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DESIGN AND IMPLEMENTATION OF ENVIRONMENT SENSING SYSTEM BASED ON GSM/GPRS USING EMBEDDED CONTROLLED SENSOR NETWORK

Shrikant M.B[1], Basavanagouda G[2]

[1] Student of Department of E&CE (VLSI&ES) TJIT, Bangalore, India

[2] Assistant Professor, E&CE department, TJIT, Bangalore, India

Abstract- ***This paper presents the design and implementation of environment sensing system based on GSM/GPRS using embedded controlled sensor network. Sensor networks are dense wireless networks of small, low-cost sensors, which collect and disseminate environmental data. Wireless sensor networks facilitate monitoring and controlling of physical environments from remote locations with better accuracy. They have applications in a variety of fields such as environmental monitoring, military purposes and gathering sensing information in inhospitable locations. Sensor nodes have various energy and computational constraints because of their inexpensive nature and ad-hoc method of deployment. Existing systems are bulky, very costly and difficult to maintain. In the Proposed system ARM based microcontroller and wireless sensors are used to control various parameters and monitor the information using GPRS/GSM and Zigbee technologies. This system has simpler features designed with the objective of low cost and effective with less power consumption using sensors for remote monitoring and controlling devices which are controlled via SMS using GSM.***

Index Terms- *Embedded controlled sensor networks, Zigbee, GPRS/GSM*

I.INTRODUCTION

Recent technological improvements have made the deployment of small, inexpensive, low-power, distributed devices, which are capable of local processing and wireless communication, a reality. Such nodes are called as sensor nodes. Each sensor node is capable of only a limited amount of processing. But when coordinated with the information from a large number of other nodes, they have the ability to measure a given physical environment in great detail. Thus, a sensor network can be described as a collection of sensor nodes which co-ordinate to perform some specific action. Unlike traditional networks, sensor networks depend on dense deployment and co-ordination to carry out their tasks. There is revolution of the sensor networks which have also come up with various applications like surveillance, traffic control, environmental and wildlife monitoring, agricultural application, home automation and industrial process control .Embedded controlled sensor networks (ECSN) are mainly designed to be application- specific so that the energy consumption is minimum as the battery-powered nodes demand life-time of several months or even a few years. Block diagram of ECSN is as shown in figure1.

The available technologies are Bluetooth, Wi-Fi, Wi-Max, wireless mobile Ad-hoc network (WMANET), UMB, wireless HART, Bluetooth and ZigBee. Embedded sensor networks are formed by communicating over wireless links without using a fixed networked infrastructure controlled by microcontroller. Zigbee is the name for a short-range, low-power, low-cost, and low-data-rate wireless multi-hop networking technology. Block diagram of ECSN consists of a master circuit which is connected to number of sub networks consisting of the various slaves. Master circuit is

connected by a personal computer which can be controlled by the internet. Wireless technologies

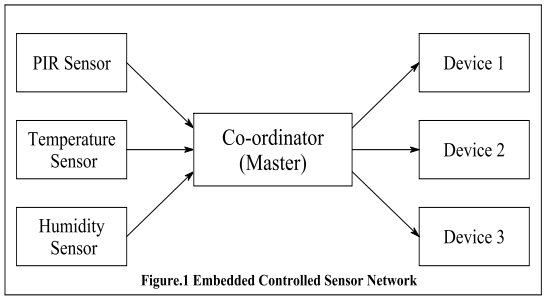

Figure.1 Embedded Controlled Sensor Network

II. METHODOLOGY

Design and implementation of environment sensing system based on GSM/GPRS using embedded controlled sensor network allows new level of comfort in industrial and commercial application and it can also manage the energy consumption efficiently which in turns promotes the saving. The hardware unit of prototype of system is represented by block diagram bellow. It contains a LPC2148 as main processing unit and it gets the input from various sensors (PIR, Temperature, and humidity sensor). From the data obtained from sensor nodes, the program controls the devices to achieve system requirements. It also uses a LCD display to display the data obtained from sensors. The requirement of the system is to monitor and regulate the various sensors parameter to user defined value and controlled around predefined values. Also detect the human motion by PIR sensor. The environment sensing system consists of three sensor nodes and they are,

1) Human motion detection and control node

Human motion detection we are using PIR (Passive Infra-Red) Sensor is a pyroelectric device that detects motion by measuring changes in the infrared levels emitted by surrounding objects and it is indicated by BUZZER. This motion can be detected by checking for a high signal on a single I/O pin. The PIR Sensor has a range of approximately 20 feet. This can vary with environmental conditions. The sensor is designed to adjust to slowly changing conditions that would happen normally as the day progresses and the environmental conditions change, but responds by toggling its output when sudden changes occur, such as when there is motion.

for environment sensing system -offers many benefits to the users.

2) Temperature monitoring and control node

Temperature monitor and control node work according to the temperature value defined, first it get the values from sensor and displayed on LCD. The LM35 is commonly used sensor which has range of -55˚ to -150˚C.The LM35 series are precision integrated-circuit LM35 temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. The LM35 sensor thus has an advantage over linear temperature sensors calibrated in ° Kelvin, as the user is not required to subtract a large constant voltage from its output to obtain convenient Centigrade scaling . The LM35 sensor does not require any external calibration or trimming to provide typical accuracies of ±¼°C at room temperature and ±¾°Cover a full -55 to +150°C temperature range. Low cost is assured by trimming and calibration at the wafer level. The LM35's low output impedance, linear output, and precise inherent calibration make interfacing to readout or control circuitry especially easy.

