

SOIL QUALITY MEASUREMENT USING WIRELESS COMMUNICATION

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ABSTRACT

The main objective of the present paper is to develop a smart wireless sensor network (WSN) for an agricultural environment. Monitoring agricultural environment for various factors such as soil moisture, temperature and humidity along with other factors can be of significance. A traditional approach to measure these factors in an agricultural environment meant individuals manually taking measurements and checking them at various times. This paper investigates a remote monitoring system using Zigbee. These nodes send data wirelessly to a central server, which collects the data, stores it and will allow it to be analyzed and displayed as needed and can also be sent to the client mobile.

Keywords: Wireless Sensor Network , Zigbee, Avr, Soil Quality,

I INTRODUCTION

Agriculture is the foundation of Indian economy. Due to the expanding population growth, land deterioration and raising demand for food, a viable and sustainable agricultural system has become a critical issue to achieve. So, in order to overcome this critical problem, the Nations crop production must be increased effectively and efficiently. Soil quality plays a major role in increasing the crop production. Plants obtain support for their growth from the soil, which manages functions of portioning water and solute flow, maintaining biodiversity and productivity, buffering and purifying and nutrient cycling which reflects the soil nature. Large impact on soil nature is maintenance of soil. Three essential factors that plants require for their growth and reproduction are light, water and nutrients. However, plants make use of sunlight which is naturally available for their growth and reproduction functions. But the major focus is on water and nutrients which are available by soil to the plants. Sometimes nutrients loss occurs by the soil due to runoff water, erosion and leaching, gaseous losses to the atmosphere and becomes unavailable for plant uptake. The water and nutrients level vary depending upon the type of soil and plants. So, an efficient soil quality management system is needed to be developed.

Wireless technology using various sensors for precision agriculture has become a popular research with the greenhouse effect. People are utilizing the merits of embedded system into monitoring and control system for agriculture parameter. Monitoring parameters of temperature and humidity is an important means for obtaining high-quality environment. Remote monitoring is an effective method in order to avoid interference environment and improve efficiency. Today, Ethernet network, RF module and ZigBee wireless network are used to transmit data in remote Monitoring System.

Why Do We Monitor Soils?

Regional Councils are charged with the responsibility for promoting the management of the natural and physical resource of their region. Monitoring of these resources establishes the state of the environment and whether the communities' expectations are being met. The results of the monitoring provide information that can be used to change or prioritise, the manner in which we manage the environment. The trends determined by the monitoring of soils can be used to develop policies and rules that will protect the sustainability of our soils resources.

Analysis of soil quality

The soil quality monitoring programme undertaken since 1999 has involved the following:

1. Location of the high quality soils in the region;
2. identification of sites covering a range of landuses for each of the soiltypes;
3. undertaking site investigations to confirm the soil type; and
4. sampling of the identified sites.

