International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 4 Issue 04, April-2015

Agro-Sense: A Mobile App for Efficient Farming System using Sensors

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***Abstract*— Agro-Sense: A mobile app is simply a "Farm in hand" for farmers. This system focuses on using Sensors technology to enhance the application and its benefits to the field of agriculture. Often, farmers have to keep watch on the farm in order to know the conditions there. In order to make his work efficient and optimized, we are developing an android application "Agro-Sense". The system is developed in such a way that farmer will get all the information of his farm on his Smartphone. Different sensors like light, temperature, moisture and humidity sensors will be used in the farm. Once the system is fitted in the field, the application has to be installed on Smartphone. Through the sensors and microcontroller kit, farmer can monitor and control his farm on his Smartphone using the application. When the water level in the field reduces, the farmer will get notification, so that he can switch ON the motor through his Smartphone. Besides this, the application gives facility of Post Scenario (database) where one can post his agricultural records. It includes parameters like name of farmer, crop, season and profit. All users using this system can view database of other users and access their own. This would help them for further decision making. This application tends to reduce manpower and saves the valuable time of farmers to increase productivity.**

Keywords*— Sensors, Smartphone, Web Services, Mobile Computing

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. EASE OF USE

1.1. Existing system

The existing system consists of a database which includes various parameters and famers can upload their data. Parameters include name of farmer, crop, time, fertilizer, season and the profit gained. All other farmers can refer this database for the further decision making, as this data is shared among all the farmers using the system. This data is shared among all the farmers via internet. No other farmer using database can access or update the information of other farmer. Farmer can only access his own account and can only view the other for the efficient farming. This all is done using computers.

1.2. Proposed System

In order to make farming more efficient, rather than using the desktop we are developing the mobile app which will perform all the above work in existing system. Smartphone will be used in this system which makes the work easier.

Since this is a data-centric product it will need somewhere to store the data.. The database is stored on the server PC and any authenticated farmer using the application can access it via internet. The application 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. No other person can access or update the Database.

Besides this, the hardware is designed which will be fitted in the farm. It consists of microcontroller kit, sever PC, sensors and devices. Light, temperature, moisture and humidity are the various sensors use. The main activities of the sensors are to sense and measure the environmental data from the fields. Farmer can check the water level or all other parameters on his Smartphone itself. He can start the device through his Smartphone. The device can be motor. When the moisture sensor sense the moisture in the soil and if the water level is low, farmer can switch his device ON i.e water motor. As soon as the device is switched ON, water supply in the field will start. Also he can switch OFF device whenever he want. Farmer can set threshold value when sensors are activated in

automatic mode. Motor can started manually or automatically. This all can be done only via Internet.

II. RELATED WORK

2.1. Client-Server Model:

- The client–server model of computing is a distributed application structure that partitions tasks or workloads between the providers of a resource or service, called servers, and service requesters, called.
- Often clients and servers communicate over a computer network on separate hardware, but both client and server may reside in the same system.
- A server host runs one or more server programs which share their resources with clients.
- A client does not share any of its resources, but requests a server's content or service function.
- Clients therefore initiate communication sessions with servers which await incoming requests.
- The client–server model does not dictate that server-hosts must have more resources than client-hosts.
- Rather, it enables any general-purpose computer to extend its capabilities by using the shared resources of other hosts.
- Centralized computing, however, specifically allocates a large amount of resources to a small number of computers.
- The more computation is offloaded from client-hosts to the central computers, the simpler the client hosts can be.

➢ SOAP

- SOAP, originally defined as Simple Object Access Protocol, is a protocol specification for exchanging structured information in the implementation of Web Services in computer networks.
- It relies on Extensible Markup Language (XML) for its message format, and usually relies on other Application Layer protocols, most notably Remote Procedure Call (RPC) and Hypertext Transfer Protocol (HTTP), for message negotiation and transmission.
- SOAP can form the foundation layer of a web services protocol stack, providing a basic messaging framework upon which web services can be built.

