Utilization of Zigbee Transceiver in Agriculture and Structural Analysis

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Abstract: *In this paper,the utilization of Zigbee transmitter and receiver in the field of agricultural and structural analysis is done with the help of accelerometer and other type of field sensors such as humidity sensor and temperature variation sensor.*
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I. INTRODUCTION

Zigbee is a low cost, low power, wireless mesh networking standard. The Zigbee transceiver is used in agricultural field to provided remote monitoring of agricultural field conditions to the farmer such as temperature variation and humidity variation.

The Zigbee transceiver is also used in the structural analysis of buildings. In this application, several Zigbee enabled wireless sensors like accelerometer can be installed in a building and all the sensors form a wireless network to gather the information that will be used to evaluate the building structural health and detects the signs of possible damage.

II. INSTRUMENT & TECHNOLOGY USED

The system gives a view of remote control systems based on existing technologies like Zigbee and GSM for communicating with the devices so that the design implemented has the advantage of both technologies. Figure gives the basic block diagram of this system. In this diagram, the sensors take the readings from the field at defined intervals which are communicated to the Base Station via Zigbee WSN module working as a Transmitter and laptop/PC at the remote monitoring stations which is connected with Receiver Zigbee modem records the data. Microcontroller is the central control station and the GSM is other communication module or link. The GSM modem will deliver the SMS to farmer's mobile when the readings in field for the sensors exceed the threshold value. The controlinstructions from the farmer's mobile then can be sent to the microcontroller unit whichas a response controls the actuators/ DC motor interfaced with it.
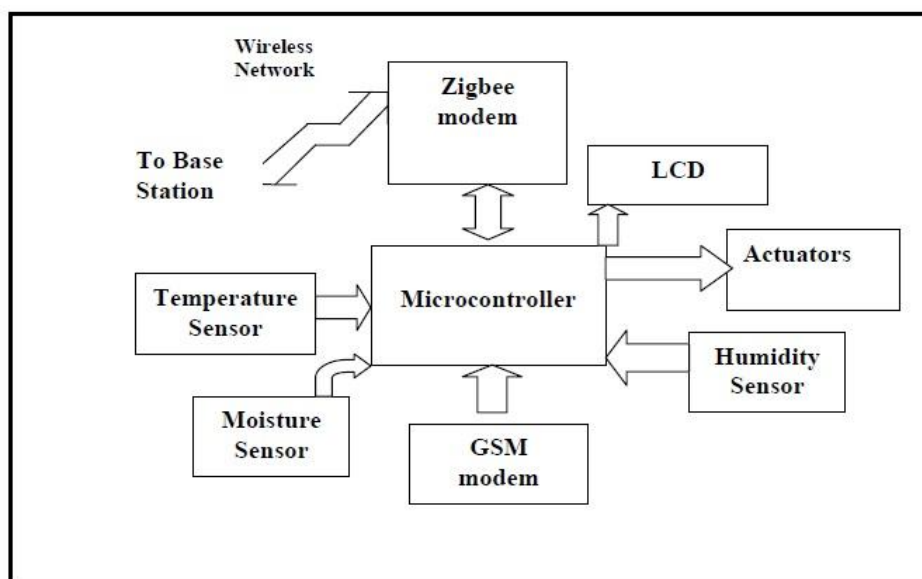

Figure: Basic Block Diagram of Zigbee-based Field Control System

It was observed that the technology is new in its idea and the implementation has not been very wide, so the knowledge if percolated to the farmer's at lower level then the increase in the efficiency of crop management will be much greater.
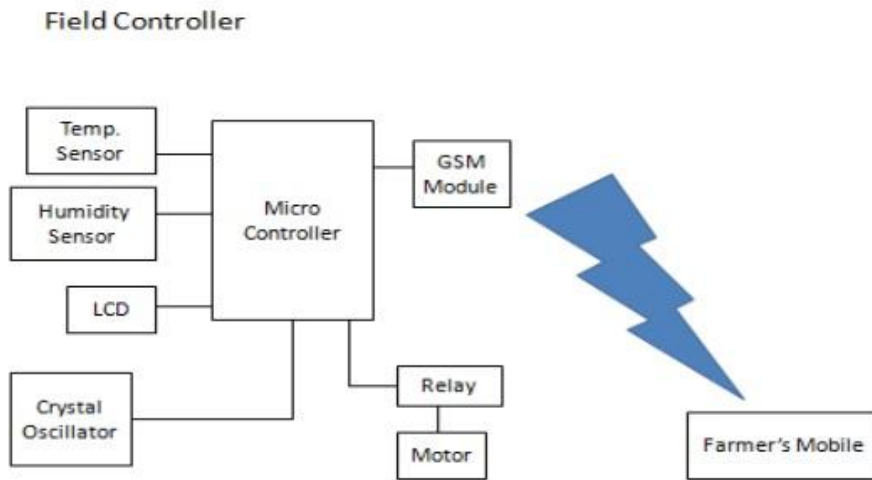
Field Controller

