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EFFECTIVE CROP MONITORING SYSTEM FOR SMART AGRICULTURE USING WSN

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Abstract *- In the modern world the major problem in agriculture is the lack of labours to monitor the crop field and less crop yield due to the intrusion of animals. The main objective to overcome these problems by using wireless sensor networks to monitor the crop field and to generate the warning alarms for animal intrusions. Sensors are arranged in the form of master slave technique. Three wireless sensor networks are used in the agricultural field to measure the soil moisture, atmospheric pressure and ph value. The values obtained from the sensors are converted to the digitized value then sent to the micro controller in order to make real time values. GSM is used to coordinate the microcontroller and monitoring system. The monitoring system is done by the lab view technology, where the real time values are being compared with the pre defined values stored in the database using the ontology technique. Any changes occur in the crop field then the SMS will be sent to the farmers mobile. The mobile messaging system will make the data flow very simple and easy. The master systems can be connected through the WLAN so that the global crop disease warnings can be sent very easily. This system also reduces the time to be spent on the agricultural field and gives the correct suggestion at the right time, so that it helps to attain the high yield.*

Keywords— WLAN-Wireless Land Area Network, GSM-Global System for Mobile Communication, WSN-Wireless Sensor Network, SMS- Short Messaging Service.

1. INTRODUCTION

Nowadays, WSN is the important technology used to improvise the precision agriculture. Wireless sensor network is a transducer with the communication infrastructure which is used to monitor and record the environmental data. A WSN based agricultural environmental monitoring system consists of sensors to measure the temperature, soil moisture, pH, and humidity. Monitoring the soil moisture at the agricultural field, from tens to hundred meters is essential in many hydrologic and agricultural applications [7]. WSN consists of large number of micro sensor nodes which will be of small volume and low cost. The master slave technology is used for the sensory communication through the self organizing communication through the wireless network.

2. CLUSTER BASED MASTER SLAVE TECHNOLOGY

The farm at the different location can be coordinated using master slave technique. The master slave technique is based on the candidate division technique. It will be very useful in monitoring the crop field. [6]. The data acquired by the slave node are communicated with the slave master node. The slave master node checks the threshold value, which in turn directly reach the base station using the global system monitoring technology. The values recorded by the master slave system will be sent to the monitoring system through the main master system. Fig.1 shows the cluster based master-slave technology [10].

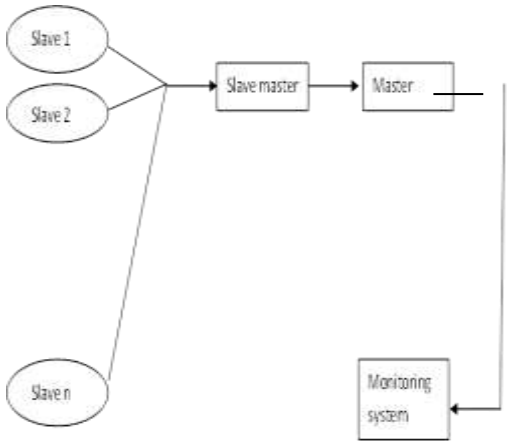

Fig.1 Clustered master slave technology

3. DATA ACQUISITION AT SLAVE NODE

The data's are collected from various sensors such assoil moisture sensor, pH sensor and humidity sensors and are placed in the agricultural field to measure soil moisture, pH value of the soil and humidity of the soil respectively. One sensor node will act as a slave master and remaining sensor nodes will act as a slave node. The values from the sensors are measured continuously by the slave node. If slave node experiences any difference with the values stored in knowledge base, then it sends the obtained value to the slave master [5]. The slave master analyses the value with the threshold value and then communicates with the master through GSM technology. The functional flow of slave master is shown in Fig.2.