2.2. System Architecture

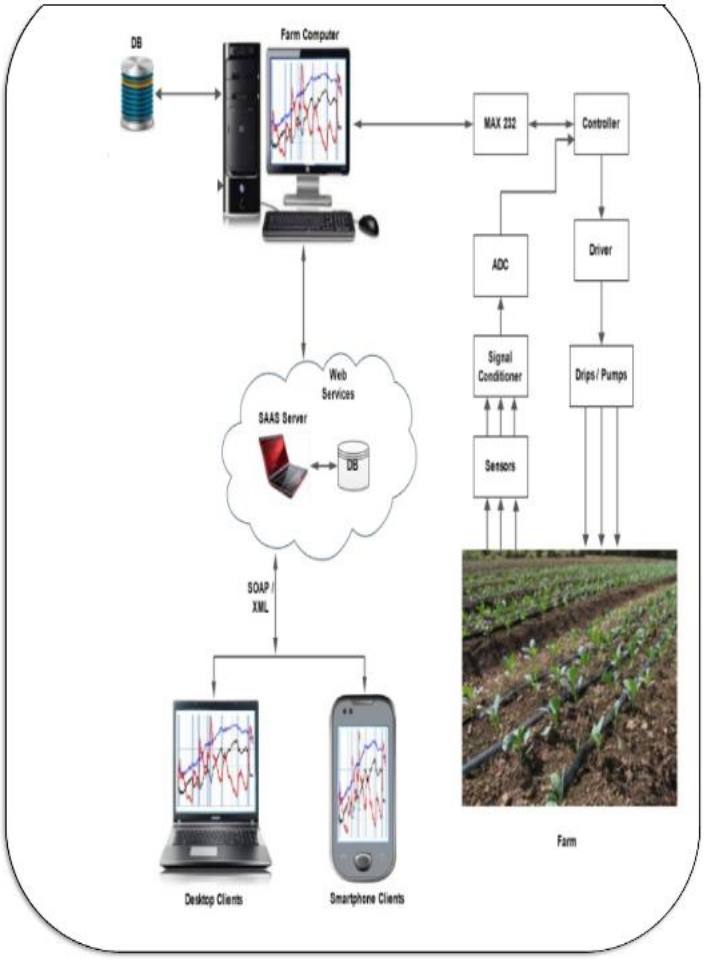

Figure 1:Block diagram

The above Block Diagram shows the complete representation of system.

It consists of the following elements

a. 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.

b. Microcontroller Kit: It consists of different components such as Sensors, Signal Conditioner, ADC, Max 232, Controller and Device Driver.

c. 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 Smartphone.

2.3. 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:

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. IMPLEMENTATION FLOW

3.1. Server side

1 .Login/Registration module:

The new user should register to use the system. When the registration is done, farmer can login through his username and password whenever he wishes to do so.

2. Comport Selection Module:

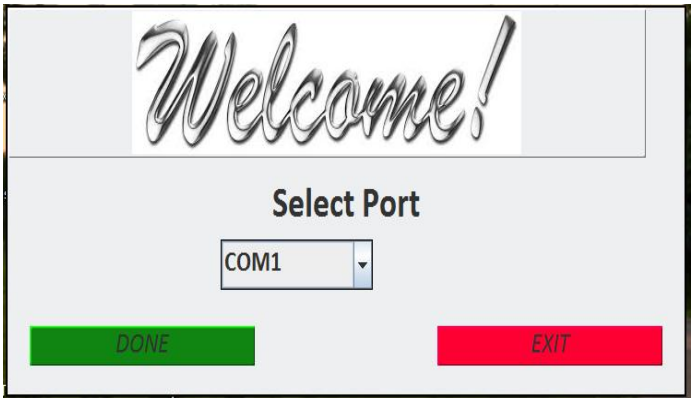

Figure 2: COM port selection

It is for the selection of comport to which our hardware is connected.

3. Main Form Module:

It displays the menu with options.

4. Test Device Module:

It displays all the 8 devices. The status of device can be checked using ON/OFF button

5. Test Sensors Module:

It displays all the 8 sensors. This module is for testing temperature, light, humidity and moisture sensors..

6. Control Device Module:

This displays all the devices and sensors and allows control. Thresholds value can be set according to user's convenience. User can activate, deactivate the sensors. Also he can set sensors in automatic mode.

7. Web based control:

This is to allow user control of his farm on his smartphone. Application in Smartphone can access all the activities in control device module on his Smartphone through allow control and generate feedback.

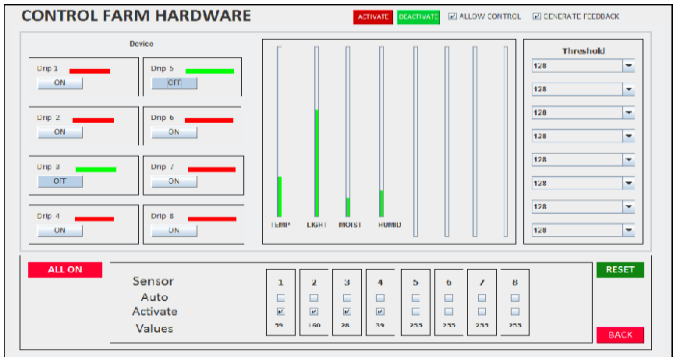

Figure 3: Web based Control Module

3.2 Client Side: (User side)

1. Login:

The user will first login into the application for authentication purpose.

2. View Hardware Status:

The user will be able to check status of sensors and devices.

3. Web Based Control:

In this user can view the database which includes details of all the farmers using the system. User can add his info if he wants to and can update it. User cant update other farmer's data. Rather he can only view it for further decision making.

4. Post Scenario:

The user can update the field information for decision making.

5. View posted Scenario:

The user can view his updated information anytime once updated.

IV. CONCLUSION:

The use of Web services and sensors 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 the Database on their Smartphones. It gives the notifications of conditions in the field. 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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