Agro-Sense: A Cloud-Enabled Mobile App and Efficient Farming System using WSNs

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Abstract— Agro-Sense: A cloud-enabled mobile app plays an important role in improving farming activities. This paper focuses on using cloud computing and Wireless Sensors Network (WSNs) technology to enhance the application and its benefits to the field of agriculture. The paper focuses on the Cloud Database which gives details of past agriculture work records of farmers. The farmers who have inculcated the system and installed the application on their Smartphones can register the application on their Smartphones can register, so that they can access as well as upload the data stored on the server and use the system efficiently. Light, Temperature, and Humidity and Soil moisture will be the various WSNs used. The main activities of the sensors are to sense and measure the environmental data from the fields. The farmer will get the notifications of condition in his field by these sensors. When the water level in the field reduces, the farmer will get notification, so that he can switch ON the motor through his Smartphone. The motor will get switched OFF automatically when the sufficient water supply is provided in the farm up to the threshold value. The main objective is to optimize the efforts and time of farmer and perform efficient farming to increase productivity.

Key words: Cloud Computing, Wireless sensor networks, Smartphone.

I. INTRODUCTION

India is developing in every sector in today's world of competition. Our country enjoys second position all over the world in terms of agricultural production. Agriculture is the backbone of our nation. The only reason for this leading progress is farmers of India. But even today, farmers of our country lack behind in case of proper facilitation. The main purpose of developing this system is to reduce the manpower, save time and increase the productivity. A system of cultivation management, Agro-Sense, is proposed, which is developed to support efficient farming management.

A. Existing system

Farmers can upload their data on Cloud Database. Data include parameters such as name of farmer, crop, season, time, pesticides and profit. The data will be shared among all other farmers. Farmers on farmland can easily refer to work plans, enter field data into the cloud system, and share them with head office in real time by using PC. Cloud Computing is used to share the data stored on Database. The Cloud provides unlimited storage space. In this system, farmers use computer to access the database.

B. Proposed System

Smartphone will be used in this system which makes the work easier. This system consists of two parts: one mobile application and one web portal. The mobile application will be used to find the records and view information about them while the web portal will be used for managing the information about the farm and the system as a whole.

Since this is a data-centric product it will need somewhere to store the data. For that, a Cloud database will be used. Both the mobile application and web portal will communicate with the database, however in slightly different ways. The mobile application will only use the database to get data while the web portal will also add and modify data. The database is stored on the server PC and any authenticated farmer using the application can access it. It includes various parameters like Name of farmer, crop, season, time, pesticide and profit. Farmer can upload his data through his account. Also he can update his account whenever needed. He can access the data stored on Database. Security is provided to database in order to protect it from illegal access. No other person can access or update the Database.

The farmer using the system will get the information in is field. The proposed approach involves using wireless sensor actor networks (WSANs) in combination with cloud computing services to help farmers optimize the use of available resources in their agricultural tasks. Light, temperature, and Water Level are the various WSNs used. The main activities of the sensors are to sense and measure the environmental data from the fields. When the water level in the field reduces, the farmer will get notification on his smartphone. He can start the motor through his smartphone itself. As soon as he starts the motor, water supply in the field will start. When the water in the farm reaches the threshold value, the farmer will get notification to OFF the water motor. Motor can started manually or automatically.

II. RELATED WORK

A. Cloud based delivery:

Three of the most basic cloud computing models are:

- Software as a Service (SaaS)
- Platform as a Service (PaaS)
- Infrastructure as a Service (IaaS)

1) Software as a Service (SaaS):

