

Application of Wireless Sensor Network for Precision Agriculture

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Abstract: precision farming is a bunch of new information technologies applied to the management of wide-reaching, trading agriculture. It guaranteed higher yields and lower input costs by real-time and automatic monitoring of site specific environment and soil conditions using different sensors and thereby improving crop management, reducing waste and labour costs. Wireless sensor networking is acquire popularity for managing precision agriculture through real-time monitoring of agricultural parameters and climate conditions. simulation tools exist for evaluating large scale sensor networks, however, they fail to capture practical aspects wireless communication. Real life test-beds bring out actual challenge and important aspects related to large-scale deployment of sensor networks. In this paper, Researcher present a tested implementation of a wireless sensor network for automatic and real-time monitoring of soil and environmental parameters influencing crop yields. The paper shows the system architecture, physical setup, sensor node hardware and software for real time-monitoring and management of agri-parameters through a simple graphical user interface.

Keywords: Wireless Sensor Network, USB to TTL, Motor driver circuit, Buzzer, Microcontrollers, CC2500

1. Introduction

Agriculture provides the economic foundation for the majority of rural India. In past few years, new trends have emerged to improve the different areas of agricultural sectors using the new technologies. weather condition monitoring is one of the most important aspects in agricultural production that has its direct impact on the productivity and maintenance of field crop. A big loss every year due to damages of crop by various ways caused by improper maintenance of some climatological behavior observe different climatological, soil parameters like temperature, humidity, soil moisture, soil pH, soil conductivity, leaf wetness. in real time is important for better management and continuity of agricultural production. If these factors can be maintained properly, that in turn, may stop the severe attacks of diseases on the crops. This problem gives birth to a new domain called Precision Agriculture Precision farming relies upon intensive sensing environmental conditions and computer processing of the resulting data to inform decision-making and control farm machinery. In this project, the sensor mote have several external sensors namely soil moisture, soil pH, humidity sensor etc. based on the value of all sensors water is supply to the field of agriculture, once the field

is sprinkled with the adequate amount of water, the water sprinkler get switched off. Hereby, the water is conserved. Also the value of soil pH sensor is sent to base station and in turn to base station intimates the farmer about the soil pH through SMS using GSM system.

2. Objective

To report the design, construction and testing of distributed infield WSN, a remote monitoring control, grid topologies. The main aim of this paper is to propose a sat of art wireless sensor technology in agriculture, which can show the path to rural area farming community to replace some traditional techniques.

3. Requirement analysis

A. Hardwares

1) CC2500

CC2500 is new wireless technology guided by IEEE 802.15.4 Personal Area Network standard. It is firstly designed for the wide range controlling applications and to replace the existing nonstandard technologies. CC2500 currently operates in 868 MHz band at a data rate of 20Kbps in Europe, 914 MHz band at 40kbps in USA, and the 2.4GHz ISM bands Worldwide at a maximum data-rate of 250kbps. It is used to verify whether user's truncation is possible or not.



Fig. 1. CC2500

2) Microcontrollers

Here in our project we are using AT89S52 microcontroller. It is a 40 pin IC with four 8 bit port, namely Port 0, Port 1, Port 2 and Port 3 which is used as a general purpose I/O lines. Various sensor input is given to the microcontroller via Port 1 and Port 3. The collected sensor data is sent wirelessly to the PC base station located at faraway place. The data from

microcontroller is sent to the serial buffer first i.e. at P3.1 which is the transmit buffer for serial communication.

3) Buzzer

To alert about the fire detection or animal detection we have provided an alarm bell which will ho ON as soon as any danger is sensed



Fig. 2. Buzzer

4) Motor driver circuit

It is used to drive the motor for irrigation. Here we have used IC L293. It is used to drive the motor which is activated from PC which is remotely situated.

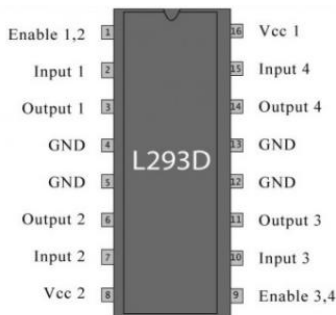


Fig. 3. Motor driver circuit

5) USB to TTL

The data received from the agricultural field via the wireless module, is sent to PC via USB to TTL converter which will convert the logic level.



Fig. 4. USB to TTL

B. Softwares

1. Keil Uvision
2. eagle
3. uc flash
4. diptrace

C. Agriculture side node

The wireless sensor Nodes are equipped with various sensors; the sensors are connected to microcontroller. Humidity sensor senses the moisture content in air and soil to analyses the weather forecasting for determining crop health.

