A State of Art on Design of Low Cost Transceiver for Data Acquisition in WSN

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Abstract: ***This paper explores the potential of WSN in the area of agriculture in India. Aiming at the crop, a multi-parameter monitoring system is designed based on low-power ZigBee wireless communication technology for system automation and monitoring. Real time data is collected by wireless sensor nodes and transmitted to base station using ZigBee. Data is received, saved and displayed at base station to achieve soil temperature, soil moisture and humidity monitoring. The data is continuously monitored at base station and if it exceeds the desired limit, a message is sent to farmer on mobile through GSM network for controlling actions. The implementation of system software and hardware are given, including the design of wireless node and the implementation principle of data transmission and communication modules. This system overcomes the limitations of wired sensor networks and has the advantage of flexible networking for monitoring equipment, convenient installation and low cost and reliable nodes and high capacity.***

Index Terms:-AVR Microcontroller, GSM, remote monitoring, LCD, Sensors, ZigBee.

I. INTRODUCTION

Wireless technology for an intelligent irrigation system has become a popular research with the greenhouse effect. People are utilizing the merits of embedded system into monitoring and control system for an intelligent irrigation system because of lots .Monitoring parameters like moisture, 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. This paper gives design of remote control and monitoring systems based on existing technologies and a GSM-Zig-Bee based remote control and monitoring system with automatic irrigation system is proposed. The design presented has the advantage of both GSM and ZigBee technology.

II. PROPOSED SYSTEM

New GSM-Zigbee system is proposed It provides easy wireless installation of sensors at a lower cost and also increases reliability using mesh networks. Although ZigBee has a capability of 250Kbps which is more than enough for SMS. It provides more secured system with less power consumption. In this system both GSM and ZigBee modules are interfaced with AVR controller chip. It has mess network technology. GSM is used for remotely monitoring and controlling the devices via a mobile phone by sending and receiving SMS via GSM network.

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It will have two units one at the pump house(farmer's place) and other at the sensor's side(farm place).Sensors like temperature, humidity and moisture will sense the farm parameters which will be given to microcontroller for evaluation. Then ZigBee will send these parameters to farmer. According to data, farmer will act and in unusual condition message will be sent to farmer's mobile via GSM module. The farm will be irrigated and crops will be cultivated smoothly. ZigBee is used for the same purpose but within a range of few meters, say when user is inside the periphery of the building where the system is installed, ZigBee can be used for communicating with the devices thereby eliminating the network usage cost. This is an important merit of the proposed system. The motor pumps and fans are controlled automatically using sensor and the other appliances are controlled by ZigBee or GSM network via SMS light and fans will be there for greenhouse and hence this will provide better atmosphere for 24 hrs.This leads to efficient utilization of power. Even using ZigBee module, by SMS, pump and fan could be automatically ON and OFF.

III. DESIGN &IMPLEMENTATION

The hardware of this system includes 16 bit AVR, Bluetooth and GSM module, Temperature, humidity and soil moisture sensors, LCD. The system should be designed in such a way that even illiterate villagers will 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. All they have to do is to make a call/miss call/SMS to the GSM module & pump gets ON.

System design and its unit

Temperature sensor

The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. It is low cost and small size sensor. Its temperature range is -55° to +150°C.

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, these measured quantities can lead to a Measurement of humidity.

Soil moisture sensor

The soil moisture sensor used is capacitive type. The sensor gives analog output of zero volt when there is 100% moisture and 5V for 0% moisture.

