SMART FARMING AGRICULTURAL USING INTELLIGENT IOT EQUIPMENT

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ABSTRACT

With the growth of the human population, there is a huge demand for agricultural products. Due to the climatic changes, many crops are often damaged by weather conditions .This paper introduces "Intelligent agriculture IOT equipment" to monitor the environmental factors as well as the soil features of the farm and also uses hyper spectrum image processing to identify weeds and pests. Later the pests and fungal infections can be removed by using micro-pest killing laser. It includes data normalization, 3D cluster analysis to analyze the relation between environmental factors ,system determines whether a selected crop has been placed in the appropriate cluster and also it sets a critical value in the cluster based on future environments and provides advice on whether a crop is suitable or not. We will place the intelligent agricultural IOT equipment in the farm for monitoring purposes and ran an actual-scenario analysis using the algorithm.

INTRODUCTION

With the rise in the human population comes the constantly increasing demand for agricultural products. According to study , the worldwide population is expected to increase from 1.8 billion in 2009 to 4.9 billion in 2030, causing drastic rise in demand for dairy products. Study suggests that, in the future, people will have a increasing demand for agricultural products, which will require improvement of agricultural lands and growth in yield of agricultural products. Due to global warming, crops are often damaged by extreme climatic conditions. Study points out that countries around the world are investing in the development

of Intelligent Agriculture out of concern for food crisis. Many farms have begun to rely more heavily on natural resources – such as using hydro power, geothermal energy, or solar power – in order to decrease cultivation costs, especially in water resources. Study proves that lack of labor force will become a serious problem in the next few decades. Currently, the agricultural labor force contain mainly of elder people who works on experience and rules of thumb; moreover, they did not have the adequate equipment to examine environmental factors on their farm. Consequently, farmers have no way of understanding which crops can grow on their soil,since the global climate change enforced many crops to be unsuitable for long-term cultivation. We must use the Internet of Things and big data to examine farm soil and environment to provide farmers with suitable crops and keep track of their cultivation techniques as well as environmental factors at their farms. Study proposes that we must establish an agricultural ecosystem if we want to fight with food crisis. The system should be used to examine farm data that can be used to improve production issues. Study also suggests that our future world will acquire 2 more billion people in population, which will not only render our residential spaces smaller, but also forbid farm lands from expanding. Therefore, we must depend on Intelligent Agriculture to improve the productivity of farms. In addition to monitoring environmental factors on a farm, Intelligent Agriculture must analyze how climatic conditions cause environmental changes at the farm and how long crop cultivation brings about soil erosion or changes in the soil properties. Monitoring a farm using big data and IOT can prevent low productivity of crops. When it comes to cultivation techniques, farmers depend on rules of thumb; however, as we know climate change, crops that grew properly in the past might not be able to adapt to present farm conditions. Farmers have no way of studying about the condition of their farm soil, which is why they should use Intelligent Agriculture systems to monitor their farm environment. Since many farm are small, outdoor farms, the Intelligent Agriculture system must be financially affordable and offer green power storage function. Monitoring farm data via the Intelligent Agriculture system improves big data analysis and helps us to understand the environmental factors and soil structure of a farm. This paper proposes big data analysis of farms based on Intelligent Agriculture. Our Intelligent Agriculture platform provides the following properties (1)

IOT sensors for temperature, humidity, atmospheric pressure, illumination, electrical conductivity of soil, and irrigation, and the system will send the data back to the platform regularly every 15 minutes; (2) a solar power storage system that helps to decrease electricity costs;and (3) an XMPP web platform that helps collect details from the IOT sensors. The proposed Intelligent Agriculture system employs affordable sensors, which improves the popularization of Intelligent Agriculture systems; more over, the solar power storage system enables the mobility of the system and makes it suitable for outdoor cultivation. This paper conducts big data analysis on the datas collected from the Intelligent Agriculture system. The analysis goals include: (1) analyzing cultivation techniques followed by the farmers, understanding how the crops are growing, and checking environmental changes; (2) examine environmental factors of a farm and choosing suitable crops for cultivation. This study examine experiences of farmers and their farming techniques through behavior analysis to analyse information such as irrigation pattern and how much water the soil needs. The study examine environmental factors of the farm to understand how weather conditions bring about environmental changes and determines which crops are suitable for the farm based on time sequence. Our proposed big data analysis approach includes the following concepts: (1) data normalization through the combination of moving average and average variance; (2) application of 3D cluster analysis to analyze the relation between different environmental factors and to examine the rules of thumb held by the farmers; (3) determination of selected crop has been placed in the appropriate cluster; and (4) setting a critical threshold value in the cluster based on future environments and providing advice on whether a crop is suitable for the cultivation. Our proposed method has undergone simulation and helps to analyze whether the locally grown crop is a suitable choice; experiment results show that the proposed scheme is not only feasible but also helps farmers understand their farm environmental through the environmental indices of their farms. Spectral imaging is the detection of light reflected by the crop with the use of specialized sensors. It is measured in spectral bands. The higher the number of bands the higher the accuracy, the flexibility and information content. Spectral imaging is widely used now in agriculture and precision farming. Hyper spectral imaging in agricultureallows to

significantly extend the range of farming issues and applications that can be addressed using remote sensing.

