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Performance Improvement for congestion control in Wireless Sensor Networks

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ABSTRACT

The performance of wireless sensor networks is a domain that attracts a lot of attention lately. Research mainly focuses in controlled environments, where wireless sensors tend to replace old fashioned wired devices that are being used to monitor specific parameters like temperature, pressure, vibration etc. In such environments, wireless sensors periodically send their measurements, hop-by-hop to the sink, in a control center. In this paper we focus on the design and development of efficient model, if applied to a wireless sensor network, will be able to guarantee the performance of the network without imposing any risk to the application. Risk to the application may also occur when data packets arrive with delay out of bounds, according to the application demands.

Keywords:- Wireless sensor network, congestion control, Risk analysis, Sensor node.

INRODUCTION

Due to diversity and applicability of wireless sensor network grow in different field such as battle field, medical field and many more application based on dynamic infrastructure and controlled topology. The work processing of wireless sensor network consumed more power for the processing of data and life of sensor consumed more energy. Energy consumed more during path finding and data transmission operations terms as routing.

Routing is the most challenging issue and direct concern to energy in WSN comparable with ad hoc and cellular network. Wireless Sensor Networks (WSNs) are wireless networks consisting of spatially distributed autonomous devices using sensors to cooperatively monitor physical or environmental conditions, such as temperature, sound, vibration, pressure, motion or pollutants, at different locations. They comprise of small, cooperative devices which are constrained in terms of computation power, memory space, communication bandwidth, and energy supply. These devices, usually called "nodes", integrate sensors, radio communications, and digital electronics into a single integrated circuit (IC) package.

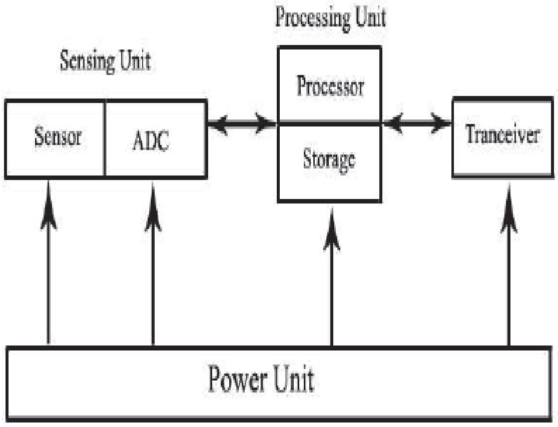

Fig 1: Wireless Sensor Node Architecture.

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Clustering technique for routing in WSN is considered most suited based on its characteristics such as energy-efficient, scalable, lower latency, etc. In clustering, WSN network is divided into sub networks\clusters and each cluster has cluster head which is responsible to collect the sensed data from his cluster and forward it to the base station. Cluster heads consumed more energy due to collecting and forwarding data from cluster while remaining nodes in the clusters still have more energy of 90% of their initial energy. This situation normally happened due to unbalanced energy assumption which causes more drain of energy from nodes far from cluster heads in random fashion from sensor nodes. To address this issue, several energy efficient routing algorithms and protocols have been proposed recently, including cluster based protocols, power-aware routing and multi-level transmission radii routing. If sensor nodes consume energy more equitably, they continue to provide connectivity for longer and the network lifetime increases.

Most wireless sensor networks (WSNs) are composed of cheap battery-powered devices that are able to sense their environment and to communicate with each other in a wireless manner. Their low-cost and energetic autonomy has enabled environmental monitoring applications to emerge in the recent years. For instance, WSNs have been used for wildlife tracking and monitoring. In order to last for years with the current technology, it is crucial to save nodes energy in a WSN. As the radio module of a sensor node generally needs several times more energy than its processor, many researchers have focused on implementing energy-efficient communication protocols, where sensor nodes go to sleep mode periodically.

Typically, WSNs operate under light load and suddenly become active in response to a detected or monitored event. Depending on the application, this can result in the generation of large, sudden, and correlated impulses of data that must be delivered to a small number of sinks without significantly disrupting the performance (i.e., fidelity) of the sensing application. This high generation rate of data packets is usually uncontrolled and often leads to congestion. Congestion can appear either due to collisions in the medium, since they create retransmissions and delays, or due to overflow of the buffers of nodes. Buffer overflow results in random drops of data Packets and increased delay. Dropped packets are major handicap for WSNs, since they result in severe energy consumption. If no countermeasures are taken, the power of congested nodes can be quickly exhausted leading to the creation of "dead paths" (holes) in the network.

II ZIG-BEE

ZIGBEE is a worldwide standard of wireless personal area network targeted to low-power, cost-effective, reliable, and scalable products and applications. Different from the other personal area network standards such as Bluetooth, UWB, and Wireless USB, ZigBee provides the low power wireless mesh networking and supports up to thousands of devices in a network. Based on these characteristics, ZigBee Alliance has extended the applications to the diverse areas such as smart home, building automation, health care, smart energy, telecommunication, and retail services[1].

