

Monitoring Environmental Changes in Agricultural Crops via SMS

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Abstract. Based on the several situations that occur on the Department of Agriculture, gathering of data from their remote areas like the rice fields is one of the problems that they encounter. Receiving results from the farmers asked to monitor the field are mostly delayed. Due to this problem, the researchers construct solutions how to deal with this kind of problem which is one of the important transaction in agricultural field. The researchers proposed system mainly focused on how to receive and send information from the Department of Agriculture to the remote area via SMS. Through this, wherever the rice field is located, it will be monitored by the sensor that will be deployed and send the data detected to the Department of Agriculture via SMS sending.

1 Introduction

Farming is one of the resources in Iloilo City, Philippines and products like rice is one of many basic necessities. If the production of crops is low, farmers will be suffering from low profit and consumers will also be suffering from the shortage of food thus leading to increased cost.

Among the important things that may come to farmers interest is how to control the use of natural resources that the crops depend on. Because of these concerns, farmers become interested to implement new technologies to monitor the changes that could affect the crops.

Technology is widely used on the way we carry out our daily activities, the way we work and even on how we could communicate. It has a dramatic impact on teaching and learning in many various fields like in engineering, healthcare, innovation, science and agriculture.

The fast growth of SMS technology is one of the elements that help utilizing technology. SMS technology is fast and reliable and users are able to get very fast information anywhere. This technology can be a great help on the agricultural field for it can help the farmers provide them with new technologies that can help them in improving their production in crops. In [1] a temperature sensor has been implemented and the use of SMS technology was also used. Other researches such as [2] & [4] that

make use of wireless sensor networks to keep track of changes in the environment prove that sensor network technologies are very helpful in agriculture. In addition, [2] was very useful by providing data worldwide. In [3] discussed SMS technology to send agricultural data particularly, irrigation data, to farmers.

Our proposed project can help the sectors in the Department of Agriculture to monitor the agricultural fields to produce good quality of crops. It can make the monitoring effort easier because instead of checking the crops' location in every place, it is the sensors job to monitor and report the data to the end user. These sensors can easily detect the environmental threats temperature and soil moisture. When the sensors detect a threat, the data gathered are then delivered to the end user for them to take action on whatever problem that may occur and before the threat could damage the crops.

2 Related Works

2.1 Remote Monitoring in Agricultural Greenhouse Using Wireless Sensor and Short Message Service

In traditional method of farming, human labours were required to visit the greenhouse at specific time and need to check the humidity level and temperature level manually. This conventional method is considered time consuming and needs a lot of work and effort. This research focused on developing a system that can remotely monitor and predict changes of temperature level in agricultural greenhouse. Its objective is to develop a remote temperature monitoring system using wireless sensor and Short Message Service (SMS) technology [1].

They utilized a tool which is capable of detecting the level of temperature and they have included a mechanism to alert farmers regarding the temperature changes in the greenhouse so that early precaution steps can be taken. They conducted several tests in order to prove the viability of the system and results indicated that the reliability of the system in propagating information directly to the farmers could be gained excellently in various conditions.

2.2 New Wireless Sensor Network Keep Tabs on the Environment

University of Alberta's Faculty, the departments of computing science and earth and Atmospheric Science [2] have been working to create wireless sensor network that allows clandestine data collection of environmental factors in remote location and its monitoring from anywhere in the world where internet is available.

They created a functional model in University of Alberta's Agriculture/Forestry Centre that is a feature-rich environment that is like that of a tropical forest for them to monitor factors like temperature and luminosity. Data will be transmitted co-operatively with wireless sensors to generate data collected and made available to users worldwide.

The overall framework of WSN can be extended in monitoring potentially dangerous situations like hazardous wastes disposal or hard-to-witness phenomena such as ice cap movements in the Arctic.

2.3 Irrisat-SMS for Farmers

In this study [3], the researchers combined satellite data, information from local weather stations and feedback from farmers to deliver daily, detailed irrigation scheduling advice via SMS. Irrisat SMS is an irrigation water management service that uses high-level technology to deliver information to farmers. This system converts data from satellite images and weather stations, and sends this information as an SMS to farmers' cell phones.

