

Use of IOT for Smart Security Management in Agriculture

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Abstract - Agriculture can be considered as one main economic field in Sri Lanka, also it's same for the other countries in the world. As with the increase of the population, the demand of the agriculture production is also increasing. Agriculture field face numerous difficulties, among them Agriculture security is the main issue affecting to it now a days. The main objective in this research paper is to introduce sophisticated methods to get accurate decisions combine with the modern technology to increase the security in agriculture areas and to enhance the agricultural productivity. Also, by using Internet of Things and develop the gadgets to detect the information related in the agricultural areas and give the efficient and effective solutions for smart security management in agriculture.

Key Words – Internet of Things, Agriculture, Security, Difficulties, Productivity, Monitoring

I. Introduction

The Internet is a network that connected in globally. The Internet of things are referring to wireless connection between the objects that are connected with the internet and transmitting of data and information with each other. IOT is represent by the things in the real world which are sensitively connected in wired, wireless or wireless network [5]. Agriculture is the field of cultivating the plants and livestock [1]. The history of agriculture is going back to thousands of the years. In the agriculture security, plant and animal protection are some of important thing under that. with the increasing of the population in the world, while demand of the agriculture automatically increasing.so this field faced and facing various type of issues because of less security and this is a common problem in worldwide agriculture [6].

The development of technology and as a result of globalization, agriculture section also has been improved. The smart security in agriculture with IOT is supported to reduce the wastage and to increase the productivity of the crops [2]. In this case Internet of Things are effective and have the efficiency to manage the security in agriculture firms. Agriculture is very essential thing and the internet of things helps to identity and solve the security issues related in agriculture.

In the development of the technology Internet of things is a better solution for the agriculture security. Using the camera, wireless sensor network and GSM modules to design an online monitoring system to the agriculture areas and get the information then send these data to the farmers through the internet [2]. Design a sound system(noise) to detect the animal which enter to the agricultural areas [6]. Also reduce the man power using the livestock management and using of the tags (embedded with GPS) to animals help farmers to monitor no of resting hours of each animal at the grass areas [1]. To enhance the agricultural productivity, can introduce a network to measure climate changes using IOT and embedded systems. By using it we can design a crop prediction system to identify each crop related with time period specially using the three parameters like soil PH value, soil temperature, soil moisture respectively [9]. Also, the agricultural water management, weather forecasting, cannel management, grain stores management, crop production management etc. can be monitor using IOT sensors and network technologies with the help

of mobile application and desktop applications which are connected to the internet [8]. So, farmers can monitor every detail without accuracy issues, risk and time wasting.

II.OVERVIEW OF USING IOT TO ENSURE SMART SECURITY MANAGEMENT IN AGRICULTURE.

Internet of things is one of the major steps in the development of the technology. Using the modern technology methods, IOT has an ability to connect the physical things and virtual things together in the world. IOT networks are classified on people to people, people to things, things to things [5]. Mainly There are three categories classified in IOT devices as Wearables, Smart home devices and M2M (machine to machine) devices [18]. Wearable devices which are usually connected via Bluetooth and the internet. Smart home is also a main part of the IOT devices connect to the internet via using wireless communication and home routers. In the third category of IOT devices are M2M devices which are directly connected to the cellular networks.

In the security of agriculture field, IOT enables with some of the following discussed technologies.

1. Cloud computing

Mainly when consider cloud computing there are several types,

- software as service (SaaS)
- infrastructure as service (IaaS)
- platform as the service (PaaS)
- information as an administration (DaaS)

There are five main values include in cloud computing as below,

1. Initial cost can be minimized
2. Resources cab be allocated without limit
3. As maintenance and upgrades are done in backend it won't collaborate with other parts in the cloud
4. possibilities of global service development

5. Risk can be minimized [20].

The farmers who are working in the agriculture field can monitor, analyze, and get decisions by using that data collected from the cultivation [4][9]. Farmers can get various type of services from the cloud by using the mobile devices, sensors, scanners etc.