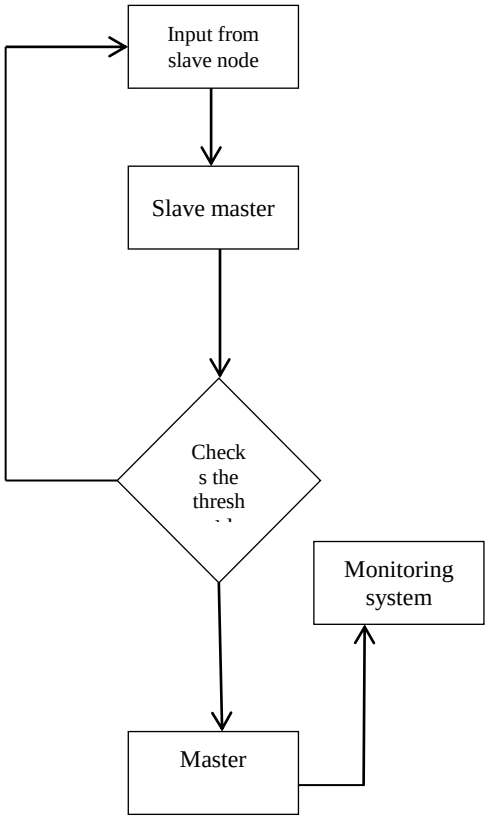

Fig. 2 Functional flow of Slave-Master

4. CROP MONITORING

Data monitoring will be done in the base station, where each farmer's data are maintained in the secured manner. The data obtained from the slave master are sent to the base station through GSM technique and are converted into digital value in the master system [12]. These values are analysed with the data in the knowledge base and then the sensory values are monitored. When there occurs any change in the value with respect to the rules then the warning will be sent to the land owner in the form of short messaging service through the global system positioning [14]. Fig.3 shows the block diagram of monitoring system.

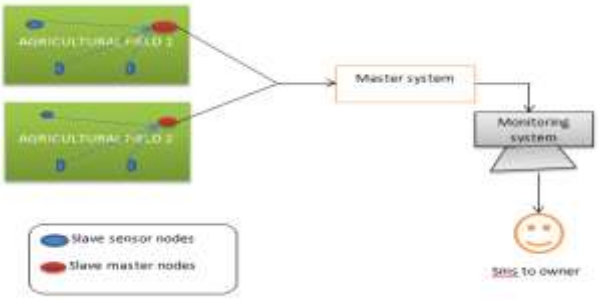

Fig.3 Block diagram of Monitoring System

5. RESULT AND ANALYSIS

5.1Communication Analysis

Online Communication and mobile communication are analysed and compared in crop monitoring system. The efficiency of the data to be communicated is less in online communication when compared to sms communication, since high signal rate is needed for online communication [1]. Fig.4 shows comparison of Email communication and sms communication. Therefore, in agricultural monitoring system, messages and warnings can be sent through mobile phones which are shown in Fig.5. It can be easily accessed by all people.

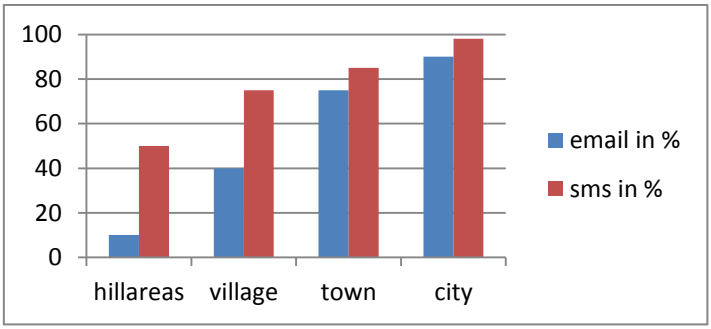

Fig.4 E-mail communication Vs SMS communication

Fig.5 Snapshot of mobile message.

5.2. Humidity Analysis

The humidity is the amount of water vapour present in the atmosphere which is mainly used to analyse the rainfall warning. The temperature is used to measure the heat and cold in the atmosphere. The humidity and the temperature has been recorded periodically to predict the season and the change in the climatic condition. [4]. The values are noted and ploted as the graphfor the year 2014 which is shown in Fig.6. Fig.6 shows the screenshot of temperature and humidity values obtained from sensor.

