Health Monitoring System Using Wireless Sensor Networks

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Abstract- *This paper presents the wireless sensor networks with mobile nodes for monitoring applications. Total 5 mobile nodes have been choosen for simulation and 1 sink node (base station) for gathering multiplexed data. Each mobile sensor node has three data and from this each data transferred to sink node individually. Multiplexing scheme was used for data gathering process .Mobile node infrastructure was designed by using simulator. Monitoring the data logger to gather data over a long term period in order to establish a continuous link which can in turn be used as baseline information to detect a possible change in a mobile node. The base station was capable of receiving data from sensors wirelessly and forwarding the collected data to a server or user mobile phone. The transmission range obtained can be 800m-1km.*

Keywords- Wireless Sensor Node, Mobile Node, Multiplexing, NS2, Datalogger.

I. INTRODUCTION

A wireless sensor node(WSN) is a one type of sensor technology to monitor physical or conservational needs, such as pressure, sound, vibration, temperature, motion and to transmit the data to a sink (base station) through the network. Currently most of the latest networks are bi-directional, enabling to cope up with the activity of the sensors. Military applications are like battlefield reconnaissance is the main inspiration for wireless sensor networks development; recently this type of distributed networks area dopted in most of remote monitoring applications and industrial measurements application like machine condition monitoring, industrial process monitoring, structural health monitoring, and indoor monitoring AWSN essential of “sensors” which we say nodes–deployed from some sensor nodes to numerous hundreds or even thousands numbers of nodes, where every sensor node is associated by radio link to one or sometimes several other sensors nodes[1].

Each such sensor network node comprises of typically several parts such as an electronic circuit to interacting with other sensors nodes and an external energy source(sensors are battery operated),are transceiver with an association to an external antenna or may have an embedded internal antenna, a microcontroller and typically an embedded form of energy source or a battery[2]. Sensors nodes are characteristically proficient of wireless communication and are considerably obliged in the amount of existing resources such as energy (power), storage (memory) and computation. These obligate make the deployment and operation of WSN significantly distinct from existing wireless networks, and demand the development of resource aware protocols and supervision techniques.

II. WIRELESS SENSOR NETWORKS APPLICATIONS

A wireless sensor node (WSN) is a node in a wireless network that is able to collect the information from sensors, process it and communicate wirelessly with other nodes in the network SINK. Sink which is a kind of base station that collects messages from the sensor nodes and forwards them to for example a satellite system or Internet.

In environmental monitoring applications, sensor nodes are always utilized as miniature weather stations [3]-[5]. These nodes can measure air temperature, humidity, light intensity, barometric pressure and so on, just as traditional weather stations. However, higher spatial resolution can be realized than traditional weather stations. In these applications, no mobile nodes are needed.

With these requirements in mind, a system architecture as shown in Fig.1 was designed. In this architecture, fixed sensor nodes are installed evenly along the boundary of the monitoring area. Then, inside the monitoring area, fixed sensor nodes are located to realize maximum coverage. To assist this procedure, a tool is designed to display the coverage effect. The fixed nodes construct the network infrastructure. Locations of environmental nodes can be selected evenly from the locations of all the fixed nodes as they can also forward data as relay nodes. The rest fixed nodes can be used as relay nodes. As a result, when mobile nodes wander in the monitoring area, at least one fixed nodes can see them and forward data for them.

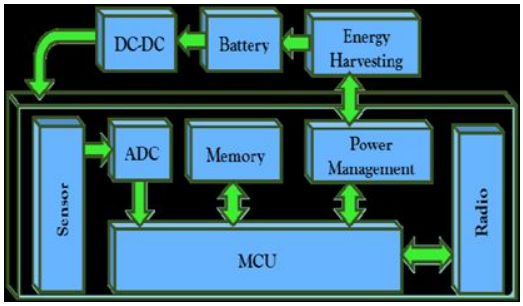

Fig.1.System Architecture of the Monitoring System

According to the environmental data and appropriate density needed by zoologists, two kinds of environmental nodes are designed. One has wind speed, wind direction and precipitation sensor and the other not.

III. WIRELESS SENSOR NODE DESIGN

The I-type environmental node, II-type environmental node and mobile node are designed following the architecture shown in Fig.1. As the nodes are all deployed outdoor, solar energy harvesting is used to satisfy the lifetime.