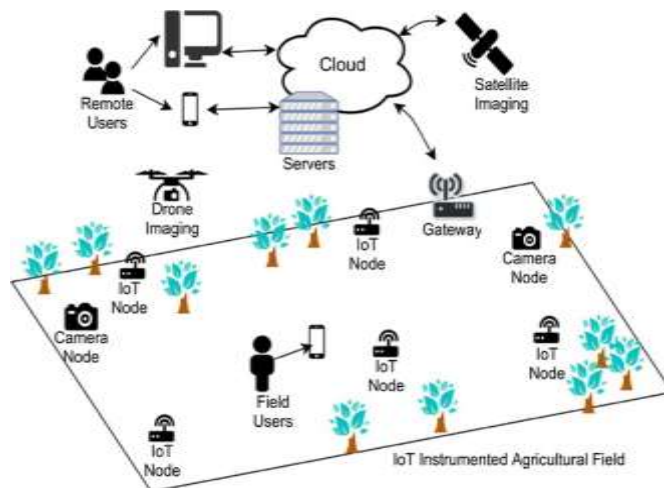


Figure 1.0

2. Using Sensors

Sensors can be used to measure the weather, soil moisture, soil temperature, fertility of soil, PH value of the soil to identify whether each crop's suitable time period of growth and cultivate areas That is very useful for get maximum output from the production and minimize the wastage of the natural and human resources [8]. And also, we can design sound system by using sensors to detect the animals who are entering the cultivating areas, and then by it can ensure the security of agricultural areas [2]. Same as with the help of sensors and get parameters like pH, conductivity, temperature, turbidity to measure the quality of water [18] [22]. So, use of sensors (Ultrasonic sensor, IR sensor, Moisture Sensor, Humidity sensor, Temperature Sensor, Gas Sensor, URD Sensor, DHT Sensor) with the help of other controller gadgets to gather the details to protect the agriculture areas. [3] [6] [16] [23].

3. GPS tags

What is GPS?

GPS or **G**lobal **P**ositioning **S**ystem is a navigation system with space based. GPS provide real time details and location information, enable with all weather conditions with anywhere. So that GPS help to farmers to increase the production, manage the land resources [1]. And also, it helps to monitor the animals .it is easy to use GPS and can get decisions about animal farming without using lot of man power instead [3].

4. GSM Module

What is GSM?

GSM or **G**lobal **S**ystem for **M**obile communication is mainly use in mobile phone system's and that is a digital mobile network. As the wireless network use this GSM system so that farmers can monitor the water, soil, weather, temperature etc. and get the details using mobile application through the internet. So that is very easy for the tighten up the security for agricultural areas [1].

5. Web Camera

For ensure the quality of an agricultural product, security of those fields is one of the most important facts. Farmers can use video surveillance systems easily in their agricultural areas to give the customers very fresh and quality product at the end with smooth running and operating of those farming premises While protecting animals, equipment and facilities from harm and misuse. So, to fulfill this task web camera is a very good equipment as it can capture the images of any harmful rodent in seconds when IR sensors detect any motion. And also, modern web cameras can directly send these data to a server directly.

III. MAJOR RESEACHERS IN USING IOT WITH SMART SECURITY MANAGEMENT IN AGRICULTURE

Various types of research papers were studied to identify the area of agriculture security by use with the Internet of Things. In this section main focus is on researches' which have already been done.

According to the team of (Jeet Sanghavi, Alay Shah, Saurabh Rane, Naitik Shah, Siddharth Nayak, Poonam Kadam Dwarkadas J. Sanghvi College of Engineering, Mumbai, India) research in India, along with the three soil parameters like moisture, temperature and PH value they did an experiment to build a crop prediction system and to identify each crop's related time period [1].



Figure 2.0

The research about Smart Security for agriculture using IOT by Prabavathi , Department of ECE, SVCE, Tirupathi, used current IP based CCTV cameras to design and organize a network to monitor the remote areas and then examine the transmitted data through the remote areas. Also using the LM35 IC temperature sensors, Moisture sensor, Humidity sensor, Obstacle sensor (Ultrasonic), Raspberry Pi and Raspbian Operating system the able to measure values for parameters and to get decisions based on that [2].

According to the Mahammad Shareef Mekala and Dr P. Viswanathan's research about Smart Agriculture IOT with Cloud Computing, has discussed IOT, cloud computing with the agriculture. They have done a survey on usage of smart irrigation systems to get a good knowledge about IOT based

research and development combined with cloud computing in the field of agriculture. And using wireless networks with the help of intelligent software applications, farmers can get the details and analyzations. With the use of GSM, it has help to increase the security of agriculture [9]. Dr. Veena S, and students of Mahesh K, Rajesh M, Salmon S in India conducted a research about IOT and smart agriculture. This has mainly base on water management [7]. The Level of water inside tank is maintain by using sensors and the details were sent to the client via mobile application. Farmers can view the details easily without physical effort also can control anywhere anytime.

