Remote Crop Monitoring System using IOT

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Abstract : **The backbone of Indian economy is agriculture and it is the vital for the food security. . In conjunction with the population growth over last century, the need for finding new and ustainable methods of agricultural cultivation and food production has become more critical. The remote crop monitoring system consist of soil temperature sensor, soil moisture sensor and PIR sensors leading to increase in productivity. Also with help of the microcontroller and Zigbee module we can send the data to remote areas. Wireless distinct sensor nodes can reduce time and effort required for monitoring an environment. PC data gives graphical representation which allows simplified diagnosis and analysis. Monitoring systems can ensure better quality control, response time is less and labor cost also reduces.**

Keywords: Smart irrigation, PIR sensor, ARM-7, Zigbee module

I. INTRODUCTION

The awareness about implementing the technology in the agricultute field has increased.Collection of data manually requires much time to get the response.This leads to barrier in measuring the important factors. Implimenting wireless sensor networks for tracking environmental parameters and uploading that information on web may enable farmers to utilize their knowledge in order to bring out the best results from their agricultural farming. The system is based on farmers demands and the resulting collection of information may gives a valuable resource for future use, in addition to real-time decision making. The design of the veracity agriculture system contains a prototype solution regarding the sensor technology and a customizable service that can be utilized in various ways and by several entities. The project attempted to monitor parameters associated with plants and crops such as soil moisture level, humidity, temperature etc and upload the same to a cloud database and gives the update to the owner of the plantation regarding the same. The information obtained was stored and graphically plotted and processed with APIs. The wireless protocol of choice was the internet for its global range.This paper includes various sensors such as temperature sensor,moisture sensoe & PIR sensors to monitor the crop in the field.With support of microcontroller and wireless communication technology we can easily monitor the crop efficiently.

II.DESCRIPTION OF CROP MONITORING SYSTEM COMPONENTS:

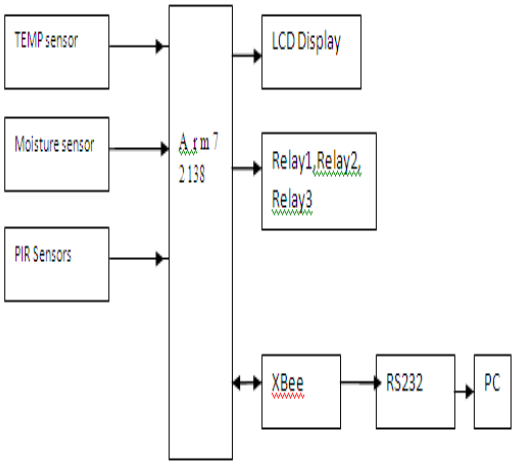

Fig. 1: Block diagram of remote crop monitoring system

II.1 Soil temperature sensor:

It monitors the temperature of the soil. Soil temperature sensors come in a variety of designs using thermistors, thermocouples, thermocouple wires, and averaging thermocouples. The electrical signals transmitted from the sensors to our data loggers can be converted to different units of measurement, including °C, °F, and °K. Our data loggers are also capable of measuring most commercially available soil temperature sensors.

Fig. 2: Soil temperature sensor

II.2 Soil moisture sensor:

It monitors the water content of the soil. Soil moisture sensors qualtify the volumetric water content inside the soil. Since the direct gravimetric

measurement of free soil moisture requires removing, drying, and weighting of a sample, soil moisture sensors evaluate the volumetric water content indirectly by using properties of the soil such as electrical resistance, dielectric constant, or interaction with neutrons, as a proxy for the moisture content.. Another class of sensors measure another property of moisture inside the soils called water potential; these sensors are usually referred to as soil water potential sensors and include tensiometersand gypsum blocks.

