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Design of Novel Routing Protocol for Wireless Sensor Network

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Abstract
A Wireless Sensor Network transfers the data from one node to another node as well as node coverage, then eighbor location can be identified. In WSN the collisions were avoided and the data's are transfer redin efficient manner. To predict the life time of wireless sensor networks beforetheir installation is an important concern. ZigBeeisan emerging worldwide standard for wireless personal area network based on the IEEE802.15.4-2003 Networks (LRWPANS). The IEEE 802.15.4 standard is specifically meant to support long battery life time. Finding out useful metrics to design reliably sensor networksis important concern. The main reason being that, the complexity in the physical structure of acoalmine, only low power WSN nodes can produce accur at esurveillance and accident detection data. Arouting protocol to avoid routing failure and power aware process is proposed.

Keywords
Wireless sensor networks, ZigBee, Full ConnectionDevice(FFD), Reduced-Function Device (RFD), LS-WPAN

I. Introduction

A Wireless Sensor Network (WSN) consists of spatially distribute dautonomous wireless sensor nodes. An odeina wireless network is able to collect the information from sensors, process it and communicate wirelessly withother network to monitor physical or environmental conditions, such as temperature, sound, vibration, pressure, motion or pollutants and to cooperatively pass their data through the network to amain location.

A WSN is a self-configuring network of small sensor nodes communicating among themselves using radio signals, and deployedin quantity to sense, monitor and understand the physical world. Wireless Sensor nodes are called motes.WSN provide a bridge between the real physical and virtual worlds. Allow the ability to observe the previously unobservable at a fine resolution over large spatiotemporal scales. It has a wide range of potential applications to industry, science, transportation, civil infrastructure, and security. Wireless sensor nodes are also called as motes.

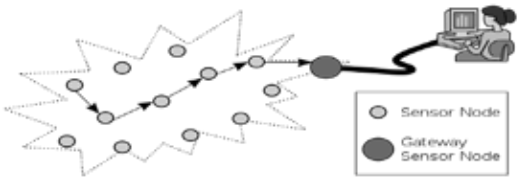

Figure 1.2 Basic Architecture of WSN

A. Components of WSN

A typical sensor network device comprises the following components some of which are optional: microcontroller, wireless communication channel, sensor, power supply, and local storage and realtime clock systems. The principal idea is that the sensors are connect edtoatiny computer that coordinates the measurement, preprocessors, and stores and delivers the information.

1. Microcontrollers

Microcontrollers used in wireless low power, small profile, built in peripherals and on chip RAM and flash memory.

2. Sensors

Sensors used in WSN may be onboard and external sensors, various types of sensors like temperature sensors, voltage sensors, photo sensors, humidity sensors, and vibrations ensors are used.

3. RadioTransceivers

RF transceivers can be interfaced to microcontroller using SPI, I2C, or UART interfaces.Components used in transceivers are Low Noise Amplifier (LNA), Mixer,Variable Gain Amplifier (VGA), ADC, demodulator, modulator, DAC, filter, mixer, power amplifier.

4. Power/Batteries

Poweroption in sensor network may be battery operated, solar power and DC power.

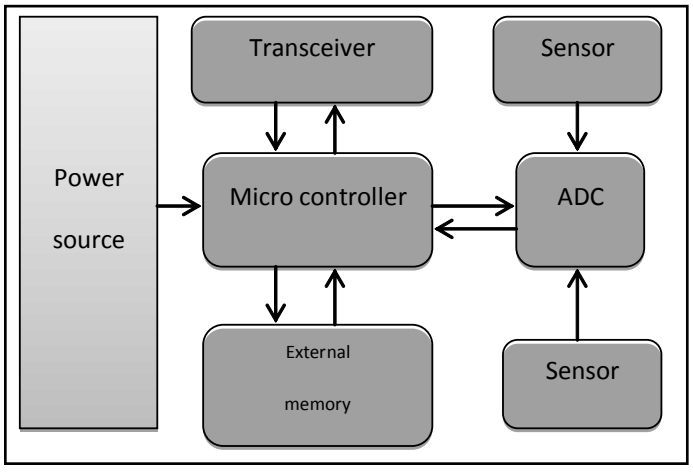

Figure 1.2: Block Diagram of WSN

B. Requirement and design Factor in WSN

Following are some of the basic requirement and design factors of WSN which serves as guide lines for development of protocol and algorithms for WSN communication architecture.

1. Faulttolerance, Adaptability, Reliability

Sensor networks are required to operate through adapting to the environmental changes that the sensors monitor. The network should be self- learning. Reliability is the ability to maintain the sensor network functionalities without any interruption due to sensor node failure. Sensor node may fail due to lack of energy, physical damage, communication problems, inactivity and environmental interference.The network should be able to detect failure of anode and organize itself, reconfigure and recover from node failures without losing information.