Satellite images collected throughout the season are used to monitor crop development on farms. A satellite captures the light reflected from the vegetation and lands are captured by sensors on board and convert it using remote-sensing software to show crop-vigor. This could indicate the rate of evapotranspiration from the crop.

In the farmers' region, the weather station collects weather information on the field like temperature, wind speed, solar, radiation and relative humidity. The data will be automatically delivered to the Irrisat database.

The system then converts data from satellite images and weather stations then passed to the farmer via SMS. The subscribed farmers are informed everyday on how long they should run their water pump for them to replenish the water for their crops by the irrigation system.

The water rise on fields is expressed in inches of water but this doesn't mean that the farmers know exactly how much water their field needs. Farmers are provided with information of the actual flow rate or how much water delivered to the plants.

2.4 A Wireless Sensor Network-Based Ubiquitous Paprika Growth Management System

The application of WSN technology to the agricultural area [4], which is labor-intensive compared to other industries, adds value and can increase the agricultural productivity. This particular study attempts to establish a ubiquitous agricultural environment and improve the productivity of farms that grow paprika. The proposed system can collect and monitor information related to the growth environment of crops outside and inside paprika greenhouses by installing WSN sensors and monitoring images captured by CCTV cameras. In addition, the system provides a paprika greenhouse environment control facility for manual and automatic control from a distance, improves the convenience and productivity of users, and facilitates an optimized environment to grow paprika based on the growth environment data acquired by operating the system.

3 Monitoring Environmental Changes in Agricultural Crops

Environmental changes like too much heat that causes dryness of the soil, insufficient water and most especially the pests that attacks the crops, affects the growth and variety of crops which causes to have a low quality and low production of it. To help solve the problem, we proposed a system entitled "Monitoring Environmental Changes in Agricultural Crops via SMS" which aims to develop a project that can help agricultural sectors and farmers to produce a good quality and variety of crops.

This can help reduce the monitoring effort because instead of checking the crops' location in every place, this project will make it easier. It can detect easily the environmental threats like lack of water and high temperature. When these sensors sensed a threat, the data will be sent to the server for them to be alarmed. Through this they can make an early action on how to prevent the threats before it occurs and damage the crops.

The proposed system is designed for monitoring environmental changes in agricultural crops. The study focuses and limited only on the environmental changes that includes temperature and soil moisture. With that, the system is capable of monitoring, recording data and generating reports. Any uncontrollable situations or transactions that are not related in monitoring are beyond the limitation of this system.

This project aims to develop a networking system that can help the Department of Agriculture to monitor and update the current situation of the crops in the field. This project has the capability to detect some of the environmental changes in temperature, water and the pests that could affect the growth and production of crops. Our purpose of having this project is to make it easier for the agricultural sector to monitor and update the crops' growth. Through this, we can help the Agricultural sectors and farmers to achieve the good quality and production.

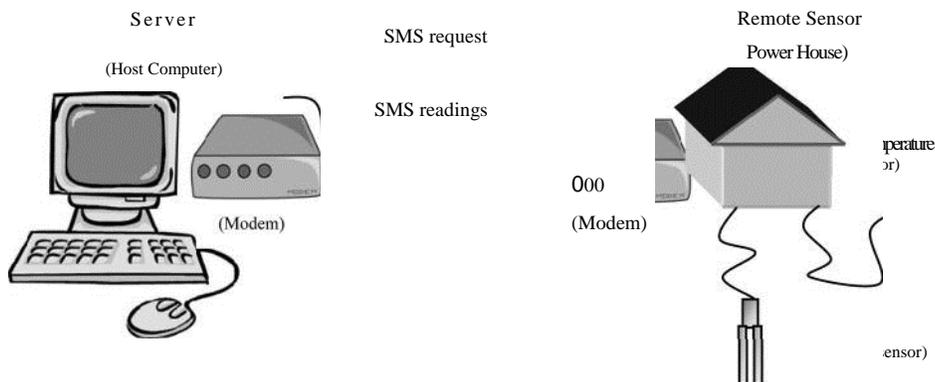


Fig. 1. This shows the architectural design of the proposed system consisting of the server that receives data readings on temperature and soil moisture from the remote sensor through SMS