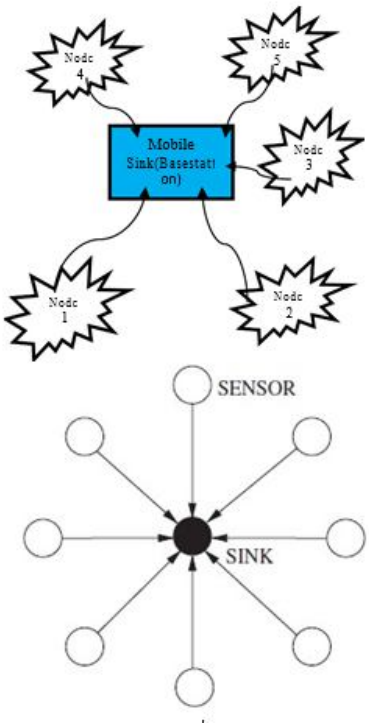

Fig.2: Single HOP Sensor

IV. DATA-GATHERING MAC

The Data-Gathering MAC (DMAC) protocol exploits the fact that many Wireless sensor networks rely on converge cast as communication pattern, that is, data from sensor nodes are collected at a central node (the "sink") in a data-gathering tree. The goal of DMAC is to deliver data along the data gathering tree with low latency and high energy efficiency. In DMAC, the duty cycles of nodes along the multi-hop path to the sink are "staggered"; nodes wake up sequentially like a chain reaction. Nodes switch between sending, receiving, and sleep states. During the sending state, a node sends a packet to the next hop node on the route and awaits an acknowledgment (ACK). At the same time, the next hop node is in the receiving state, immediately followed by a sending state (unless the node is the destination of the packet) to forward the packet to the next hop. Between these intervals of receiving and sending of packets, a node enters the sleep state, where it can power down its radio to preserve energy.

V. RESULTS AND CONCLUSIONS

Nodes have been transmitted at a specified interval one after another. In order to obtain detailed data about the mobile node individuals and the environment they live in, a wireless sensor network based monitoring system has been designed and deployed. Total 5 nodes have been deployed up to now and 1sink node (or base station) for data gathering. Network protocols were designed using popular components and tailored for particular application scenarios. System function sand network performances were evaluated by simulations and will be field experiments, which demonstrated the effectiveness of our monitoring system.

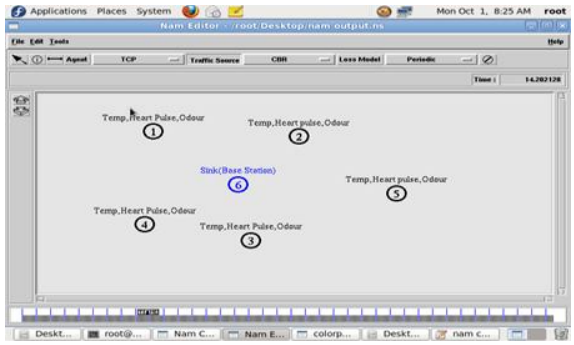

Fig.3. Node Design

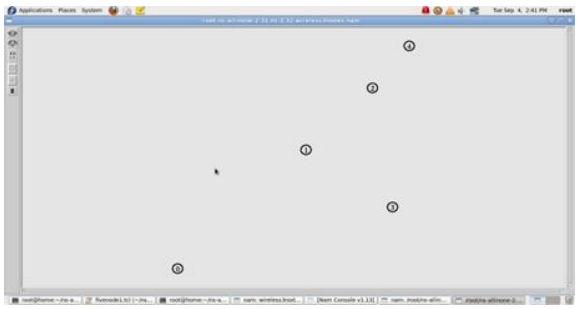
Fig.4. Transmitting Node from Another Node

Analysis: Node 1 starts transmitting at time T =1.4 sec while Node 2 starts transmitting at time T=10 sec.

During the period of time [1.4 sec, 10 sec] Node 1 is the only transmitting node using the entire available bandwidth.

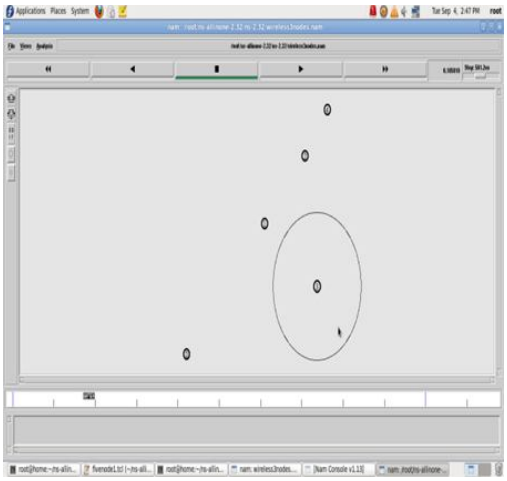

Fig.5. Analysis Node Using Health Monitoring

Analysis: Node 1 starts transmitting at time T =1.4 sec while Node 2 starts transmitting at time T=10 sec.

During the period of time [1.4 sec, 10 sec] Node 1 is the only transmitting node using the entire available bandwidth. This justifies the high performance of Node 1 during the specified interval of time.

At time T=10 sec, Node 2 starts transmission

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