SMART AGRICULTURE MONITORING SYSTEM WITH GSM MODULE USING INTERNET OF THINGS

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ABSTRACT: Agriculture plays vital role development of smart irrigation in our everyday life. The Internet of things (IOT) is remodeling the agriculture enabling the farmers with the wide range of techniques such as precision and sustainable agriculture to face challenges in the field. IOT technology helps in collecting information about conditions like weather, moisture, temperature and fertility of soil, Crop online monitoring enables detection of weed, level of water, pest detection, and animal intrusion into the field, crop growth, and agriculture. IOT leverages farmers to get connected to his farm from anywhere and anytime. Wireless sensor networks are used for monitoring the farm conditions and microcontrollers are used to control and automate the farm processes. To view remotely the conditions in the form of image and video, wireless camera shave been used. A smart phone empowers farmer to keep updated with the ongoing conditions of his agricultural land using IOT at any time and any part of the world. IOT technology can reduce the cost and enhance the productivity of traditional farming. The design and implementation of hardware is simple as it uses GSM modem, PIR sensor, Temperature sensor, Humidity sensor, pH sensor, Soil moisture sensor, with relays, ADC and microcontroller with software implementation on Android Mobile Phone.

Keyword: GSM modem, PIR, Temperature, Humidity pH, Soil moisture sensors, ADC, microcontroller and Android.

I. INTRODUCTION

Agriculture plays vital role in the development of agricultural country. In India about 70% of population depends upon farming and one third of the nation's capital comes from farming. Issues concerning agriculture have been always hindering the development of the country. The only solution to this problem is smart agriculture by modernizing the current traditional methods of agriculture. The continuous increasing demand of the food requires the rapid improvement in food production technology. In a country like India, where the economy is mainly based on agriculture and the climatic conditions are isotropic, still we are not able to make full use of agricultural resources. The main reason is the lack of rains & scarcity of land reservoir water. Another very important reason of this is due to unplanned use of water due to which a significant amount of water goes waste. In the modern drip irrigation systems, the most significant advantage is that water is supplied near the root zone of the plants drip by drip due to which a large quantity of water is saved.

At the present era, the farmers have been using irrigation technique in India through the manual control in which the farmers irrigate the land at the regular intervals. This process sometimes consumes more water or sometimes the water reaches late due to which the crops get dried. Water deficiency can be detrimental to plants before visible wilting occurs. Slowed growth rate, lighter weight fruit follows slight water deficiency. This problem can be perfectly rectified if we use automatic microcontroller based drip irrigation system in which the irrigation will take place only when there will be intense requirement of water. Irrigation system uses valves to turn irrigation ON and OFF. These valves may be easily automated by using controllers and solenoids. Automating farm or nursery irrigation allows farmers to apply the right amount of water at the right time, regardless of the availability of labor to turn valves on and off. In addition, farmers using automation equipment are able to reduce runoff from over watering saturated soils, avoid irrigating at the wrong time of day, which will improve crop performance by ensuring adequate water and nutrients when needed. Automatic Drip Irrigation is a valuable tool for accurate soil moisture control in highly specialized greenhouse vegetable production and it is a simple, precise method for irrigation. It also helps in time saving, removal of human error in adjusting available soil moisture levels and to maximize their net profits.

II. PROBLEM STATEMENT

The motivation of the farmers working in the farm lands are solely dependent on the rains and bore wells for irrigation of their land. In recent times, the farmers have been using irrigation technique through the manual control in which the farmers irrigate the land at regular intervals by turning the water-pump ON/OFF when required. If they Switch ON any of the motor, there will be the sudden defuse in motor circuit. They may have to travel so far for SWITCHING ON/OFF the motor. For this problem the solution can be found through this paper work.

III. EXISTING SYSTEM

Complexity in managing the data related to the agriculture products, soils, fertilizers, mandi /market details. The existing system has following difficulties in the system:

- No Information on demand supply given to farmers.
- No preproduction support is given.
- Production support is not given i.e., no digitalization of agriculture.

- Sales support not given. No blog is available so that educated engineers can support farmers.
- Lack of security and this system does not provide category wise classifications of products.

IV. PROPOSED SYSTEM

The development of this new system contains the following activities, which try to automate the entire process keeping in the view of database integration approach.

- Information on demand supply given to farmers.
- Preproduction support is given. Production support is given i.e., digitalization of agriculture like using of sensors to identify problems.
- Blog is available so that educated engineers can support farmers. And facilities like introducing modern agriculture thro YouTube is given.
- Reduce complexity in managing the data related to the agriculture products, soils, fertilizers, mandi/market details.
- Current system provides different access levels for security.
- Rich user interface is provided in order to interact with application.

ADVANTAGES OF PROPOSED SYSTEM:

- Reduces water consumption.
- Less man power is required.
- Product is feasible and reliable, scalable and economical.
- Increase in productivity.