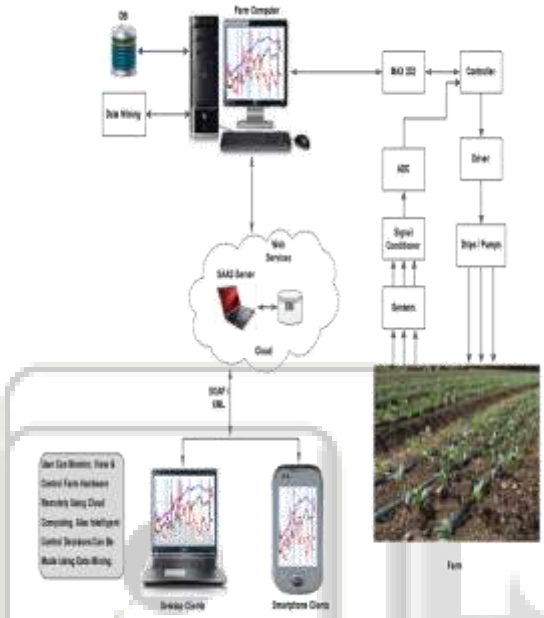
Software as a service (SaaS), sometimes referred to as "on-demand software", is a software delivery model in which software and associated data are centrally hosted on the cloud. SaaS is typically accessed by users using a thin client via a web browser. SaaS has become a common delivery model for many business applications, including accounting, collaboration, customer relationship management (CRM), management information systems (MIS), enterprise resource planning (ERP), invoicing, human resource management (HRM), content management (CM) and service desk management. SaaS has been incorporated into the strategy of all leading enterprise software companies. One of the biggest selling points for these companies is the potential to

reduce IT support costs by outsourcing hardware and software maintenance and support to the SaaS provider.

The five major benefits of cloud computing are:

- Reduction of initial cost.
- Allocation of resources on demand without any limit.
- Maintenance and up gradation performed in the back end.
- Easy rapid development including collaboration with other systems in the cloud.
- More possibilities for global service development.

B. System Architecture



The above Block Diagram shows the complete representation of system.

It consists of the following elements

- Database: It stores all the past agricultural records of the farmers. It includes the parameters such as name, crop, season, time, pesticides and the profit. Any farmer before cultivating a new crop can access the database for reference. Also he can upload his own crop with details.
- Microcontroller Kit: It consists of different components such as Sensors, Signal Conditioner, ADC, Max 232, Controller and Device Driver.
- Smartphone: The farmer using this system needs to install this application in his smartphone. When registered, he could access as well as upload the data. Also he will get light, temperature and water level notifications of his field on his phone.

C. System Requirements

A system can be characterized by its functional and non-functional requirements. Functional requirements describe the functionality of a system while non-functional describe attributes like reliability, maintainability and security, etc.

The systems functional requirements are as follows:

1) Hardware Interface:-

- Micro-Controller Kit:
  - ADC 0808
  - MAX 232
  - Device Driver UCN C803
  - Signal Conditioner
- Sensors:-
  - Light sensor
  - Temperature sensor
  - Humidity Sensor
  - Soil Moisture Sensor
- Smartphone
- Server PC

2) Software Interfaces:-

- Language: Java J2SE and JDK
- J2SE (Java 2 Standard Edition) Java would be the required as language for development of the project. JDK is the development kit used to compile java programs.
- IDE: NetBeans
- Just like visual studio provides development environment for VB and .Net, NetBeans provides an integrated development environment (IDE) for Java.
- IDE: ADT
- Android Development Tool provides development environment for android applications.
- Web Server: Glass Fish
- Glassfish is an open source application server project started by Sun Microsystems for the Java EE platform and now sponsored by Oracle Corporation. The supported version is called Oracle Glassfish Server.

The system's non-functional requirements are as follows:

3) Software Quality Attributes:-

- Reliability: The application should be highly reliable and should generate all the updated information in correct order.
- Availability: Any information about the farm should be quickly available to the authorized user.
- Portability: The application should be portable on any windows based system. It should not be machine specific. This tool enables us to reuse the existing code instead of creating new code when moving software from one environment to another.
- Performance: In software engineering, performance testing is testing that is performed, to determine how fast the software performs under a particular workload. The performance of our tool can be defined by determining the load on the tool. This system can have only one user at a time. So this secures a high performance. This tool immediately responds to the request of the user. Thus this tool performs faster.
- Security: The system must be fully accessible to only authentic user.

– User Friendliness: This tool is user friendly. As a user there are no complicated steps to use this tool. User has to install the application in his smartphone.

III. CONCLUSION

The use of Cloud services and WSNs in agricultural field provides high potential benefits which are economically worth in the field of agriculture. In this paper we have proposed the Smartphone application Agro-Sense through which farmers can refer and access the data stored on Cloud Database on their Smartphones. It gives the notifications of conditions in the field by SMS. Farmers can receive at an affordable price the information about water level, light, and temperature conditions during cultivation. Database is secured. Hence, this system provides the necessary data mining and sensors that works in an automated fashion that comes at a reasonable price, and can be easily adapted to an existing system.

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