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Performance and Accuracy Enhancement of Cloud Environment During Precision Agriculture

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ABSTRACT

In precision agriculture, the data acquired by sensors are classified into groups according to a variety of parameters, including the existence of animals, the degree to which soil nutrition is present, and the quantity of soil moisture. In the event that any unfavorable conditions take place, a signal of warning will be sent. On the other side, if the conditions are right, the surgical procedure won't be done at all. Several recently concluded research projects related to intelligent solutions for healthcare and agricultural problems have made use of a variety of techniques from the disciplines of cloud computing, IoT, and wearable robots. These methodologies were used in the study. Enhancing the performance and accuracy of cloud environments for use in precision agriculture is the primary emphasis of the research being done at the moment. The problem-solving aspects of the area have often been the focal point of the study that has been carried out in relation to this issue. Despite this, there are still many obstacles to overcome with regard to the implications of cloud computing and agricultural precision. One of these challenges is the necessity of including an accuracy mechanism in order to ensure the integrity of Agriculture precision while it is operating in an environment that includes Cloud Computing. This is a necessity because one of these challenges is the necessity of including an accuracy mechanism. In addition to this, the traditional approaches to research need to be enhanced in order to deliver a greater degree of accuracy.

Keywords : Agriculture Precision, Intelligent Solution, Cloud Computing

I. INTRODUCTION

Agriculture Precision

PA management considers both inter- and intra-field differences in crop yield. At the tail end of the 1980s, progress was made in both the theory and practise of PA. PA experts have set out to develop a DSS for farm management that would maximize returns on inputs while minimizing waste. The phytogeomorphological method is one such strategy; it correlates landscape features with the qualities and consistency of crop development over the course of many growing seasons. Because geomorphology often controls the hydrology of farmland, the phytogeomorphological method is useful. Improvements in satellite navigation systems like GPS and GNSS have facilitated precision farming. Researchers and farmers may use maps to measure the geographical variability of a variety of parameters, including pH,crop yield,soil moisture, topographical characteristics, nitrogen levels, magnesium levels, and more. Similar information is gathered by the sensor arrays in the harvesters equipped with global positioning systems. Incorporating real-time sensors and multispectral imaging, the arrays allow for continuous monitoring of plant and crop water and chlorophyll levels. Utilizing satellite photos and data collected from seeders, sprayers, etc., VRT efficiently disposes of the resources. However, thanks to advances in technology, real-time sensors that can communicate without human intervention may now be installed wirelessly in the soil.

Unmanned aerial vehicles, or UAVs, have revolutionized agriculture by providing a cost-effective and user-friendly method for achieving pinpoint crop yields. Orthophotos may be made by using a variety of photogrammetric techniques to combine multiple large shots acquired with multispectral or RGB sensors placed on agricultural drones. Vegetative indices such as NDVI maps can only be analyzed and evaluated with the use of multispectral photographs, can have a lot more than just the basic RGB values per pixel. Drones are used by certain programmers to carry out complex algebraic map computations, taking pictures and gathering a wealth of data about the terrain, including its topography, altitude, and other features. As a consequence, precise maps of the area may be made. Once the connection between the environment and a plant's health has been mapped, several applications may be used to ensure inputs like water, chemical fertilizers, herbicides, and so on are provided.

1.2 Challenges

Connection problems are a major hindrance to the adoption of new technology by farmers. Despite the fact that there are over 90 million people who use the Internet (as reported by internal studies), we lack detailed information on how farmers make use of the web or smartphones in the agriculture sector. Large agribusinesses often use these methods, although small farmers are frequently unaware of their existence. 680 (or 68%) of 1600 American farmers surveyed regarded themselves to be Internet of Things beginners. The adoption and use of these technologies will be more challenging for smaller farms that are responsible for growing a greater diversity of crops. However, the investment required to create and maintain such technology would be significant. The cost of agricultural software and hardware goes substantially when it is damaged by factors such as high temperatures and humidity, heavy rains, strong winds and sand, and direct physical impact. As a result, deciding on the most effective approach for the firm would be a challenging task. A sound Internet of Things business plan is necessary in order for any agricultural goal to be realised. The second issue is ensuring that all of our electronic records are kept secure. It is vital to monitor and safeguard all linked devices since there is a risk of theft and abuse, as well as changes in product price and expenditures. The last hurdle is represented by the insufficient number of competent personnel. It would be difficult to evaluate and make sense of the information acquired and produced by such gadgets. Increased production has been possible for producers of agricultural equipment thanks to the use of tools and tactics for data analysis that make use of cloud computing. In spite of advances in technology, the agricultural industry continues to place a significant amount of reliance on outmoded systems, which only rarely provide sufficient levels of data backup or security. For the purpose of more accurate data collecting, some field observation drones, for example, may be attached to agricultural machines. These devices, which are often connected to open networks as well as the internet, frequently lack even the most basic types of security, such as the capacity to monitor user behaviour or need of a second authentication factor for remote access.