V. SYSTEM DESIGN

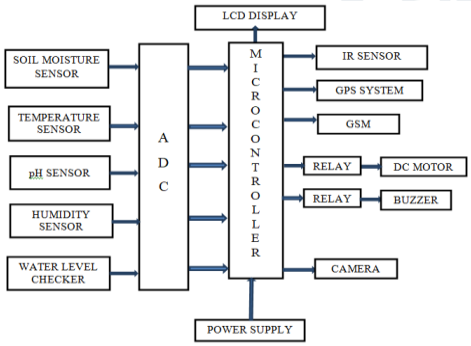

Figure 1: System Design

A. Sensors Data acquisition

There sensors used are already discussed. Let discuss about data acquisition from sensors one by one. The sensor is interfaced with SST microcontroller and programmed. Once it is programmed it is placed inside a box and kept in the field. The soil moisture sensor has two probes which are inserted into the soil. The probes are used to pass current through the soil. The moisture soil has less resistance and hence passes more current through the soil whereas the dry soils has high resistance and pass less current through the soil. The resistance value help detecting the soil moisture. Figure 2 shows soil moisture sensor.

Figure 2: Soil Moisture sensor

The DHT11 temperature and Humidity sensor is used. The total amount of water vapor in air is defined as a measure of humidity. Relative humidity is calculated because when there is a change in temperature, relative humidity also changed. The temperature and humidity changes occur before and after irrigation. The amount of water droplets in air is increased after irrigation. This causes decrease in temperature which in turn increases the relative humidity of the surroundings. The temperature and humidity reading are often notified to the user so that the user can be able to know the field conditions from anywhere. The temperature and humidity sensor can also be used in green houses.DHT11 temperature and humidity sensor is shown in Figure 3.

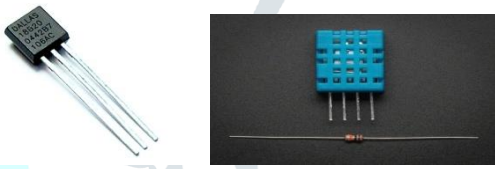

Figure 3: Temperature and Humidity sensors

A pH meter relies on a voltage test to determine hydrogen ion levels and thus pH. pH meters have two electrodes, a glass electrode and a reference electrode. The glass electrode has a permeable membrane made from specialized glass, which houses a chemical solution and a silver-based wire. The pH is the logarithm of the hydrogen ion concentration. The ideal pH electrode: Zero volts output at neutral pH (=7.0) Positive voltage in acids, pH<7.The pH sensor is shown in Figure 4.

Figure 4: pH sensor

An infrared sensor is an electronic device, that emits in order to sense some aspects of the surroundings. An IR sensor can measure the heat of an object as well as detects the motion. The intruder is shown in Figure 5.

Figure 5:IR sensor

Global system for mobile communication (GSM) is a globally accepted standard for digital cellular communication. It is the

name of the standardization group established in 1982 to create a common European mobile telephone standard. The GSM specifications define the functions and the interface requirements but do not speak about the hardware. The GSM system is divided into 3 major systems:

- The mobile station which is carried by the subscriber.
- The base station system (BSS) controls the radio link with the switching system.
- The network subsystem, the main part of which is the Mobile services Switching Center (MSC), performs the switching of calls between the mobile users, and between mobile and fixed network users.

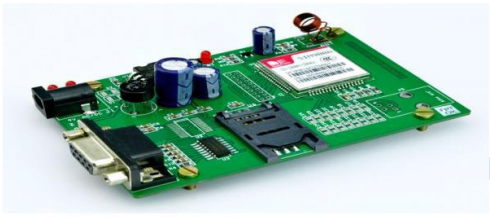

Figure 6: GSM structure

B. Mobile Application

An application called Famer's Buddy is developed using embedded C and android SDK for getting the information of the pre-production. This application can be used by any user who is registered through this application. The user needs to provide the information like Username, Password, AadharId number, Phone number, Address, Land area in acres, Pahani number, and Major crops grown in the registration window to get registered. After filling the information user will get pop up message like registration successful. The Farmers Buddy Application is used by the famers to register them for getting the information like pre-production, crop rate, etc.

After registration is successful the user can login by using User Id and Password. Once the user is logged in he/she can get two options like BLOGS and CROPS. In BLOGS option the user get the written blogs where the information of crops given along with video link for more reference. In CROPS option the famers get the information like price of the crop, total area available for cultivation along with the image of the crops. If the area is available then he will get registration successful message otherwise it will give the messages that the threshold has reached please try another crop. The Farmer's Buddy Application is useful application with user friendly features in it which helps each and every person to access easily.