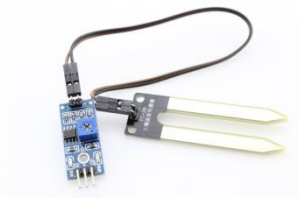

Fig. 3: Soil moisture sensor

II.3 PIR sensor (Passive Infrared Sensor):

All objects with a temperature higher than absolute zero radiates heat energy in the form of radiation. Generally this radiation is not visible to the human eye since it radiates at infrared wavelengths, but it can be recognised by electronic appliences designed for such a purpose.The term passive in this sensor refers to the fact that PIR devices do not create or radiate any energy for detection purposes. They perform completely by detecting the energy given off by other objects. PIR sensors do not identify or measure "heat"; instead they detect the infrared radiation emitted or reflected from an object.

When warm bodies like a human or animal passes by, it first intercepts one half of the PIR sensor, which results in *a* positive differential change among the two halves. When the warm body leaves the sensing area, the reverse operation takes place, whereby the sensor cause a negative differential change. These change pulses are what is detected.

Fig. 4: PIR sensor

II.4 ZigBee Module:

ZigBee technology is based on the Institute of Electrical and Electronics Engineers Standards association's 802.15 specification. It works on the IEEE 802.15.4 physical radio specification and in unlicensed radio frequency bands, including 2.4 GHz, 900 MHz and 868 MHz. The specifications are maintained and monitored by the ZigBee Alliance. As of this writing, there are three ZigBee specifications which includes ZigBee, ZigBee IP and ZigBee RF4CE. ZigBee IP optimizes the standard for IPv6 full mesh networks and ZigBee RF4CE optimizes the standard for partial mesh networks.

ZigBee is an IEEE 802.15.4-based specification. It is used for a suite of high-level communication protocols used to implement personal area networks with small, low-power digital radios,which includes home automation, medical device data collection, and other low-power low-bandwidth requirements. Its less power consumption reduces transmission distances to 10 to 100 meters line-of-sight.

Fig. 5: ZigBee Module

II.5 Microcontroller ARM 7 2138:

'LPC2138' is an ARMv7 based microcontroller by NXP, 'STM32' is from ST-microelectronics company. "The ARM architecture has the best MIPS (Million Instructions per Second) to Watts ratio as well as best MIPS to $ ratio in the industry.The smallest CPU in the size, all the obligatory computing capability incorporate with low power consumption of which a highly flexible and customizable set of processors are accessible with options to choose from, all at a low cost."

Fig. 6: Microcontroller ARM 7 2138

III. ADVANTAGES:

- The data are accessible for major areas.
- They are obtainable on a regular basis for all over the globe (repetitive coverage).Data may be received every 1 to 3 days.
- They are objective.The sensor transmission reception system comprise no human intervention.
- The data gained are related to the Earth surface features
- They actually present in digital form and geometrically corrected images are used to provide a base to overlay other data or to be used as part of a research in a GIS field.

IV. APPLICATIONS

- In the field of vegetation: Crop type categorization, crop condition analysis (crop monitoring, damage assessment), crop yield evaluation.
- Factor Soil: Mapping of soil features, mapping of soil type, erosin of soil, soil moisture level , mapping of soil management practices and compliance supervising (farming practices).
- By using the sensor technology data access time reduces which results in efficient increase in efficiency.So in crop monitoring various parameters measurements can be easily done.
- With the use of microcontroller technology manipulation of the data becomes drastically easily.This will help to manipulate data in the field of the agriculture.
- Wireless technology in the agriculture plays a vital role for the transmission of the data from one node to another.

V.CONCLUSION

Zigbee-based agriculture monitoring system serves as a faithful and efficient system for monitoring agricultural parameters. Wireless monitoring of field allows user to reduce the human power and it also allows user to observe precise changes in it. Cost is less and consumes low power.

ACKNOWLEDGMENT

I am honestly thankful to all faculties for their support. Without their support it was not easy job for me to fulfill this task. I am very thankful to my guide Prof.Payal Varangaonkar for her consistent advice, encouragement and inspiration throughout the period .I also want to thank our Head of the Department (EXTC) for providing us all necessary facilities.

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