II. LITERATURE REVIEW

In an effort to make cloud services more secure, several research have been undertaken so far. This article discusses a few of these topics. After reviewing many scholarly articles covering various issues, we settled on the focus of our investigation. In [1], researchers discussed cloud computing and how to bring its capabilities to the network's edge via fog computing. Fog computing, the next logical step in the evolution of distributed computing after cloud computing, is discussed in [2], and is said to be gaining increasing relevance and use in the present day. It is with the intention of solving problems associated with cloud computing that a whole new method, known as "fog computing," has been established. Both Yunguo G., et al. [3] and Jiyuan Zhou [4] analyse the development of cloud computing and conclude that it has a major impact on the IT industry. As the cloud computing market has grown, a wide range of cloud-based solutions have emerged. First described in [5], fog computing was developed by Mohamed F. Mohamed et al. They thought about how this innovation may help cloud computing in the future. Although cloud computing has made it easier to acquire computer resources over the Internet on a pay-as-you-go basis, these proponents argue that fog computing will enhance the simplicity and flexibility of computing. The authors of [6] discuss the widespread use of cloud computing outside the IT sector. They claimed that we could get highly adaptable computing resources in the cloud at a low per-use price. Another advantage of cloud computing is its potential to forge a fresh connection between internal IT departments and business units. As was previously shown in [7], high resource utilisation is a critical goal in the context of equipment sharing, and this point technology is a key enabler in achieving that goal. Because it is difficult to accurately predict the performance of many applications working together, actual utilisation often remains low. In addition to the most advanced illustration of its n-tiered usage, we also present an experimental technique for testing. Issues of this kind have already manifested because of reshapable realms. According to Zhao & Liu [8], information security for WSNs was a major research focus. This research proposes a technique for dynamic key management that makes use of the second-level cluster-to-node authentication matrix. The approach incorporates both an asymmetrical public key system and a threshold key scheme. An EGKMST as well as cluster-based wireless sensor networks were suggested by Diop et al. [9]. When developing a key management and distribution strategy for a sensor network that makes use of pair-wise & group-based threshold key cryptography, it is strongly suggested that the hierarchical cluster structure of the sensor network be taken into consideration. Bao et al. [10] provided a concise summary of the updated approach. Key transmission in a WSN relied on Author, and ECC was implemented in the data transmission channel. Key distribution security was ensured by isolating it from the transmission channel. Abdallah and his colleagues were concerned that the security of WSN might prove to be a problem in a variety of contexts. This technique of key exchange has been shown to be both successful and easier to implement than its predecessors [11], due to the reduced number of communications and processing steps necessary to complete the operation. The concept of WSNs with a fixed set of resources was first proposed by Patel and Gheewala. Target tracking, battlefield surveillance, and even environmental monitoring are all potential applications. In this way, they may potentially maximise ESKM while minimising power consumption by picking CH dynamically for each round & sending messages through CH [12]. This has the potential to improve the ESKM and make it more eco-friendly. They were encouraged by Hemapriya & Gomathy to zero down on clustering techniques. The author created a clustering method [13] based on the decisions made by individual nodes. The study centred on a comprehensive type of control message reduction for MANETs' cluster-based P2P file searching. Raut et al. were the first to express concern over India's rapidly expanding population. With a monthly growth rate that was increasing, the researcher had reached 1.2 billion people within 25 to 30 years. The possibility of a severe food shortage has increased the importance of agriculture [14]. The soil moisture (MC) probe, the soil temperature measuring equipment, the ambient temperature sensor, the environmental humidity detecting device, tCO2 sensor, & sunshine intensity device were all provided by Keswani et al. [15]. The author took the architecture of the WSN into consideration. During the course of their laboratory investigations, Feng and his colleagues considered a diverse assortment of agricultural use cases. This study was conducted with the aim of developing wireless communication technologies for precision agriculture that were practicable, realistic, and acceptable [16]. Thakur et al. [17] looked at surveillance in a variety of fields, including agriculture, engineering, and even scientific research. The purpose of this research was to investigate the various WSNs technologies that are used in precision agriculture and to analyse the impact that these technologies have on modern agricultural practises. According to Lalitha and Umarani [18], wireless sensor networks (WSNs) have a variety of applications outside of engineering and research, some of which include agricultural and military monitoring. In this study, they provide an essential cluster-based strategy for organisational management. Gómez-Chabla et al. conducted research on the shortened "digital gap" that exists between farmers and IoT technologies. In order to achieve future productivity increases in environmentally friendly food production, improvements in water use as well as input and treatment efficiency are required [19]. Mittal [20] contemplated using a technique called Energy Efficient Stable Clustered Routing that was based on Moth Flame Optimization. It has been shown that the Internet of Things has an effect on precision agriculture by Khanna and Kaur [21]. It was proposed by Naresh et al. [22] that large-scale wireless ad hoc networks may benefit from a secure cluster-based hybrid hierarchical group key agreement. In the context of precision agriculture, Dewi and Chen [23] investigated the significance of decision-making in the process of accumulating data from IoT devices. Concerning the use of internet of things-based sensors to the field of precision agriculture, Gsangaya et al. [24] conducted research. In this regard, Symeonaki et al. [25] comes to mind. The context-aware middleware cloud strategy that is being taken by in order to integrate precision farming equipment with the Internet of Things for agriculture was the primary focus of attention. Gautam and Kumar [26] conducted a comprehensive research on the key management, authentication, and trust management strategies for wireless sensor networks (WSNs). Internet of Things; Energy Efficient Cluster-Based Routing for Wireless Sensor Networks Achieved Through Hybrid Particle Swarm Optimization, As Presented by Senthil et al. [27]; P et al. [28] made the suggestion that fog nodes should engage in collaborative load balancing. The most significant advantage was that time-sensitive queries could be performed even when fog nodes were at capacity. This was a significant advantage. A method of routing that is based on encryption and is capable of encrypting both the picture and the data that is linked with it was developed by Dankan Gowda and his colleagues [29] in order to increase efficiency even more. Ara et al. [30] developed a technique for evaluating several facial recognition and identification algorithms, which boosted the safety and dependability of online transactions.