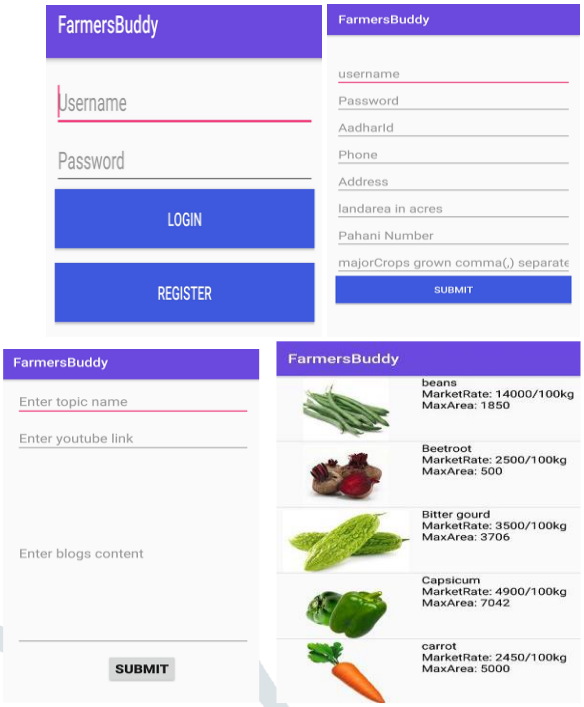

Figure 7: Farmer's Buddy Application

VI. SYSTEM IMPLEMENTATION AND RESULTS

The implementation can be described as, when the power supply is given first, the soil moisture sensor will display the message "LAND IS WET" when the land is wet or else it will display "LAND IS DRY" message to the user and the water pump will "ON" automatically and "OFF" itself when land will become wet. After that, the water level sensor will check whether the water level is full or not and gives the result "WATER LEVEL IS LOW" to the user and the user need to fill the water tank.

The temperature and humidity sensors will check for temperature and humidity of the field and display the message "TEMP IS HIGH" and "HUMIDITY IS HIGH". IR sensor will detect the intruder in the field and sends the notification "INTRUDER DETECTED" and the user can register the complaint to the nearest police station in that particular area.

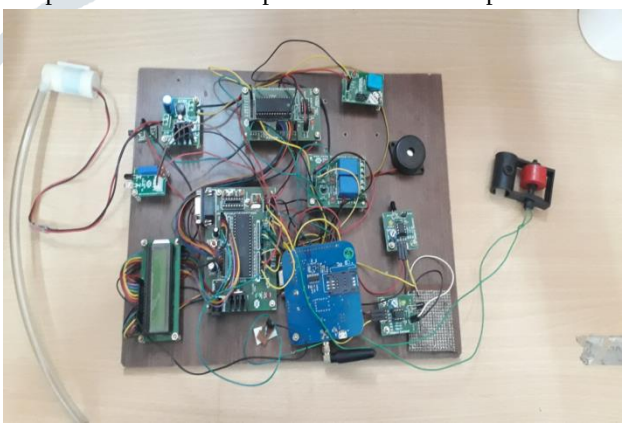

Figure 8: Hardware implementation

The pH sensor is used for checking whether the water is contaminated or pure to use for crop growing. If the water is contaminated the user will get "WATER CONTAMINATED" message in their handset.

And, it also captures the intruder photo and sends the photo to the register Email Id. The ADC converter is used to convert temperature and humidity the analog signal to digital values. The GSM modem is used to collect the information and sends that information to the user mobile in text format. The relay is used for DC motor and for the buzzer in IR sensor. In receiver section the user who has registered their mobile number, they will be getting notifications about the activities taking place in field. The user will receive the notification messages in both text and audio alert format.

If the intruder is detected than the user will send location to the GSM. The GSM will get the location and sends back the message with longitude and latitude of the location. The location tracking can be done through goggle map.

After getting the location of the intruder, the photo is captured. The photo of the intruder is sent to the registered email id via GSM. After photo is sent the user will register the complaint against the intruder. The output is shown in the above snapshots.