IV. CURRENT ISSUES OF IOT WITH SMART SECURITY MANAGEMENT IN AGRICULTURE

In the development of the IOT things which is directly support for security in agriculture field. As it helps for the enhancement of productivity and increasing security using that IOT things there are also some challenges and difficulties. When they cultivate crops to get new production, mainly have to identify the specific time period for each and every crop which are being cultivated. If that details not collected properly that can be cause for unpredictable issues. Maintaining the animal using IOT gadgets another challenge that we face today [1]. Improving the web accessibility and availability in throughout anywhere in any country and IOT the lack gadget buyers and sellers are also challenging [2]. Based on the unpredictable reasons rural areas faced lot of difficulties and security issues related to the agriculture, so the farmers who are living in the rural areas have demotivated about the agriculture, because decrease of the productivity. Also, the main challenge is introducing modern technologies to rural areas and transformation from traditional technology to modern technologies [3] [10] [11]. Gathering information which are located in agriculture areas correctly and efficiently to get better output [6]. While doing the researches the survey costs are high also the collecting of correct data is big challenge [8]. The infrastructure cost is

very high. The maintain cost of the database is high because the original data size may be very large. Then the maintain and performance cost related problems can be occurring while doing the researches [9]. After introduced modern security methods to protect the agriculture areas because they have lack of knowledge about the IOT, then transformation of the farmers from traditional agriculture methods to modern agriculture methods and giving the knowledge to get proper understanding about those things also challenging [19] [23] [24] [25]. So, improvement of the educational level of users and those new things apply to the rural areas are big challenges [14]. Creating the standards for modern technical equipment for market is an essential thing [12]. Size of farm area and basic investment costs and the lack of processing power and data governance are the main issues related with this [17].

V. APPLICATION OF USING INTERNET OF THINGS

Simultaneously, along with the new technology, IOT or internet of things are using in many fields today. Smart home, economics, women and child care, transport, smart energy, smart waste management, smart manufacturing, smart environment, smart business process, smart education, smart city etc. [5] [21]. IOT technology can use everyone in anytime and anywhere for everything. Step by step increasing of the usage of IOT, immensely facilities the world drive towards to the modernization [13]. Everything can produce in easy ways, time and cost effectively and efficiency without huge effort of the user. while increasing the usage of internet, the IOT applications have also improved.

IOT Application Ranking in 2018

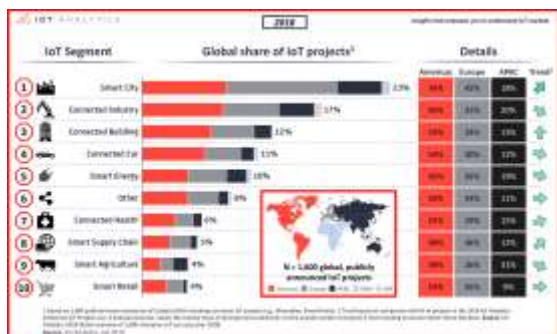


Figure 3.0

VI. CONCLUSION

Agriculture is one of the most important economic field in worldwide. But the main issue to it is the security related to that the field of agriculture. With the development of the technology using the IOT for the agriculture can enhance the productivity and give the protection to these farming areas well. With the help of IOT gadgets famers can get accurate, precise data and information in best efficiency and effectively without huge effort of the user. Then farmers can get good decisions about the cultivation using those details. So, these details will help not only the individually, also to the private and public organizations. And the main fact is that until finishing or applying the IOT completely, cannot get expected output.

The below table shows the current issues, challenges, and future direction identified from the research papers.

