, endangering the nervous system of the sprayer and resulting in countless deaths. Farming in today's world is hampered by a lack of trained labor and rapidly shifting environmental circumstances. Traditional farming methods need to be rethought in order to keep pace with today's agricultural needs. Agriculture automation is therefore necessary, and this can be done via Wireless Sensor Networks and Internet of Things (IoT).

Keywords. IoT, agriculture, sensors, technology

1. Introduction

Nowadays, widespread applications of Internet of things (IoT) have been found in various fields such as industries, smart car, phones and agriculture. IoT aims to transfer and interconnect data with world through internet as a medium. Advanced and fast-growing technologies used in various online schemes uses IoT as a medium to interact with people [1-4]. With the development of new sensor technologies IoT has been growing fast. It is possible to connect remote objects to information detecting devices such as RFDI via the Internet of Things (IoT) (radio frequency identification). Objects, machines, and animals can all be included in the Internet of Things, which is described as a network of interconnected computing devices. IoT has an ability to transfer data from one network to another a network in which there is no contact between humans or computers. Research has been done on world population on recent days [5-9]. Existing researches on IoT also proved that it had performed well by reducing farmer's losses. Food and energy are the basic needs of human beings. As population has been increasing these days the demand for crops is bigger than ever. The climatic changes of today's world are causing extreme damage to crops which leads to global crisis-a problem to be faced by all over world. To overcome all these problems, we use IoT in agriculture field [10-12]. IoT uses sensors in fields to identify the problem and also meanwhile reduces the labor cost. Up to now we think that only a limited area of earth is appropriate for agriculture purposes due to several restrictions such as weather, temperature, environment and so on. But when we introduce IoT it gave a clear note that all yield ground has different features and the only limitation is to take some measures related to that crop [13-14]. WSN is a system consisting of microcontrollers, RF transceivers.

However, when IoT has emerged the use of WSN for smart farming has been totally shifted to IoT as the chief drive of smart farming. In addition to this IoT has an ability to perform cloud computing and it denotes to the information existing to lots of internet users. An IoT monitoring system that uses cloud computing has aided in the growth of modern agriculture. This IoT based agricultural applications provide better results to farmers for their respective crops and reduces global crisis [13-16].

In maximum of the circumstances the differentiation of features in yield area even if the similar harvest is being refined in single field. These differentiations are due to limitations like temperature, soil and so on and these difficulties necessitate a solution, we use IoT based agriculture applications.

2. Literature Review related work

In [1], Farming is varied, ranging from impoverished farm villages to advanced agricultural farms. Production was lost due to a lack of accurate information and communication. In modern agriculture, a number of issues that farmers face will be addressed. As population is being increased the demand for food also increases.so, modern IoT technologies helps to improve food production. It is best because, we can use modern agriculture at any time i.e., it is not restricted for day or night. In [2], in this paper we describe about the system farming for distant control farming process which uses sensors. Sensors are very natural devices and don't necessity any intelligence linked to progression in which it works. These sensors are connected to IoT gateways. IoT gateway acts as a actual time monitor and comment of agriculture developments. After data processing, control signals are produced in these gateways. The long distance in remote control agriculture process is 169MHZ frequency band which is standard for wireless networks. In [3], IoT for agriculture is developed to support precision agriculture. IoT in agriculture contain three layers to process and provide better results in fields. They are 1. perception, 2. transportation, 3.application. In this paper we develop the set of IoT based agriculture applications with the help of experts. IoT for agriculture is mainly used to overcome the diseases caused during plant production due to pests and rapid diagnosis. IoT in agriculture is used to intimate the problems facing by farmers in time. During this agriculture experts give measures to control diseases caused by pests and also helps to increase profit for farmers. Some of the research results are adopted in watermelon planting and cultivation of grapes using modern agriculture technology. In [4], IoT is a basic network of sensors. Wireless sensor networks and wireless humidity device networks are parts of IoT. It is one of significant developments in farming is irrigation. Inappropriate irrigation results in excess of water. Proper irrigation is provided based on WSN technology. In this article, we mainly designate approximately WSN and IoT in farming requests used in green atmosphere. In recent days, research had done on green environment, it clearly shows that involuntary irrigation is better likened to scheduled irrigation. It also proved that there is a normal savage water per tree using IoT in agriculture applications. In [5-7], The original implementation in computer communication is IoT. Because it has extensive diversity of application in project development and agriculture. IoT is an upcoming technology which makes things easier. IoT has essentially increased the remote-control applications to control distant objects. That's why we're thinking about creating an Internet of Things (IoT) solution for agriculture. Controlling agricultural parameters by remote sensing is proposed in this