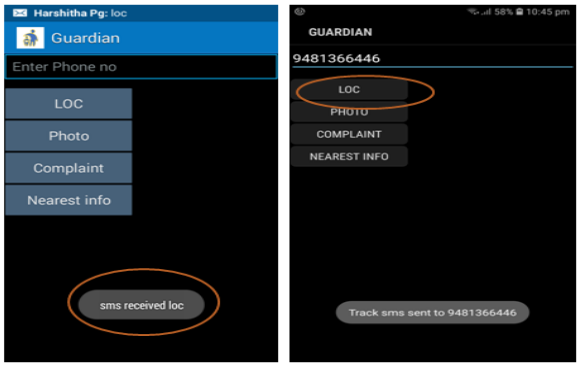

Figure 9: Tracking SMS sending

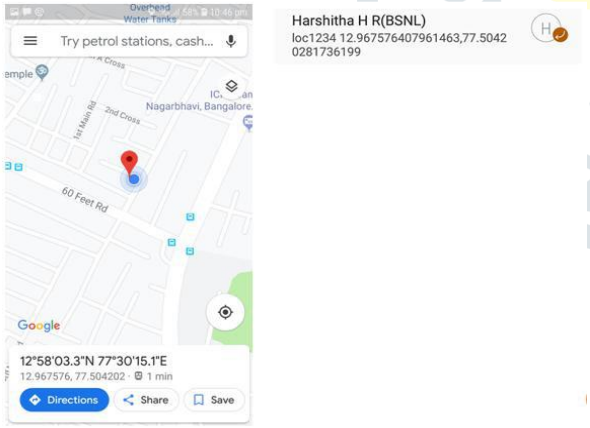

Figure 10: Tracking of location

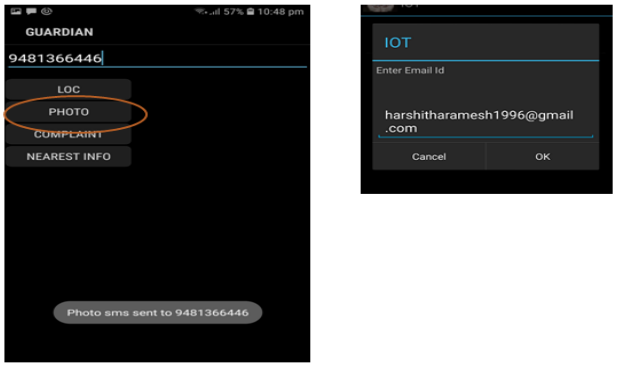

Figure 11: Photo capturing

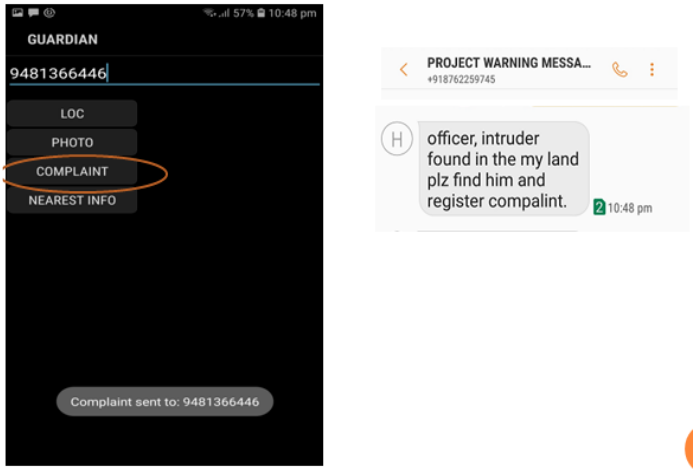

Figure 12: Complaint registration

CONCLUSION

Smart Agriculture Monitoring system is a proposed method for efficient crop monitoring for agriculture field and it is more reliable, flexible and economical. The user is notified by sending alert messages to the registered mobile number. This is also user friendly.

FUTURE WORK

In future the intruder sensor can be categorized by the detection of rodents, mammals and human by different sensors for each and the monitoring can also be done by video surveillance.

REFERENCES

[1] Joaquín Gutiérrez, Juan Francisco Villa-Medina, Alejandra Nieto-Garibay, and Miguel Ángel Porta- Gándara"Automated Irrigation System Using a Wireless Sensor Network and GPRS module" , Ieee Transactions On Instrumentation And Measurement, Vol. 63, No. 1, January 2016.

[2] Stefanos A. Nikolidakis , Dionisis Kandris,Dimitrios D. Vergadoschristos Douligeris A"Energy Efficient Automated Control Of Irrigation In Agriculture By Using Wireless Sensor Networks, Computers And Electronics In Agriculture "0168-1699/ 2015 Elsevier B.V.

[3] Venkata Naga Rohit Gunturi, "Micro Controller Based Automatic Plant Irrigation System" International Journal of Advancements in Research & Technology, Volume 2, Issue- 4, April-2015.

[4] D. K. Fisher and H. A. Kebede, "A low-cost microcontroller-based system to monitor crop temperature and water status," *Computer Electronics Agriculture.*, vol. 74, no. 1, pp.168–173, Oct. 2015.

[5] S. Li, J. Cui, Z. Li, "Wireless Sensor Network for Precise Agriculture Monitoring," Fourth International Conference on Intelligent Computation Technology and Automation, Shenzhen, China, March 28-29, 2014.

[6] Abhinav Rajpal, Sumit Jain, Nistha Khare and Anil Kumar Shukla, "Microcontroller-based Automatic Irrigation System with Moisture Sensors" Proc. of the International Conference on Science and Engineering (ICSE 2014).