Fencing sensor are placed around agriculture field to sense any intrusion. If any intruder comes alarm bell will ring and the user is also notified on PC. Fire sensor is also placed so that if any fire occurs due to natural or man-made cause, the user is alerted.

For many crops the water level on the agricultural field is an important parameter for its cultivation. For knowing the desired level of water level we are placing water level sensor and if this level is breached, the again alarm will go ON.

For doing drip irrigation on the field we are providing motor driver connected to microcontroller, so that as commanded by the microcontroller, the motor will be driven by the motor driver. When water level sensor will sense that sufficient amount of water is not present on the field, then motor will ON the irrigation circuit

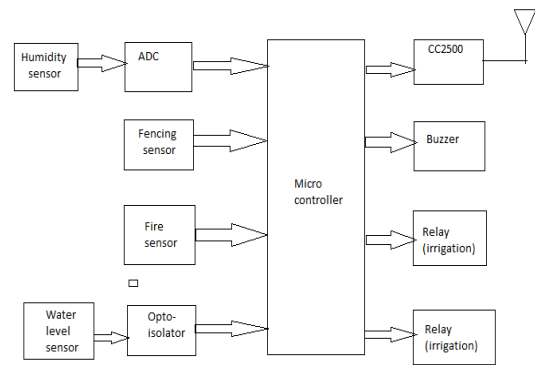


Fig. 5. Agriculture side node

D. Control room side

The whole setup can be controlled remotely using PC placed at the end of the field or around the range the wireless connecting module that is CC2500. The data received in PC are logged and its record is kept. so that for further planning of sowing of crops, these data can be used.

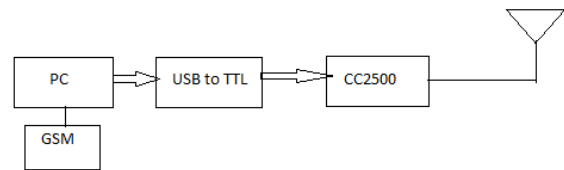


Fig. 6. Agriculture side node

4. Existing system

Weather condition monitoring is one of the most important aspects in agricultural production that has its direct impact on the productivity and maintenance of field crop. A big loss every year due to damages of crop by various ways caused by improper maintenance of some climatological behavior. In Existing System, Difficult to observe different climatological, soil parameters like temperature, humidity, soil moisture, soil pH, soil conductivity, leaf wetness for better management and continuity of agricultural production. If these factors are not maintained properly, that in turn, may not stop the severe

attacks of diseases on the crops. It requires more man power. Sometime crop will suffer from disease.

5. Proposed system

Precision Agriculture Precision farming relies upon intensive sensing environmental conditions and computer processing of the resulting data to inform decision-making and control farm machinery. In this project, the sensor mote has several external sensors namely soil moisture, soil pH, humidity sensor etc. based on the value of all sensors water is supply to the field of agriculture, once the field is sprinkled with the adequate amount of water, the water sprinkler gets switched off. Hereby, the water is conserved. Also the value of soil pH sensor is sent to base station and in turn to base station intimates the farmer about the soil pH through SMS using GSM system. Because of this proposed system farmers can sit at home and operate all the processes. This proposed system requires less man power, hence the farmer need less money. The proposed system helps for efficient plant growth.

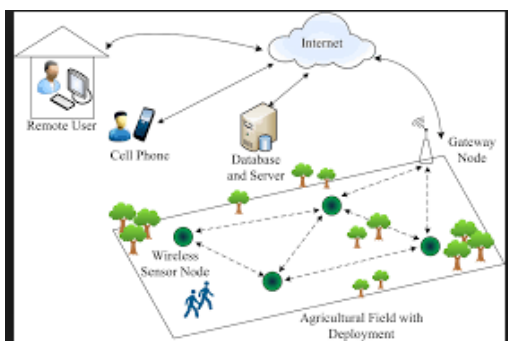


Fig. 7. Architecture of Precision Agriculture

6. Conclusion

The WSN agriculture is new technology for information acquisition and processing in any field.

WSN agriculture is more advanced than the traditional agriculture techniques.

WSN agriculture work structured the precision agriculture monitoring system by wireless sensor nodes and base station to record the data of sensor nodes.

WSN agriculture is low cost system where the recorded information is transmitted to remote location using a GSM network via a SMS.

We conclude that after detection of soil moisture percentage depends upon that drip irrigation will provide water to crops.

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