Smart Agriculture Monitoring and Security System

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Abstract: Agriculture is the backbone of our country. Farmers choose to farm for various reasons, but almost all farmers aspire to make a living from their farming activities. In the absence of profits, which translate to family income, an area will gradually lost to agricultural production.An agricultural monitoring system provides monitoring services such as crop growth rate and security. This has several advantages such as reduction in manpower requirement, thereby reducing great recurring expenditure, improvement in time consumption, easy maintenance, system reliability. This project uses various sensors integrated to an embedded controller for performing monitoring services and security. It is expected that it would be a low cost, reliable smart system catering to the needs of rural mass.

Keywords: *GSM, Wireless Sensor Network, Arduino Mega, Controlling and Monitoring.*

I. INTRODUCTION

Sensor networks are used for collecting , storing and sharing the sensed data. They can also be defined as a system comprised of a set of sensor nodes and a communication system that allows automatic data collection and sharing. Generally most of the irrigation systems are manually operated one. These traditional techniques are being replaced with semi-automated and automated techniques suggested an automated concept of irrigation to use the water efficiently and effectively Automated Drip Irrigation system is implemented based on the soil moisture sensor value. Former method is an isolated irrigation system where the farmer doesn't updated with the irrigation status and later lags in smart utilization of water due to user command without considering the condition of soil.The farmers are intimated about fertilizers required for the crops for better yield at various conditions by measuring soil nature and the better crop cultivation based on the climatic conditions. This paper focuses on the development of a wireless sensor network on agricultural environment to monitor environmental conditions and deduce the appropriate environmental parameters required for the high yield of crop production on a given agriculture land. It is expected that such decision will benefit both farming and irrigation by saving time and resources.

II. LITERATURE REVIEW

Maheswari discussed about development of Embedded based system to monitor elephant intrusion in forest border areas using IOT.Nirdosh Kumar and Mrs.Shimi S discussed about Smart Farming System for Indian Farmers using Arduino Based Technology.KhatriVyas, AmolBoroleand Shikhasinge discussed about smart agriculture monitoring and data acquisition system.Gayatri discussed about Providing smart agriculture solutions to farmers for better yielding using IOTS.R.Nandurkar, V.R.Thool discussed about Design and development of precision agriculture system using wireless sensor network.Huichang discussed about Anew Agriculture Monitoring system based on WSNs. Meonghun lee, Jeonghwan Hwang and Hyun Hoe discussed about Agriculture production system based on IOT.Yimmingzhou discussed about A wireless design of low cost irrigation system using zigbee technology.M.UshaRani ,kamalesh S discussed about web based service to monitor automatic irrigation for the agriculture field using sensors.Ghulam Ali, Shaikh A. W., Aqeel-ur-rehman, Shaikh Z.A. discussed about A framework for development of cost effective irrigation control system based on wireless sensor and actuator network for efficient water management. Zengyu Pen, Yandong Zhao discussed about Real time monitoring system for soil moisturing content based on microcontroller operating system. Nikesh Gondchawar Dr. R. S. Kawitkar discussed about IOT Based Smart Agriculture. Pasha B.R., Dr. B.Yogesha discussed about, Microcontroller based automatic irrigation system. Y. Hao ,B. Campana and E.Keogh. discussed about Monitoring and mining animal sounds in visual space. D.O.Shrisath, Punam Kamble, Rohini Mane, Ashwini Kolap, R.S.More discussed about IOT Based Smart Greenhouse Automation Using Arduino. Dr.V..Vidya Devi, G.Meenakumari discussed about Real time automation and monitoring system for modernised agriculture. C. Liu, W. Ren, B. Zhang discussed about The application of soil temperature measurement by lm35 temperature sensors.

III. PROPOSED METHOD

The block diagram of smart irrigation system. Farmers start to utilize various monitoring and controlled system in order to increasethe yield with help of automation of agricultural parameters like soil moisture, soil pH, PIR sensor, Water flowsensor, Sonicrepellent are monitored and controls the systems which can help the farmers to improve the crop yield.

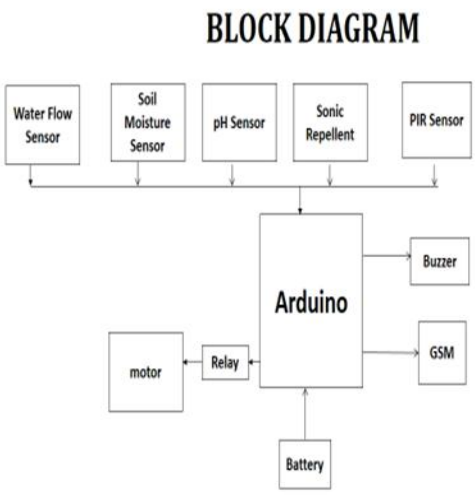

Figure 1: Block diagram of smart agriculture

There are different sensors are used to controlling the process of irrigation system. Different sensors used are soil moisture,

soil pH, PIR ,Water flow ,Sonic repellent are all measured . The measured values will be received through GSM .