Title of the Research Paper	Aim & Problem(s) addressed	Limitations / Challenges / Drawbacks / Problems	Future Directions
Agricultural Productivity Enhancement System & Livestock Management using Internet of Things ²	Global warming is a main issue in agriculture field the main objective is to introduce a sophisticated method to enhance the agriculture productivity while those climate changes using IOT and embedded systems.	Identify the specific time period for each and every crop which are cultivated. Maintain the animal	This projects database can be used for the future analysis.

		using IOT gadgets.	
Smart Security for agriculture using IOT	To solve that security issue plan to use IOT based devices to gather and send data to process and execute the solutions	Low availability of necessary frameworks to gadgets. Higher prices and lack in the market	improved using the machine learning to reap out the best security
Internet of Things (IOT) for Precision Agriculture Application	In this project main objective is to develop a cloud based agricultural monitoring and manipulation system devices are using to monitor and get the data	As a result of globalization and urbanization the growth of cities is immense so day by farming areas be coming smaller and smaller.	This system can be Improved hugely as we can use the mobile app to give alerts when particular parameter is not the point
IOT embedded smart monitoring system for agriculture	Still many farmers use traditional agricultural methods which are slow and not precise and accurate when it comes to size of crops, quality, time period etc. Goal of this project is to increase the quality, amount of the crops while keeping the cost at low by using of smart monitoring system which monitor's the soil temperature and moisture, ph. level, humidity, storage level, rainfall	Converting to traditional method from new systems.	This system can be integrated with solar power running and irrigation monitoring in future.
Smart Farming concept by using of IOT based security and monitoring system.	by using suitable actuators sensors proper IOT devises we can form a proper system to acquire data about soil quality and plant status easily and can minimize the wastage of the resources such as water by controlling it as needed.	Main problems can be identified like, spoofing unauthorized access, DOS etc.	Can be developed using the machine learning techniques.so by providing large database and feeding continuously decision making can

			be take into a very accurate level.
The Internet of Things in Agriculture for Sustainable Rural Development	Main objective in here is to how we should use the IOT technology to improve the management of food, crop, increase the quality of agriculture and water ,wildlife preserve ,forest preserve in rural areas in order to develop those habitats but keeping the nature without any harm.	Acquiring the necessary data and implementation.	Will help to uplift the standards of the rural areas Boost to national economy
Internet of Things based Expert System for Smart Agriculture	Agricultural sector is empowering and evolving with the latest methods of information technology. So, here all the efforts are being made to enhance and increase the productivity while reduce losses by using a state of the art IOT tech and equipment.	Lack of equipment and machinery. Expensive devices. Lack of knowledge among the traditional farmers	In the future there will be actuators which will be deployed in the fields and the functionality of the server will be enhanced using artificial neural network, image processing and genetic algorithms etc.
Smart agriculture by using of IOT based security and monitoring system.	In here objective is to implement an automated system which is able to eliminate threats to the crops by reducing the human intervention drastically. The major aspects will be on providing favorable atmosphere for plants.	Cost of machinery and the cost of maintenance.	This project can further develop for detect plant diseases and crop theft also
Smart Agriculture using Clustering and IOT	Main objective in this project is to implement IOT to ensure security in the field of agriculture. Main aim is to collect the information from multiple locations in the farm. Using a mobile application farmer can access to the data at any time .in here cloud-based system will be used.	Lack of knowledge in technology and weather changes. High machinery cost. Poor ICT infrastructure and literacy.	This system can be developed further in order to focus on each crop individually.

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Table 1.0

VII. FUTURE DIRECTIONS OF USING IOT WITH SMART SECURITY MANAGEMENT IN AGRICULTURE

When the starting of the IOT with smart security in agriculture, is still developing step by step. So those improvements can be successfully added to the agriculture field. In the future, farming can be developed using the machine learning and deep learning techniques.so by providing large database and feeding continuously decision making can be take into a very accurate level, can be taken to next level by introducing automated harvesting system, irrigation control and self-charging using solar, develop reliable sensors and algorithms for efficient and effective security of communication. The apparatus can make into one design given credit for carefully worked designs for machine learning and to see what is different protests and sort them into persons in general, animals of rat family and warm blooded living beings and sensor should be possible to make usefulness of the gadget and as the part of the oranges it can be utilized and executed this to be as security arrangements [2]. In the future there will be actuators which will be deployed in the fields and the functionality of the server will be enhanced using artificial neural network, image processing and genetic algorithms [19]. In father improvements hope to detect plant diseases and crop theft also and get better security for the agriculture [21]. To get better production from crop areas, IOT system can be developed further in order to focus on each crop individually [24]. So, with the use of IOT for security in agriculture field that will play a positive 1 part in the development of the little cold farming products supply chain in the future

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