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APPLICATION OF VARIOUS ROUTING ALGORITHMS INSIDE WSN FOR MORE SECURITY IN HAZARDOUS AREAS

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ABSTRACT

This article describes the Different Data Routing Algorithms Used for Enhanced Security, So that chances of data loss containing information of various parameters is very less. It is mainly used for collecting and transferring the various monitoring information inside hazardous Area to the Control room With the Help of WSN. The design of wireless sensor network based on ZigBee technology & ARM 7 .We have selected Coal mine As a Hazardous Area for application of WSN.

KEYWORDS: Wireless Sensor Network, Smart, PC Based Server, Master, Slave, Routing Algorithms

INTRODUCTION

The Wireless Sensor Networks are highly distributed self-organized systems. WSNs provide a new paradigm for sensing and disseminating information from various environments, with the potential to serve many and diverse applications.

With recent developments in the wireless networks field, This paper discusses the Use Of WSN in hazardous Area. Here We have Selected Coal Mine as a Application Of WSN .in which Various Parameters such as Temperature, Light intensity, LPG gas Can be Monitored & Controlled. PC based Server in which VB software is installed so it will continuously display values of various parameters. Different data routing algorithms used inside WSN for enhanced security are

- Collision avoidance protocol
- Cooperative communication
- Fail safe communication

RELATED WORK

Zigbee based network is used for Hazardous environment application .Here we have master and slave structure for the Application .The range of Zigbee module is about 30 mtrs .So, the whole area cannot be covered by a single Master slave combination .For this we are covering the whole coal mine by a master and slave combination. We have a main PC master terminal which has the VB software on it.

The PC master terminal is used to monitor the status of all the slaves which covers the whole area. In Our system we have 1 Master PC terminal, 2 Sub masters, 2 Slaves Terminals So in total we have 2 slaves .The Idea is that if one slave goes out of range of the PC then the communication fails .So we are placing 2 slaves which will be placed in such way that they will be always in range of the PC master .The two slaves are under the PC based masters supervision .Therefore the PC master will communicate to the slaves via Wireless Zigbee module.

SYSTEM MODELING

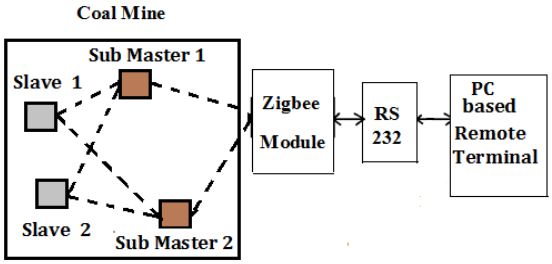

Figure 1: Generalized Block Diagram of System

Detailed Description of Each Block

Slave 1 & 2

Slaves are implemented using Arm 7 & Zigbee module combination .It will work as a Wireless sensor Network. Different Sensors are connected to Arm7 via inbuilt ADC the output of sensor is containing the information about different parameter values. The slave 1 & 2 are placed inside of the coal mine at different places to acquire different parameters .The ARM7 is connected to Zigbee module trough RS232. The Zigbee module is used to send data to the submaster in the range of 30 meters from Slave. The distance Between Slave & master can be increased by selecting Appropriate Zigbee Module.

Temperature Sensor

Temperature Sensor Used: LM35

The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. The LM35 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 does not require any external calibration or trimming to provide typical accuracies of ±1⁄4°C at room temperature and ±3⁄4°C over 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.

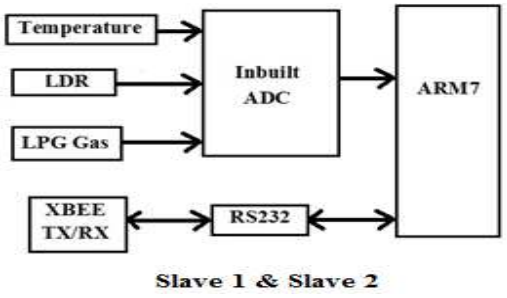

Figure 2: Same Circuit for Slave 1 & Slave 2

The Light Dependent Resistor Cell

The most commonly used photo resistive light sensor is the **ORP12** Cadmium Sulphide photoconductive cell. This light dependent resistor has a spectral response of about 610nm in the yellow to orange region of light. The resistance of the cell when unilluminated (dark resistance) is very high at about 10MΩ's which falls to about 100Ω's when fully illuminated (lit resistance).To increase the dark resistance and therefore reduce the dark current, the resistive path forms a

zigzag pattern across the ceramic substrate. The CdS photocell is a very low cost device often used in auto dimming, darkness or twilight detection for turning the street lights "ON" and "OFF", and for photographic exposure meter type applications.