Our proposed system, "Monitoring Environmental Changes in Agricultural Crops via SMS" has a programmed database which serves as the server that is managed by the

end user. It has a sensor that will be deployed in a remote area. This server has the capability of to send request to the sensor about the temperature and soil moisture.

This request is sent through SMS. When the sensor receives the request message, the sensor will automatically get the result depends upon the request from the server either for soil moisture or temperature and then send back the result to the server through SMS too.

When the program in the server received the result from the sensor, the data will be saved to the database, through this, the end user of the monitoring project can compare the past and present results. Another capability of this project is that when the temperature sensor detects the abnormal temperature, the sensor will automatically send a warning message to the server. Through this, the end user will be alarmed and will take action to the said area.

4 Simulation and Results

The proposed system "Monitoring Environmental Changes in Agricultural Crops via SMS" monitors the temperature and soil moisture update from the remote area. The system request and receive information through SMS which contain the data that are needed to monitor the remote area.

The proposed system will make the information gathering more accessible and promote further implementation of the needed action to be done in order to secure the good productivity of agricultural crops.

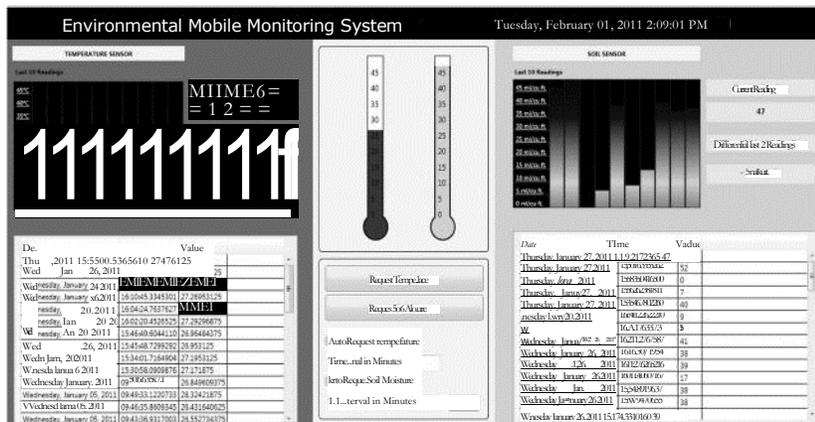


Fig. 2. The interface of the proposed system provides user friendly and easy to use icons. In this system, the user has the control in sending a request manually or automatic sending according to the given time interval. The current readings of the monitored environmental changes are shown in the history table below the graphs of the last 10 readings.



Fig. 3. This figure shows a mobile phone used in the proposed system. This phone is the medium of communication in sending and retrieving data from any remote area.



Fig. 4. This figure shows a prototype of the powerhouse that should be sited in a remote area where the sensors are attached. It provides a voltage and current supply for the remote sensors

5 Conclusion

The researchers developed “Monitoring Environmental Changes in Agricultural Crops via SMS”. The system allows the user to control the sending request, receive data and view previous readings of the sensor. The interface provides simple, user friendly and easy to use icons. The programmed sensors records readings and send it back to the server after they received a request from the server.

Monitoring Environmental Changes in Agricultural Crops via SMS was utilized by the researchers as a solution for recurring problems in the data gathering process. SMS messaging will help monitor the current readings of environmental changes that occur in the remote area. The system will retrieve and record environmental changes results to rapidly generate report.

As what the findings show, the researchers concluded that the study was reliable, efficient and has a great usability when implemented. The system may have a good

feedback from its future user and a huge development change in Department of Agriculture when it comes to the process of gathering information from a remote area.

References

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