3) Humidity level monitor and control node

The humidity level monitoring system monitors and the current humidity level and maintain it around a predefined value. When the system detects a drop in humidity level then turn on motor pump allowing water to flow to ground. To measure humidity, amount of water molecules dissolved in the air of environments, a smart humidity sensor module SY-HS-220 is opted for the system under design. The humidity sensor used in this system is highly precise and reliable. It provides DC voltage depending upon humidity of the surrounding in RH%. This work with +5 Volt power supply and the typical current consumption is less than 3mA.The operating humidity range is 30% RH to 90% RH. The standard DC output voltage provided at 25°C is 1980 mV. The accuracy is ± 5% RH at 25°C. The humidity dependent voltage is obtained and subjected for further processing. Environment sensing system offers many advantages to senior citizens and people with disabilities which helps them in being more autonomous and increasing quality of life. In addition to remote control, monitoring

temperature, humidity and motion detection is also a major concern. There is a severe need to monitor temperature or gases as they can be costly and deadly. The proposed system is cost effective and controlled by user friendly embedded systems. In this proposed system, we have designed one master module which consists of microcontroller,

The master system as shown in Figure2, we have used ARM7 based LPC2148 microcontroller. LPC2148 is 32 / 16 bit microcontroller with embedded high speed flash memory of 512KB. For GSM communication we have used STM300, which is a tri band GSM/GPRS engine. The STM 300 is integrated with the AT commands and are developed to use TCP/TP protocol easily, which is very useful for data transfer applications.GSM uses AT commands via its serial interface to control the devices. Zigbee technology is used for wireless personal area networking. Zigbee technology offers simplicity and a cost effective approach to building, construction and remodeling with wireless technology.

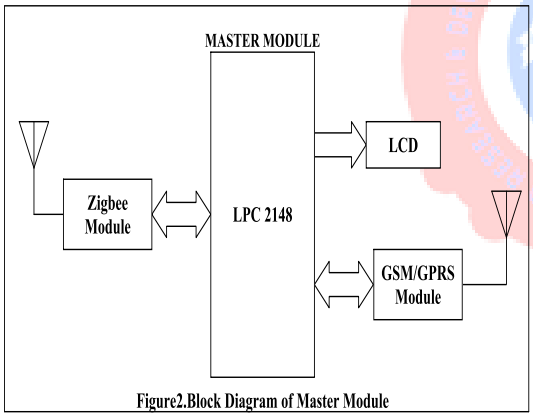

Figure2.Block Diagram of Master Module

The circuit diagram of the master network designed using the ARM microcontroller, GSM/GPRS module and Zigbee Module .In slave module as shown in Figure3, we have used ATmega16 along with zigbee module and sensors for data monitoring. Various sensors which are connected with slave module are PIR sensor, humidity sensor, temperature sensor.

GSM module and Zigbee module. Slave modules are designed using 16 bit microcontroller and Zigbee module. Remote control circuit is designed to control the various devices for short distance communication.GSM module is used for long distance control of devices and monitoring of environment of home.

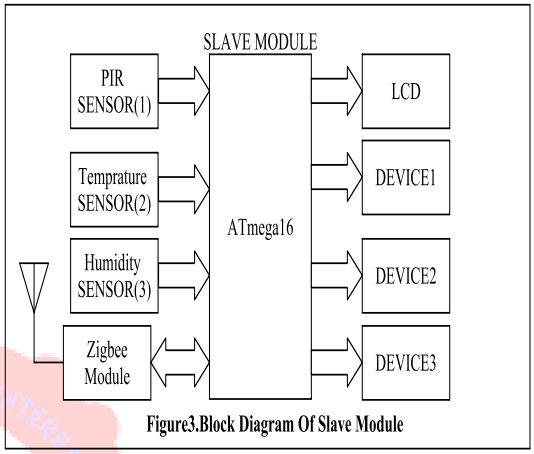

Figure3.Block Diagram Of Slave Module

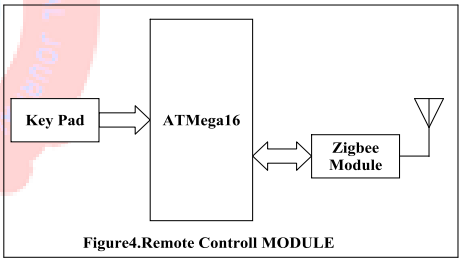

Figure4.Remote Controll MODULE

III.CONCLUSION

This paper demonstrates Design and implementation of environment sensing system based on GSM/GPRS using embedded controlled sensor network, the features of GSM and Zigbee are explored to design the system for long distance as well as short distance. Embedded controlled sensor networks have proven themselves to be a reliable solution in providing remote control and sensing for indoor environmental monitoring systems. Three commercial sensors had been integrated with the system to monitor and compute the level of existence of temperature and humidity in atmosphere using information and communication technologies.

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