II BLOCK DIAGRAM

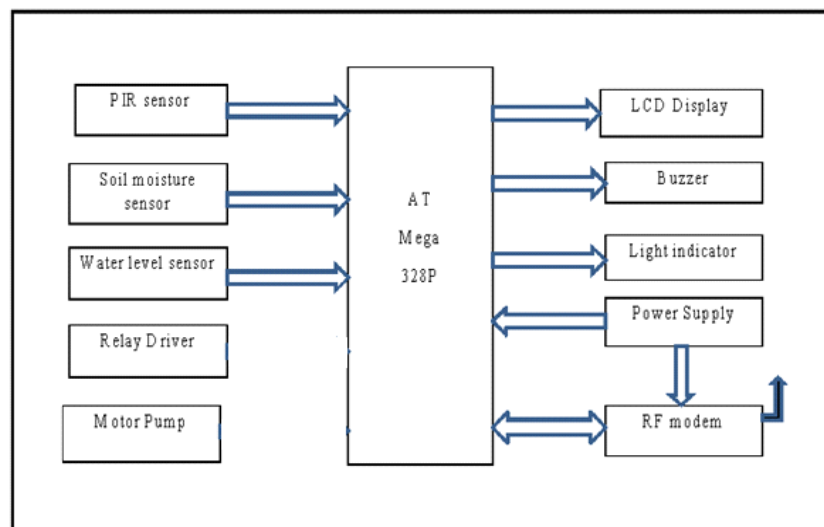


Fig 1. Block diagram of soil quantity testing by using wireless

III DESCRIPTION OF BLOCK DIAGRAM

The proposed hardware of this system includes 8 bit AVR, PIR sensor, water level sensor, relay driver, motor pump, soil moisture sensors, LCD and buzzer. The system is low cost & low power consuming so that anybody can afford it. The data monitored is collected at the server. It can be used in precision farming. The system should be designed in such a way that even illiterate villagers can operate it. They themselves can check different parameters of the soil like salinity, acidity, moisture etc. from time to time. During irrigation period they have to monitor their distant pump house throughout the night as the electricity supply is not consistent. The system can be installed at the pump house located remotely from the village, it is interfaced with the pump starter & sensors are plugged at different location in the field for data acquisition. Using this system they can switch on their pump from their home whenever they want. In this fig all sensors are connected to AT mega 328P. RF modem is used for wireless communication. All parameters value will be display on 16*2 LCD. When motion will detect the buzzer will be on as per program. When water level goes below the limit motor will be on by relay driver circuit and when water level goes at low level motor will be off.

IV SYSTEM DEVELOPEMENT

The proposed hardware of this system includes 8 bit AVR, Blue tooth module, Temperature, humidity and soil moisture sensors, LCD. The system is low cost & low power consuming so that anybody can afford it. The data monitored is collected at the server. It can be used in precision farming. The system should bedesigned in such a way that even illiterate villagers can operate it. They themselves can check different parameters of the soil like salinity, acidity, moisture etc. from time to time. During irrigation period they have to monitor their distant pump house throughout the night as the electricity supply is not consistent. The system can be installed at the pump house located remotely from the village, it is interfaced with acquisition. Using this system they can switch on their pump from their home whenever they want.

A. Temperature Sensor

The LM35 series are precision integrated-circuittemperature sensors, whose output voltage is linearlyproportional to the Celsius (Centigrade) temperature.

B. Humidity sensor

Humidity measurement instruments usually rely on measurements of some other quantity such as temperature , pressure, mass or a mechanical or electrical change in a substance as moisture is absorbed. By calibration and calculation, the semeasured quantities can lead to a Measurement of humidity.

C. Soil moisture sensor

The soil moisture sensor used is capacitive type. Thesensor gives analog output of zero volt when there is100% moisture and 5V for 0% moisture.

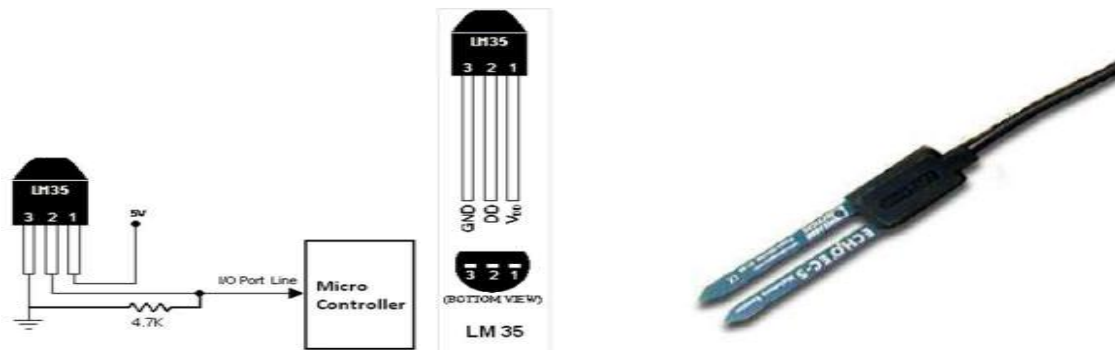


Figure.2 Temperature Sensor Figure.3 Soil Moisture Sensor

Table I: Comparison between Wi -Fi, Bluetooth and ZigBee

FEATURE	Wi- Fi	BLUETOOTH	ZIGBEE
Radio	DSSS	FHSS	DSSS
Data Rate	11mbps	1 Mbps	250 Kbps
Nodes Per Master	32	07	64000
Slave Enumeration Latency	Upto 3s	Upto 10s	30ms
Data Type	Video, Audio, Graphics, Pictures, Files	Audio, Graphics, Pictures, Fles,	Small Data Packates
Range (M)	100	10	70
Extencibilty	Roaming Possible	No	Yes
Better Life	Hours	1 Week	>1 Year
Complexity	Complex	Very Complex	Simple

V FUTURE SCOPE

To minimize the efforts of Farmers, and to do effective cropping by using different types of sensors which detect humidity water level

V CONCLUSION

RF modem based agriculture monitoring system serves as a reliable and efficient system for monitoring agricultural parameters. The corrective action can be taken. Wireless monitoring of field not only allows user to reduce the human power, but it also allows user to see accurate changes in it. It is cheaper in cost and consumes less power. Wireless monitoring of field not only allows user to reduce the human power, but it also allows user to see accurate changes in it. It is cheaper in cost and consumes less power.

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