III. PROBLEM STATEMENT

Several researches focus on the management of cloud computing for precision agriculture. To be effective, though, cloud computing must be included. Users should have access to the practical implementation of agricultural precision via a cloud-based, web-based interface. There can be no compromises in data security during transmission. Sensing data is filtered by parameters like livestock presence, soil nutrition, and soil moisture to achieve greater accuracy in agriculture. If there are any unfavorable circumstances, an alert will be generated. Conversely, the operation will be postponed if the preconditions are met.

IV. Proposed Research Methodology

The presence of animals, soil nutrition, and soil moisture are the three main factors used to classify sensor data in precision agriculture. In the case of any unfavourable situation, an alert will be sounded. On the other hand, when optimal circumstances exist, no action is taken. Recent studies on Smart Agriculture Solutions have made extensive use of Cloud Computing techniques. In previous studies, researchers frequently aimed to find answers to existing issues. Despite this, there are a few challenges brought up by the Implication of Cloud Computing for Smart Agriculture Solution. One of them is the necessity to implement an accuracy mechanism to guarantee the honesty of the Smart Agriculture Solution even when it's being run in a Cloud Computing setting. Research methods that have been used traditionally also need to be more precise.

V. Conclusion

Data collected by sensors in precision agriculture is organised in three ways: by the presence or absence of animals, by the availability of soil nutrients, and by the amount of soil moisture. A notification will be sent if there is a problem. However, when conditions are favorable, no action is performed. Recently published research on "Smart Agriculture Solutions" has taken use of Cloud computing. Long studies have concentrated on the field's problem-solving aspects. However, the Implication of Cloud Computing for Smart Agriculture Solutions presents a number of obstacles, including the need to provide an accuracy mechanism to guarantee the integrity of Smart Agriculture Solutions when deployed to the cloud. Additionally, standard research techniques need increased accuracy.

VI.Scope of Research

Precision agriculture might lead to more effective use of inputs including herbicides, fertilizers, tillage, and irrigation water. More effective use of inputs has the potential to increase agricultural output and/or quality while decreasing the industry's total environmental impact. If precision agriculture is to be given more weight in policymaking, more research along these lines is required. In addition, deep learning's threat classification helps guarantee confidential data transfers, and picking the right people to lead each cluster is key to peak efficiency. The.NET-based, user-friendly web interface has potential to collect images from a wide range of cloud nodes deployed in a farming environment.

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