2. Power Consumption and Power Failure
One of the components of sensor nodes is the power source which can be a battery. The wireless sensor node being a microelectronic device can only be equipped with a limited power source. Over the remote inaccessible place with less human control and existence, power sources play critical role in survival of sensor nodes. Power source should be intelligently divided over sensing, computation, and communications phases as per requirement.

3. Network Efficiency and Data Aggregation
Flooding raw sensed data over the network can easily congest the network. Some critical applications like intruder detectors require urgent transmission and faster processing of data which may degrade performance and loose reliability due to congestionor latency in the network. Intelligent aggregation of sensed data elimination of unwanted and redundant information and data compression can be a solution for efficient resource and energy utilization and congestion avoidance.

4. Intelligent Routing
Routing protocols must be adaptive to these changes and should be self-healing and self-configuring. The information should be persistent in spite of changes in network nodes. Routing algorithms should be intelligent to choose minimum hop and minimum distance paths for data transfer.

5. Lifetime
The primary limiting factor for the lifetime of a sensor network is the energy supply. Each node must be designed to manage its local supply of energy in order to maximize network lifetime.

C. Application
Area Monitoring is the common application of WSN. It is used to deploy over a region where some phenomenon is to be monitored. Environmental Sensing is used to cover the earth science research, includes sensing volcanoes, oceans, glaciers. Industrial monitoring is used in machine health monitoring, water/waste monitoring in industries, agriculture and structural monitoring.

II. Literature Review
Joon Hoe et al.,Suggested [5] the Host-Agent based standby power control mechanism in home network environment. It uses the IEEE 802.15.4 based ZigBee communication protocol between Host and Agent for transmission and secure network. The Agent can acquire the local context information from various embedded sensor and sends the sensing information to the Host. The Host compares this context information from Agent with database and sends the standby power control message to the Agent. The proposed mechanism uses IEEE 802.15.4 based ZigBee communication protocol for context information and control message transmission between Host and Agent.

Mitsuguterada et al., Suggested [10] the ZigBee sensor network for data acquisition and monitoring. A ZigBee module is connected via a USB interface to a Microsoft Windows PC, which works as a base station in the sensor network. Data collected by remote devices are sent to the base station PC, which is set as a data sink. The data sampling rate is one sampling per second. The data are recorded in the hexadecimal number format by device control software, and the data file is stored in text format on the data sink PC.

Charles L. Despins et al., Suggested [15] experimental results obtained from narrowband wideband radio-channel measurements in an underground mine with narrow veins at 2.4 GHZ from Continuous- Wave (CW) measurement data, large scale distance-power curves and path-loss exponents of the environmental are determined. Other relevant parameters, such as the mean excess delay, the maximum excess delay, the root-mean square(rms) delay spread, and the coherence bandwidth are extracted from the wideband-measurement data. Results show a propagation behavior that is specific for underground environments with rough surfaces.

P.Corke et al., Suggested [16] the nodes were programmed under TinyO Sand and used an in house developed self-organizing time-division multiple-access scheme (ZTDMA) which cooperated with the Deluge protocol for over-the-air reprogramming. This produces an architecture comprising only a low number of inherently low-complexity functional units, which are collectively capable of performing the entire LUT-Log-BCJR algorithm.

III. Existing System
In the existing system, the ZigBee based MAC protocol with on demand routing is implemented and network performance in the sensor network is evaluated. The battery lifetime requirement is essential in order to avoid the necessity of frequent battery changes. Using a ZigBee was energy efficient but is not a safety routing easily affected an link failure.

IV. Proposed Algorithm
ZigBee provides self-organized, multi hop, and reliable mesh networking with long batter lifetime. Two different device types can participate in an LR-WPAN network: a Full Connection Device (FFD) and a Reduced- Function Device (RFD). The FFD can operate in three modes serving as a PAN coordinator or a device. The IEEE 802.15.4 is a new standard defined for LS-WPAN (LS-Link State) which provides a low cost and simpler solution. Link state routing protocol for safety routing in sensor network on ZigBee process IEEE 802.15.4 is used.

A. Network Formation
The Network Formation is the process of creating the node. The node is allocated in separated manner. It is used to define the size and structure of each node.

B. Routing Description
The routing description of the node function packet switching that behaves as a mail service, with data carrying addresses to route the packet through the system. When multiple routers are used in interconnected networks, the routers exchange information about destination addresses using a dynamic routing protocol.

C. Protocol Implementation
The protocol is to provide mines with a self-audit tool through which management can assess the efficiency of the health and safety management systems. Protocols presenting the potential for serious risks and adverse events may include clinical trials using investigational agents.

D. Routine Maintenances
The routers are maintained for communication process Macs are relatively peaceful most people can get by without doing any routine maintenance. Purging unnecessary files and programs, backing up your files, and updating software go a long way to

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keeping Mac well. Inspect the installation site for moisture, loose wires or cables, and excessive dust. Make sure that airflow is unobstructed around the router and into the air intake vents. Routine maintenance purpose for optimum router performance, perform preventive maintenance procedures.