LPG Gas Sensor Methane Gas Sensor: MQ6

Sensitive material of MQ-6 gas sensor is SnO2, which with lower conductivity in clean air. When the target combustible gas exist, The sensor's conductivity is more higher along with the gas concentration rising. Please use simple electro circuit, Convert change of conductivity to correspond output signal of gas concentration.MQ-6 gas sensor has high sensitity to Propane, Butane and LPG, also response to Natural gas. The sensor could be used to detect different combustible gas, especially Methane, it is with low cost and suitable for different application.

Inbuilt ADC of LPC 2148 10-bit ADC

The LPC2141/42 contain one and the LPC2144/46/48 contain two analog to digital converters. These converters are single 10-bit successive approximation analog to digital converters. While ADC0 has six channels, ADC1 has eight channels. Therefore, total number of available ADC inputs for LPC2141/42 is 6 and for LPC2144/46/48 is 14.

SYSTEM ORGANIZATION & MODELING

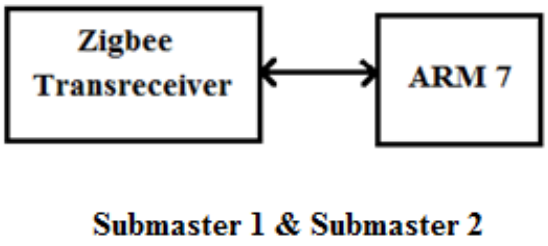

Figure 3: Same Circuit for Sub Master 1 & Sub Master 2

In Our system we have

- Master PC terminal.
- Sub masters
- Slaves Terminal

So in total we have 2 slaves .The Idea is that if one slave goes out of range of the PC master then the communication fails .So we are placing 2 sub masters which will be placed in such way that they will be always in range of the PC master. The two slaves are under the PC based masters supervision .Therefore the PC master will communicate to the slaves through sub masters 1 & 2.By adding Sub masters 1 & 2 will increase the price of the project but to have additional security features we are using sub masters in System.

PC Master

Here we making Zigbee based network for Hazardous Area application .Here we have master and slave structure for the Application. We have a main PC master terminal which has the VB software installed on it .The PC master terminal is used to monitor the status of all the slaves which covers the whole area.

Routing Algorithms between Slave1, Slave2 & Sub master 1, Submaster2 to have secure communication in case of any Sub master fails

- Cooperative communication
- Request & respond (Anti-collision)
- Fail safe

Cooperative Communication

Here we are using the cooperative communication technique to make sure that the slave is always in range of the master. For this we use two sub masters units. These units are basically repeater unit which will enhance the data signal when the slave is not in range of the master. Here the request is first given to the sub master. The frame transmitted by PC master will contain the sub master id as well as the slave id from whom the data is to be retrieved. The sub master upon receiving the frame will then check for the slave id and will retransmit the frame as it is. If one of the sub masters fails then the other sub master can also send the data of the other slave.

Collision Avoidance Protocol

Here we are using a master **Request and slave response protocol** .In this system the Master sends the request to the all the slaves. In the request frame the master mentions the slave ID .The request frame is received by all the slaves which are in range .The slave who are in range receive the incoming frame and store it in its internal RAM memory .Then they check for the slave ID .If the incoming slave ID matches with their own slave ID then they Accept the frame and send the parameter back to the master .If the ID does not match then the slave discards the frame.

Fail Safe Protocol

For more data security this protocol is used if in case of submaster1 fails then slave 1 will send request to the submaster2 & data is transferred to the PC master through submaster2 without need of Submaster1.

CONCLUSIONS

For more data security purpose more focus is given for implementation of routing algorithms such as Anti-collision, cooperative & Fail safe. By use of such Routing algorithms more data security is implemented in hazardous area.

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