Figure: Block diagram of the proposed system

TEMPERATURE SENSOR:
The LM35 can be applied easily in the same way as other integrated-circuit temperature sensors. It can be glued or cemented to a surface and its temperature will be within about 0.01°C of the surface temperature. We have to be sure that the wiring to the LM35, as it leaves the device, is held at the same temperature as the surface of interest. The easiest way to do this is to cover up these wires with a bead of epoxy which will insure that the leads and wires are all at the same temperature as the surface, and that the LM35 die's temperature will not be affected by the air temperature.
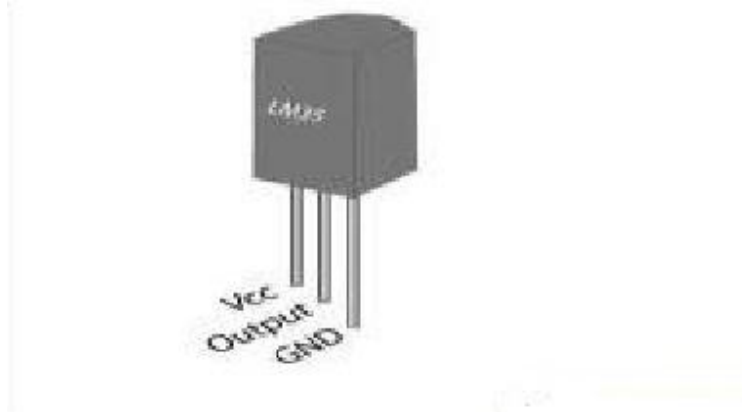

Temperature Sensor

HUMIDITY SENSOR:
Humidity sensor is an important chemical sensor, which is widely used in fields of warehousing, industry production, and process control, environmental monitoring, home appliances and meteorology etc.
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, these measured quantities can lead to a measurement of humidity. Modern electronic devices use temperature of condensation, or changes in electrical capacitance or resistance to measure humidity differences.
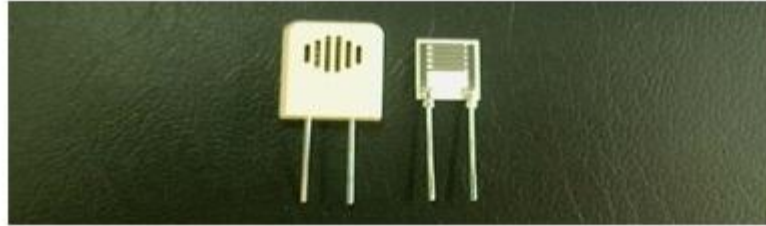
Humidity Sensor

Measuring soil moisture is important in agriculture to help farmers manage their irrigation systems more efficiently. Not only are farmers able to generally use less water to grow a crop, they are able to increase yields and the quality of the crop by better management of soil moisture during critical plant growth stages.

ACCELEROMETER

ZigBee transceiver is widely used in monitoring the structural health of large scale building and structures. In this application, several ZigBee enabled wireless sensors like accelerometers can be installed in a building and all these sensors can form a single wireless network to gather the information
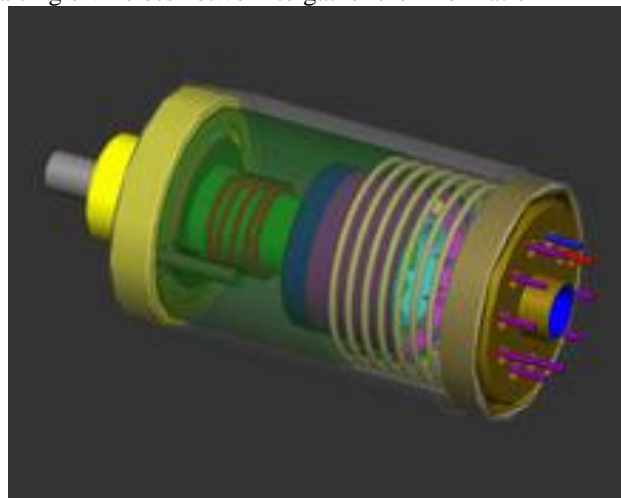
Accelerometrer

that will be used to evaluate the building structural healthand detects the signs of possible damage. After an earthquake, for example, a building couldrequire before it reopens to the public. The data gathered by the sensors could help further and reduce the cost of inspection.

III.   RESULT AND ANALYSIS

A GSM enabled Remote Monitoring System prototype is developed and experiments have been conducted. This system is designed with the objective of taking readings from the cotton field of the parameters like temperature, humidity etc and are controlled remotely by SMS using GSM.

Table shows the response of the system according to temperature and humidity. Also this table shows the response of the system according to changes in temperature and humidity.

Data	Temperature(^{0}C)/	Response
1	28	None
2	34	None
3	35	None
5	40	None
6	42	SMS send to farmer's mobile
7	44	SMS send to farmer's mobile

Table: System Response based on Temperature/ Humidity

When temperature is less than 42 degrees and humidity is less than 35, no SMS is sent to the mobile of the farmer. When temperature reaches 42 degrees and humidity reaches 35and above, a SMS is send to farmer's mobile which indicates "TEMP IS 42 C" and "HUMIDITY IS 35" continuously till temperature falls below 42 degree.

IV.   CONCLUSION

This work was taken up with an objective of promoting learning of application of Zigbee Transceiverin the field of agriculture. In this respect it was essential to first study the concepts ofwireless technologies, their features, and application challenges. Here in the project climatological sensors have been used for controlling field parameters and to transfer and use the data to actuate the further response.Here it was studied that different type of sensors in the field and their behavior was noted against time. And also studied different technologies like Zigbee and GSM. We found that each technology has its own merits and demerits. We studied and compared these merits and demerits and found different problems while communicating using these technologies. These are cost, range, real time monitoring, data rate and much more.

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