Soil moisture sensor:

Itconsist of two probes which are used to measure the volumetric content of water, which gives the resistance value to moisture value. The sensor gives us both analog and digital output.When there is water, the soil will conduct more electricity, which means that there will be less resistance.Dry soil will conduct electricity poorly, so when there is water, the soil will conduct less electricity, which means that there will be more resistance.

Specification:

Input voltage: 3.3-5V
Output voltage: 0-4.2V
Input current: 35mA

Water flow sensor:

The water flow sensor consists of plastic valve body, a water rotor and a hall-effect. When the water flows through the rotor , rotor rolls and the speed of it changes with the different rate of flow. Flow meters have proven excellent devices for measuring water flow and now it is very easy to build a water management system using the renewedwater flow sensor YF-S201.This sensor sits in line with the water line and contains a pinwheel sensor to measure how much water has moved through it.

PIR sensor:

A PIR sensor do not emit any kind of radiation for detection purposes but they just measure the infrared radiation emitted by other objects inside its field (or) range of measurement. The electronic sensor used to detect the movement of human being within a certain range of the sensor (range of the sensor is about 10m to 15m). There are different types of sensors and here let us discuss about the PIR sensor with dome shaped Fresnel lens. The PIR sensor is used in numerous electronics projects which are used to discover a human being entering or leaving the particular area or room. These passive infrared sensors are flat control, consist of a wide range of lens, and PIR sensor can be easily interfaced with electronic circuits.

Specifications:

Input voltage:4.5-12V.
Output voltage:0-3.3V.
Range: 10m.

pH sensor:

pH is a measure of the acidity or alkalinity of a soil.The most common pH sensor is the glass electrode it's used in many industry applicationand in wide variety of fields. The glass-electrode methods has high reproducibility, and it can measure pH of various solutions. A pH electrode is a potentiometric or electrochemical sensor that has a voltage output.The normal pH value for the plant ranges from 5 to 7.

GSM module:

GSM(Global system for mobile communication) is a standard developed by the European Telecommunications Standards Institute(ETSI).GSM modem is a specialized type of modem which accepts a SIM card and operates over a subscription to a mobile operator just like mobile phone.It uses a variation of time division multiple access(TDMA) and is the most widely used of the three digital wireless telephony technologies(TDMA,GSM,CDMA).GSM digitizes and compresses data then sends it down a channel with two other streams of user data each in its own time slot. The digital system has an ability to carry 64kbps to 120Mbps of data rates. It is available in three frequencies: 900MHz, 1800MHz and 1900MHz.

Specification:

Input voltage: 12V.

Sonic repellent:

Sonic repellent are a constant irritation to pests because the high pitched noise affects their central nervous systems and causes them physical discomfort .Though not harmful, it does make it unpleasant enough to leave the treated areas.

IV. RESULTS AND DISCUSSIONS

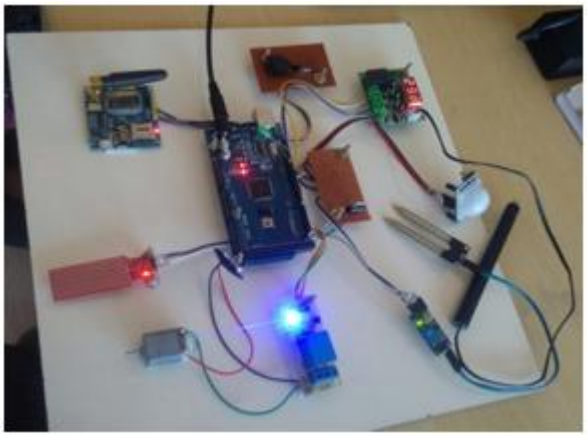

Figure 2: Overall output of the system

The overall output of the system is shown in figure 2. Here, the soil moisture sensor senses the volumetric water content in the soil and if the soil is in dry condition the motor will be on so that the plant gets required water. When the PIR sensor detects the object the buzzer gets on to alert the farmer. When the waterflow is reduced the LED will glow.pH sensor measures the pH value in the soil and the values are send to the farmer through GSM. The cost benefit analysis for the system is shown in the below table.

Table1 Cost benefit analysis for the system

S.NO	NAME OF THE MODULE	COST
1	Soil moisture sensor	205
2	PIR sensor	120
3	pH sensor	845
4	Water flow sensor	185
5	Sonic repellent	820
6	Relay	150
7	Motor	190
8	Buzzer	25
9	Arduino mega 2560	1225
10	GSM	940
TOTAL		4,705

CONCLUSION

This paper presents a crop monitoring system based on wireless sensor network. With the use of wireless module system becomes flexible. Sensors can be placed anywhere in the field and if there is a need of relocation the it can be easily done. The monitoring of field not only allows user to reduce human power, but it also allows user to see changes in

it.Implementation of this system in the field can definitely help to improve the yield of the crops and overall production.

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