E. Performance Evaluation

It is easy to avoid the traffic signal and delay for the data transfer is reduced. And finally, it transfers the data in efficient manner.

1. Packet Received

In Figure1, every node is verified and packet is deliver is calculated. The packet is delivered after every node is verified.

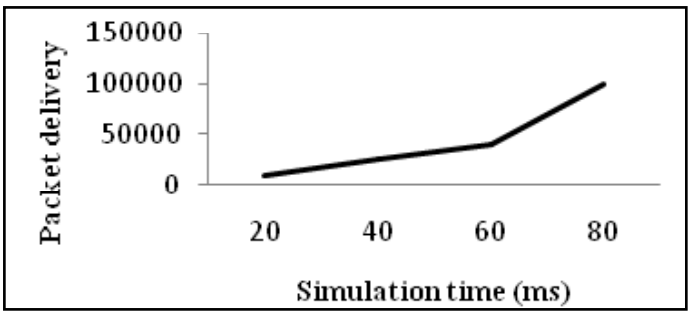

Figure 1 Packet Delivery

2. Throughput

In Figure 2, the graph represents the throughput at a certain amount of simulation time. The throughput is increased as the simulation time decreases.

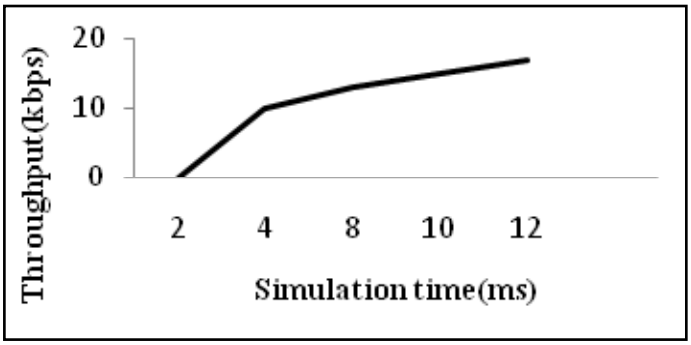

Figure 2 Throughput

3. Energy Consumption

In Figure 3, it describes the relationship between the simulation time and average delay.

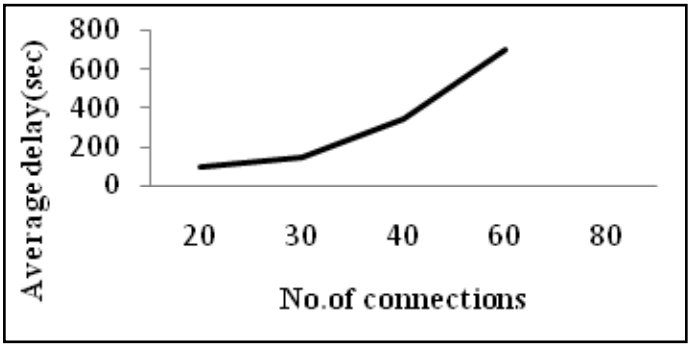

Figure 3 Average Delay

4. Loss Rate

In Figure 4 describes the relationship between the loss rate and simulation time.

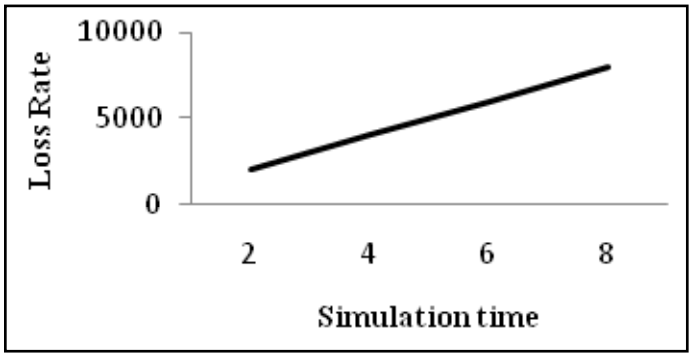

Figure 4: Loss Rate

V. Conclusion

This system can meet multiple requirements for the applications such as monitoring the methane concentration, and miner localization. To realize the hybrid architecture, we also designed and implemented an overhearing-based adaptive data collecting scheme which exploits the redundancy and correlation of the sampling readings in both time and space to reduce traffic volume and control overhead within a bounded offset error. There a variety of hopping, star mesh networks were simultaneously simulated for a comparative analysis. The design parameters were kept in close correspondence to the actual mine parameters. The reliability for both the point-to-point communication and multi-hop communication using IEEE 802.15.4 standard was examined.

VI. Future Enhancement

In future IEEE 802.15.4 is a new standard defined for LS-WPAN (LS-Link State) which provides a low cost and very less complicated solution. Link state routing protocol for safety routing protocol for safety routing in sensor network on ZigBee process IEEE802.15.4 will be used.

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