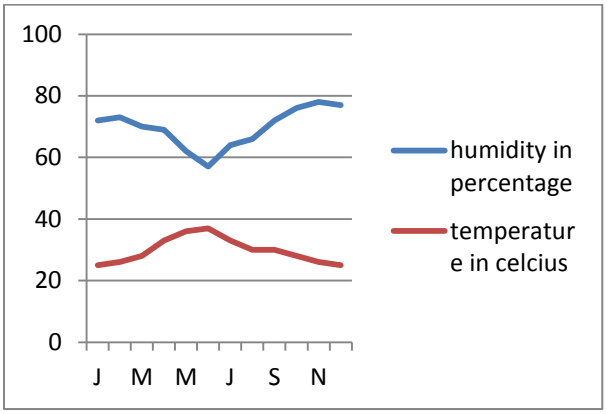

Fig.6 Temperature and Humidity analysis

5.3 pH Value Analysis

Based on the pH value and climate condition, the the crop to be cultivated can be identified and analysed by comparing the obtained values from the sensor with knowledge base. It is sent to the farmer in the form of short messaging service [3]. The maximum and minimum pH value of various soil such as alluvial, black, desert, mountain, red and laterite soil is given inthe table.1. Graph is contructed from the table.1 which is shown in Fig.7. Graph shows that pH value ranges from 1 to 14. Based on this, type of crop to be grown in each soil is identified and stored in knowledge base [2].

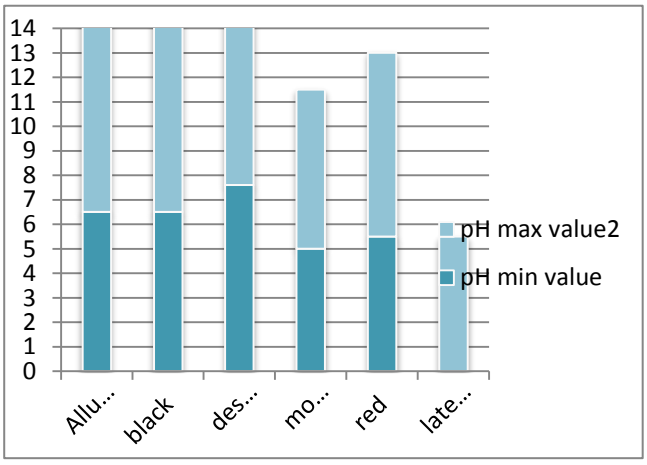

Fig.7 pH value analysis

5.4.Energy Consumption in Master Slave Technology

Energy consumed by normal system and master slave system is measured and plotted as a graph which is shown in Fig.8. In the normal systems, each sensor nodes are connected to the system and all the nodes are active at all time to generate alert during the changes occur in any one of the nodes. So the power consumed by the normal system is high.

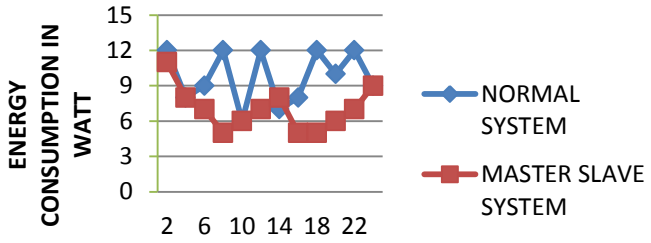

Fig.8 Energy Comsumption

Hence, the master slave technology is used to overcome these problems by reducing the energy consumption. In master slave system,only the changes occurring sensor node will be active at a time rest of the nodes will be passive with the previous data until the changes occurs. Thus, Fig.8 shows the use of electricity reduced moderately in master and slave technology.

6. CONCLUSION

This paper uses WSN technology for agricultural field monitoring and crop suggestion. It provides low cost maintenance, consumes less power and provides an efficient production in the modern agriculture. The ontology based crop cultivation predicts the crop to be cultivated with high yield. The collected data are transferred to the monitoring system through the GSM. These data are monitored and stored in the database using the LAB VIEW technology. The alerts from the monitoring system are sent to the farmer through the short messaging service. Automatic crop monitoring system has been established to avoid paucity of workers. The master slave technology is used which reduces the energy consumption. The crop prediction makes the farmer to have high yield.

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