Block diagram:

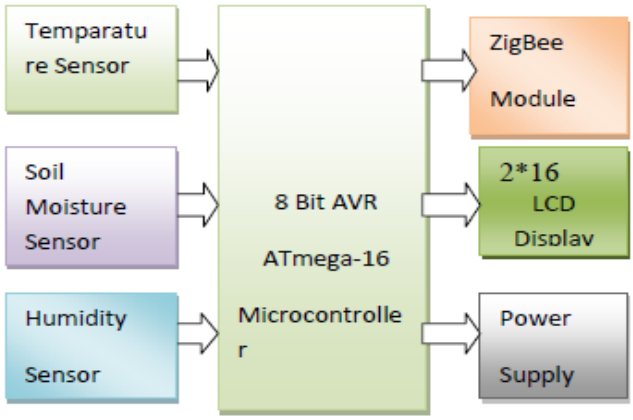

Figure:1 Block Diagram of Transmitter

Working

System works in two parts

1) Transmitter

2) Receiver

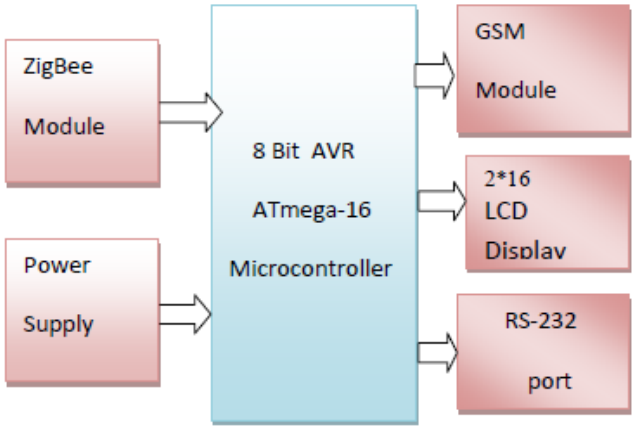

Figure:2 Block Diagram of Receiver

Transmitter

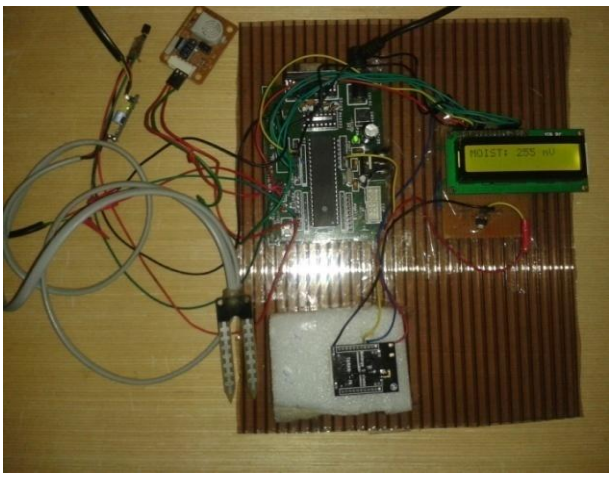

Figure:3 Prototype of Transmitter

Initially power is on. After this system is reset. Signals are read by different sensors and its output is given to microcontroller. Output to microcontroller from sensor is taken through 8 channel ADC pins. The output from microcontroller is given to Bluetooth trough Rx and TX pins. In the fault condition such as in empty tank, signal is given to GSM. Empty tank is sensed by level sensor

Receiver :

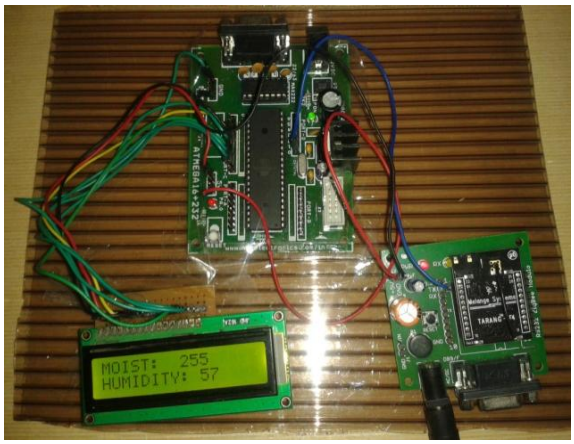

Figure:4 Prototype of Receiver

At receiver side both GSM and Bluetooth come into picture. There is only one TX and RX pins so we are using a relay. Relay will switch one by one. Signal is send to microcontroller and according to this controlling of actuators is done.