II. THE PROPOSED SCHEME

In this paper,illustrates the system model, discusses data cleaning and normalization, includes 3D cluster correlation analysis, give information on crop selection analysis and decision-making. Internet of Things is used with IOT frameworks in order to easily view, handle and interact with data and information. Within the system, users can register their sensors, create streams of data, and process them. The system also have searching capabilities, helping the user with a full-text query language and phrase suggestions, allowing a user to use APIs to perform operations on data points, streams and triggers. It can also applied on various agricultural areas apart from security. Few areas are :

- Water quality monitoring
- Monitor soil constituent, soil humidity
- Intelligent greenhouses
- Water irrigation
- Scientific disease and pest monitoring

To create more cost efficient system by avoiding the need of maintenance, free from geographic constraints and to access affordable services, extended ”as-a-Service” framework in cloud computing can be integrated with Internet of Things to deliver financially economical IT resources.

A. SYSTEM MODEL

Our proposed paper requires establishing an Intelligent Agriculture platform. We established IOT sensors in farms to monitor the farm environment; the sensor equipment can help to check temperature, humidity, illumination, atmospheric pressure, soil electrical conductivity(EC), soil moisture content, and soil salinity. We can obtain soil fertility conditions through the EC and can use the sensors to determine irrigation time and quantity. Our system calls for IOT sensors that are financially affordable, which should help popularize its adoption. As for IOT power consumption, our system uses solar power storage, which not only frees the system from the need for external power support but also gives it physical mobility. The data of our IOT sensors are transmitted to the server via 4G networks in XML format; this helps to get information integration across different platforms and formats. We have also included charts and graphs in our XMPP platform to give data

presentation of each sensor; among the features, the charts and graph scan be exported into reports. Data from all sensors can be exported from the database to undergo big data analysis. The aim of our big data analysis include: (1) analyzing cultivation techniques done by the farmers, understanding how the crops are growing, and observing environmental changes,and (2) checking the environmental factors of the agricultural field and selecting suitable crops. Big data defines the 5V features as[22]: (1) volume, (2) velocity, (3) variety, (4) veracity, and5) value. Our proposed big data approach satisfies the 5Vdefinitions. The data in our analysis comes from IOT sensor data from the farm. In our system, the IOT sensors acquire data and send it back to the platform every 10 minutes. Our analysis provides data variety by obtaining relevant information from weather stations. Before analyzing any data, our system performs data cleaning and normalization to ensure that both the analyzed data and the analysis result of pre determined targets are accurate. Our proposed approach and goals can effectively increase crop production and help analyze cultivation techniques of farmers. To check pests and weeds:, An image is acquired over the visible and near-infrared (or infrared) wavelengths to specify the complete wavelength spectrum of a sample at each point in the imaging plane. The big advantage of hyper spectral imaging is the ability to characterize the inherent chemical properties of a sample. This is achieved by measuring the spectral response of the sample, i.e., the spectral pixels collected from the sample. Since hyper spectral images are too big and complex to be interpreted visually, image processing is often necessary in hyper spectral imaging for further data analysis. Many commercially analytical software tools such as Environment for Visualizing Images software and MAT LAB are available for hyper spectral image processing and analysis. In addition, one can develop one's own hyper spectral image-processing software for some specific requirement and application based on some common computer languages.

B. DATA CLEANING AND NORMALIZATION

The first step in big data analysis is data cleaning and normalization. Our system uses 4G networks for IOT data transmission, while this ensures stable network quality, the system might still run into problems such as packet loss or poor signal might. The big data first undergoes data cleaning; since farm environments usually fluctuate in the

pattern of linear increase or decrease, it rarely differ drastically. . We first compute the moving average with the Algorithm .

C. 3D CLUSTER CORRELATION ANALYSIS

proposed system uses 3D correlation analysis to check cultivation techniques of farmers. First, we calculate the irrigation cycle usually done by the farmers by applying autocorrelation to obtain the periodicity.

D. CROP SELECTION ANALYSIS AND DECISION-MAKING

This study partitioned sensor data into clusters based on the numerical size, which resulted in 7 clusters: temperature, air humidity, atmospheric pressure, soil moisture content, soil electrical conductivity, illumination, and soil salinity. The sensor clustering data is G 0 i,j . Next, the system places into in order the necessary conditions as well as other conditions to select feasible crops. The needed conditions include temperature, soil electrical conductivity, and soil salinity; other conditions may include atmospheric pressure, soil moisture content,air humidity, and illumination. Also soil moisture content and air humidity can be improved using the irrigation system and; illumination can also be improved using lighting equipment.

V. CONCLUSION

Faced with extreme climatic changes and rise in global population, we are forced to address food issues including crops and agriculture. Our study proposes using an Intelligent Agriculture platform to examine the environmental factors on a farm and applying these environmental factors in analyzing cultivation techniques practised by farmers. Our proposed system employs moving average and variance in data cleaning, which cleans out data with more drastic variation. Our study applies auto correlation to compute periodicity by using 3D cluster correlation to conduct behavior analysis of farmer actions such as application of fertilizer or pesticide. Our study takes observes environmental factors to assess whether a crop is suitable for a farm or not; it also takes global warming into consideration .The Experiment show analysis of our crops using our proposed system; the results prove that farmers can gain a better understanding of whether a crop is suitable for their farm by looking into

factors such as temperature and soil moisture content. Through the environmental factor analysis proposed in our study ,farmers can gain insight into which crops they can grow; while the system keeps its track and analyzes crop cultivation behavior. In future, our proposed scheme can incorporate with artificial intelligence and apply the analysis results to help farmers gain automatic cultivation and environment control.