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Farm Automation Using Cloud and Sensor Network : A Survey

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Abstract
Information Technology is used in various fields like education,business, Medicine, Weather forecasting systems ,Communications etc., but not used vastly in Agriculture sector which is main livelihood for majority of people in rural areas and which also drives economy in developing countries like India, China, Brazil etc. Farmers conventionally write records on paper but it is difficult and tedious to check past agricultural-work data and control the cost of agricultural products. A system of cultivation management, iFarm ,is proposed, which was developed to support efficient farming management .The system consists of smartphone applications, Web browsers and a cloud server. Farmers on farmland can easily refer towards plans, enter field data into the cloud system, and share them with head office in real time by using smartphones .Farmers at head office can analyze data in the cloud system with a Web browser and estimate farming costs and form work plans based on their analyses.

Keywords
Sensors, Cloud , Datamining , Smartphone ,Web database,etc.

I. Introduction

It is important to optimize cultivation management to improve agriculture. Agricultural work has been primarily managed based on the intuition and experience of skilled farmers.Precision agriculture is aimed at systematically optimizing farming management. Cultivation management requires records of agricultural work and analyses based on the records to manage agricultural work, e.g., to know exactly how much fertilizer and pesticide is used and control production costs. Although records written on paper have been used for cultivation management, it is difficult to analyze much of this data.

A. Smart Drip Irrigation System

The field is divided into two halves for having automated drip system on one side and non-automated drip system on the other side [5]. Water supply for both sides is from seperate lines from separate sources and thus has two different designs for the drip system. Volume of water utilized for non-automated system was calculated from the time of operation of the system. The total ON time and the volume of water used to recoup the source every time gave the volume of water consumed by the automated system. All cultivation practices were followed in both the regions.

B. i-Fram Based System

The system consists of three sub-systems: a smartphone application, a cloud server, and a Web browser has a schematic of the entire system. Farmers in the field can check information on work plans and send field reports to the office using a smartphone application. All data are stored on the cloud server and can be accessed everywhere from farms and offices[1]. A Web browser is used to manage field and work schedules and control costs. The browser can be used on a smartphone, a tablet,or a personal computer depending on the situations and usability requirements.

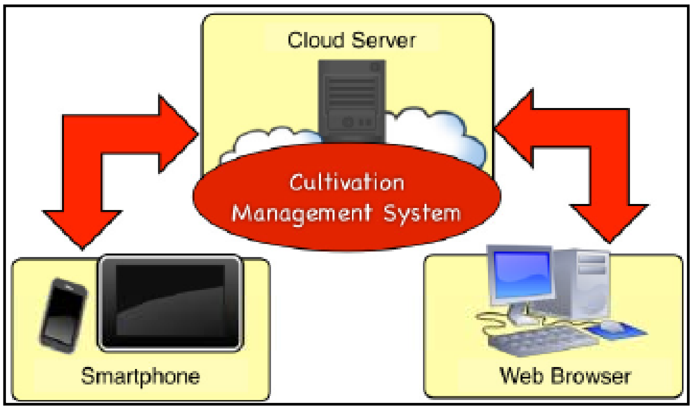

Fig.1 : Outline of proposed system

C. Mobi Crop System

The MobiCrop architecture is designed referring the mobile distributed architecture pattern. The work could not follow the standalone design due to the fact that the stand alone app will lack some of the requirements. For instance, there is the need to keep updating and monitoring the information on pesticides that are being sent to the farmers. Also there is this issue of the size of the data on pesticides that is somehow voluminous at the time to push all to the mobile nodes.[4]
Thus, the mobile distributed approach is proposed. The architecture comprises of mobile participants, a cloud-based middleware, and a cloud-based database server. The pesticides data is modeled following the REST design standard so it was manageable to process the crop farmers' requests on the middleware. The main purpose of the middleware is to shield the database server from the mobile participants.

II. Use of Farm Automation in Various Field

As the farm automation can be used in many areas we present some application domains that can use farm automation for there convience.

A. Polyhouse

Polyhouse are some of the area where the farm automation is vital, As polyhouse are more concerned about the Temperature, Light, Water and many other characteristic.

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To control this farm automation can be good choice. As farm automation can monitor the environment in polyhouse, and change it as per the input data respectively.

B. Farm

Farms require more monitoring , as compared to other Fields .Farm automation can give a hand of help for similar situation .As farmer cannot not always be present,at farm, To reduce this effort the farm automation can be useful. As it will automatically use its history base decision for automatically making decision for device.

III. Implementation

In this model, data is generated locally but processed globally. Nodes do not analyze the data they collect; they transmit them to a central system, where they are stored and processed.

1. Data Generation Strategy

Data is generated as a response to an event, viz. when the parameter reaches or exceeds a threshold[7]. We seek to generate as much data as possible, while not compromising the lifetime of the network, so that it remains operational throughout a full season.

2. Embedded Probes

Soil moisture is a parameter of higher variability. We chose to equip several sensors with two probes each as shown in Fig. 2.We have implanted four sensors at spatially and operationally optimal points .The sensors sense the moisture level of the soil by measuring the conductivity of the soil which is due to the presence of flow ions contained in the soil.

The flow of ions increases as the moisture content increases. Thus a decrease in the resistance of the soil indicates an increase in the moisture level. By measuring the voltage drop across the soil and by properly calibrating it against the moisture level, we measured the moisture content of the soil[8]

Fig. 2 : One of the embedded probes

IV. Conclusion

We proposed and developed a cloud-based system to manage cultivation. The functions of the system were briefly described. The system helps many Polyhouses to manage agricultural work to accomplish cost-effective precision agriculture. We plan to conduct experiments to evaluate how usable the system is and how well it performs. Moreover, it is expected that data collected with the system will comprise big data for precision agriculture. Analysis of big data will lead to improved precision agriculture and cultivation management in the future

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