research. In order to boost output and provide organic farming, this is the primary goal of this endeavor. IoT is also used to monitor parameters like co2, temperature, light with the help of cloud and internet. In [8-9], Nigeria agriculture sector has been playing a lot of attention in recent years to increase its economy. Two key problems facing by agriculture sector are 1. They are unable to meet domestic food requirements.2. they are unable to export products to market at required level. Finally, Nigeria agriculture sector have been proposed IoT and DA to overcome their problems. In [10], Indian agriculture plays a prominent role in means of livelihood. Pesticides used for controlling pests. So, it will increase crop yield. Drones piloted remotely are discussed in this study and for spraying and this spraying system helps farmers to spray pesticides and fertilizers. This structure has a benefit of reducing usage of water and chemicals over spraying. It also reduces human effort and also consumes less time. This concept can be further developed by using cameras and drones, which helps the farmers to sense or observe the crops from distant place itself. In [11], Now a days advanced technologies uses IoT as a major part for better usage of agricultural applications. Main disadvantage for crops is climatic conditions. The traditional method which we use for cultivation has to be modified into modern methods to meet the present demand. Therefore, we use agriculture applications that are managed using IoT. This paper summarizes the usage of modern agriculture methods considering temperature, moisture, which are very useful for decision making in high yield productivity. In [12-13], the basic aim of the population is to shift towards modern agriculture methods. So, this limits natural resources which is the main problem in every country in recent days. An overview of IoT and DA has been presented in this paper. The survey of literature has declared that there been a lot of works going on to develop IoT for preserving live stocks and plants. In [14-16], the development of knowledges has made IoT to come out with great opportunities, but at the same cost of high energy feasting. However, to develop proper infrastructure, an innovative cellular founded licensed technology i.e., narrow band IoT (NBIoT) is introduced. IoT is providing hopeful life in one hand but on the other hand it releases carbon. So, we have to take proper measures for reducing carbon emission.

3. Methodology Analysis

3.1. Work-flow of the system

Many sensors are implemented by using IoT in agriculture applications. These sensors are connected using wireless sensor networks or IoT gateway. After processing the data, result is sent to gateway and then IoT gateway send it out through mobile communication or internet.

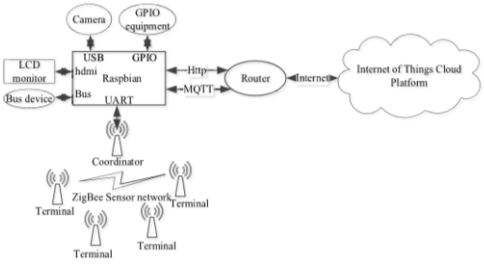

Figure 1. Overall structure of gateway [11]

3.2. Intelligent gateway system

System intelligence hardware plan is the elementary hardware stage, which uses raspberry pi-based networks. In IoT application system IoT is very important. The raspberry pi is open-source hardware which is developed as a hardware stage deprived of any patent rights. It is low cost and consumes low power.

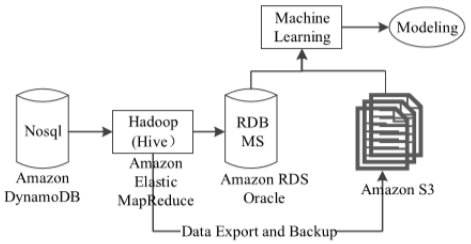

Figure 2. Analysis and machine learning process [11]

3.3. Choice of cloud computing platform

The term "cloud computing" is a hot topic in the information technology industry right now. The importance of IoT and cloud integration cannot be overstated. The Internet of Things (IoT) and cloud computing's strong storage, processing, and service capabilities create a true network between people and things and the things themselves. Despite the fact that cloud computing is defined differently by different people, at the very least a layered architecture is understood by everyone. Because of this, the number of layers isn't set in stone. The hardware is at the base of the stack, followed by the software platform and then the software layer itself. Each layer provides a service to the layer above via well-defined APIs. IaaS stands for Infrastructure-as-a-Service, and is followed by PaaS (Platform as a Service), and finally, SaaS (Software as a Service) (SaaS). This stack relies heavily on data, and giving data as a service to the geospatial world has a lot of potential. There is less discussion on DaaS compared to the other tiers. Data availability as a service, especially for geographical data, is becoming increasingly important as many companies now provide cloud-based services at one or all of these levels and the research community is eager to take use of the cloud's possibilities. For example, DaaS is based on the idea that valuable data can be provided through the internet and paid for by the user as an internet service. Precision agriculture relies heavily on WSN (Wireless Sensor network), a common technology. In order to keep tabs on a given area and gather data related to an application, it consists of multiple small nodes connected via wireless networks. Communication between sensors and network services is managed by the network. Structured and non-structured WSNs exist and less of a framework: It is tough to maintain and discover errors because the nodes are deployed ad hoc. Sensor nodes in designated zones have a low-maintenance cost compared to sensor nodes that are not structured.

As shown in Figure 4, a wireless sensor network (WSN) node consists of six basic components, including a sensor that converts a physical quantity into a digital signal, an amplifier that boosts the signal to the desired level, an analogue to digital converter

(ADC), and a microcontroller that monitors parameter changes and controls local processing operations.

Figure 3. Cloud computing system

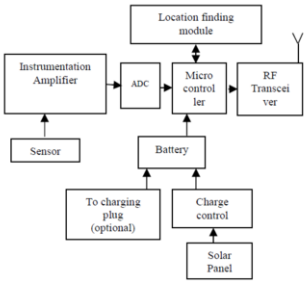

Figure 4. Sensor's applications for wireless applications

4. Conclusion

IoT Research on how smart agriculture technology enhances worldwide linking of All gadgets have been tested for faster access time efficiency as well as efficient communication efficiency. The wireless sensors can provide farmers with reliable information on the weather, soil moisture content, and temperature, allowing them to make more well-organized use of their properties, also. The use of PIR sensors for animal and bird scares is beneficial. Physical soil wetness instruments are vulnerable to physical outbreaks, however they may be changed by evaluating the soil wetness by means of photographs of the ground. Scheduled data transmissions between sensors and the base station save bandwidth. Early detection of agricultural illnesses is made possible by constant monitoring of the crop's progress. Farmers can avert big losses by making quick decisions thanks to this.

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