This is how total working takes place of automation irrigation system..Different sensors like moisture and temperature sensor senses the moisture content and temperature required for strawberry fruit. Thus it helps to provide strawberry a proper environment to grow easily.

A different technique of irrigation has been used to irrigate the field. First water is stored in tanks trough pipes then different sources like sprinklers and drip irrigation can been used as both are suitable to irrigate crops

Advantages of proposed system

In crop field we have to irrigate the land fully. We have to irrigate depending upon the soil, ups and downs of the land and where it needs. In present era, there is no mechanism to find where irrigation is needed. In this paper,

i)We have designed ZigBee wireless sensor network for monitoring the crop field area by deploying moisture sensors in the land to detect the places where the water level is low. From those results we can irrigate to that particular place only. So we can conserve water and minimize the problem of water logging in the land.

ii) We used humidity sensor to sense the weather. By this the farmer can get idea about the climate. If there is any chance for rainfall, the farmer need not irrigate the crop field. Due to this we can conserve water and also power since we dint turn on motors.

iii)Nowadays in the crops the fertilizer level is increasing, which affects people. By using pH sensors we get the information about the soil and analyze the acid level of the soil. By which we can apply fertilizer to the place where it needs, also we can avoid over fertilization of the crops.

Temperature is a randomly varying quantity in the environment of paddy field. Temperature reading gives information to the farmer. By using temperature sensors we can detect the temperature,

IV. RESULTS & DISCUSSIONS

The data is transmitted successfully from sensor node in field to base station using ZigBee. The parameters like temperature, humidity and soil moisture are monitored on computer. The screen shot of computer is given below.

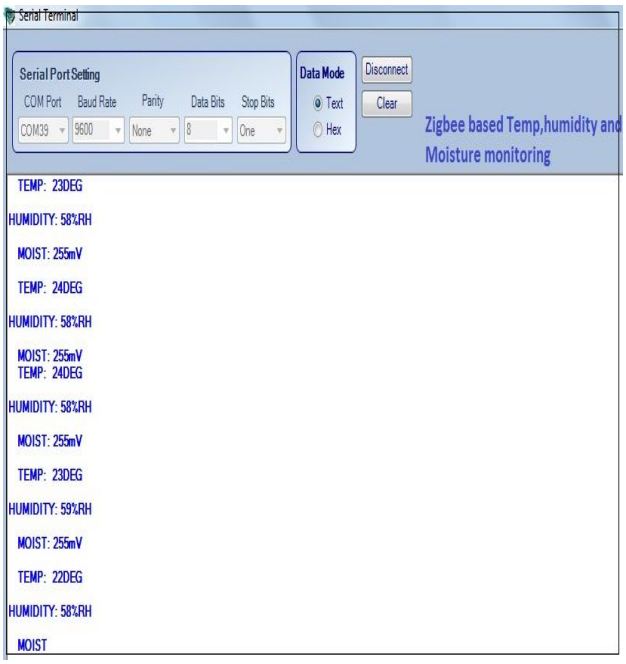

Figure:5 Monitoring of various parameters like temperature, moisture & humidity using serial port

V. CONCLUSION & FUTURE SCOPE

The design of a GSM-ZigBee based remote monitoring and control system with Automatic irrigation system is economical. This system has an advantage of using both GSM and ZigBee technology which thereby eliminates the cost of network usage to a great extent by using ZigBee when in the range of few meters with the devices.. Thus by going through all the problems and project is practically implemented and it is feasible. The farmers in drought affected areas will be more benefitted.

Irrigation project management for improved on-farm irrigation and efficiency is beyond the scope of this guide, but it brings into focus the future direction of water management. The technical principles of irrigation are fairly well developed, understood, and modelled. Most research and development efforts are aimed at refining and expanding engineering, soil and plant science, and economic knowledge of individual processes and interactions that are already well defined. The weakness therefore in irrigation science and application lies primarily in the management of the irrigation system as a whole and not the design and operation of the irrigation system's individual components.

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