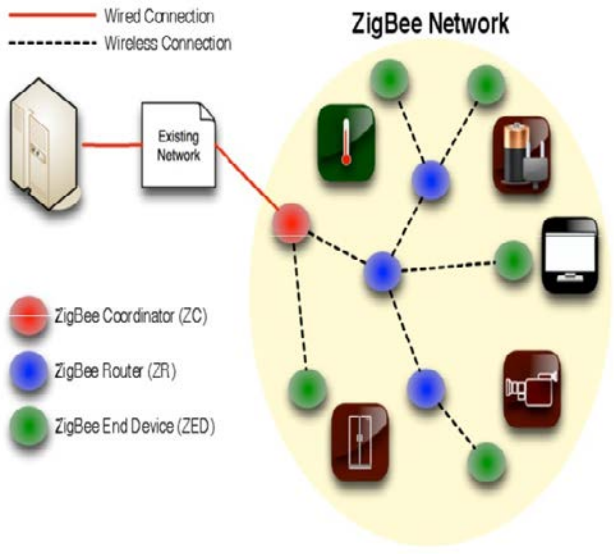

Fig 2: ZigBee Networks.

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The ZigBee network layer, which is the core of the standard, provides dynamic network formation, addressing, routing, and network management functions. ZigBee supports up to 64,000 devices in a network with the multi-hop tree and mesh topologies as well as star topology. Every node is assigned a unique 16-bit short address dynamically using either distributed addressing or stochastic addressing scheme. The routing protocols of ZigBee are diverse so that a system or users can choose the optimal routing strategy according to the applications.

III SIMULATION RESULT

A sink-based tree is an efficient topology control solution in WSNs. Usually, such trees are being builds as spanning trees using the sink as the root and all nodes forward their data using this structure. Using the sink node as the root is optimum, since the sink in WSNs is, most of the times, a robust node that does not suffer from power limitation issues. Many wireless sensor network applications rely on the availability of a collection service to route data packets towards a sink node.

A typical collection protocol provides for the construction and maintenance of one or more routing trees, having each a sink node as their root. A sink can store the received packets or forward them to an external network, typically through a reliable and possibly wired communication link. Within the network, nodes forward packets through the routing tree up to (at least) one of the sinks. To this end, each node selects one of its neighboring nodes as its parent. Nodes acting as parents are responsible of handling the packets they receive from their children and forwarding them towards the sink. To construct and maintain a routing tree, the collection protocol must initially define a specific metric to be used by each node, in order to select its parent.

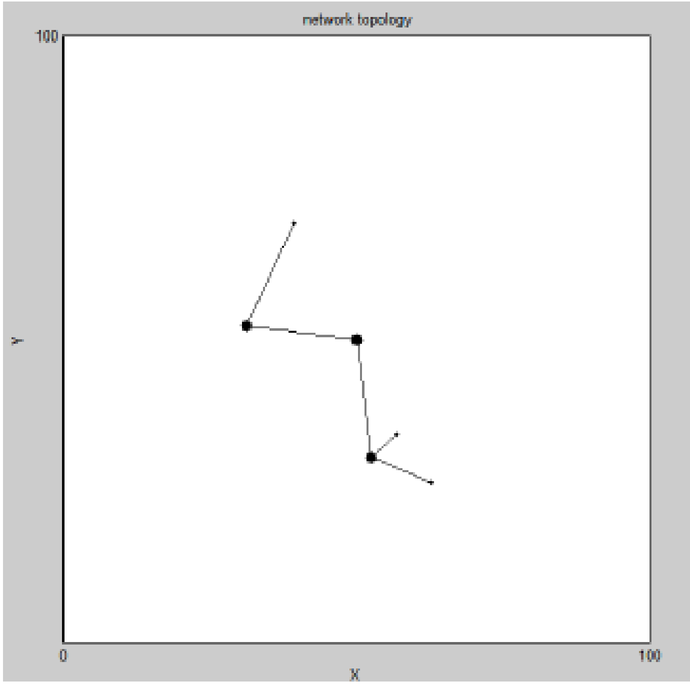

Fig 3: Shows that simulation for the node count 6 network topology of proposed methods for the communication.

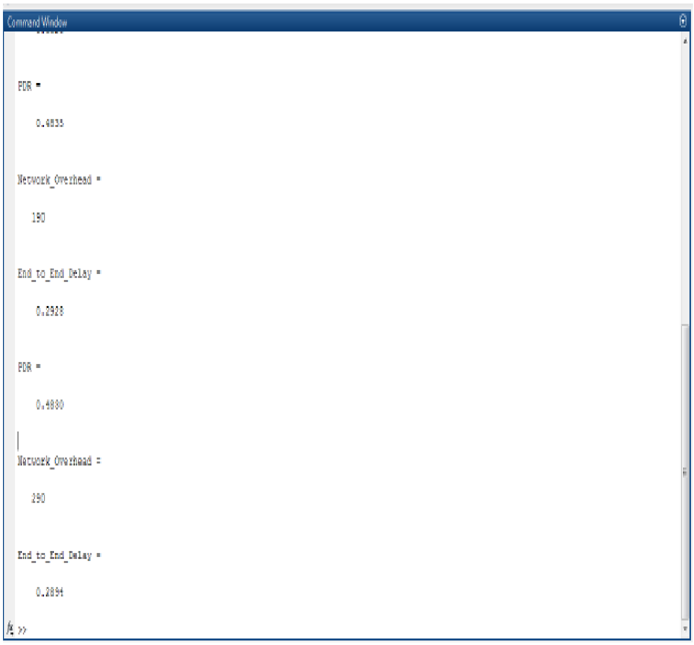

Fig 4: Shows that result window for the proposed methods using the number of node is 6.

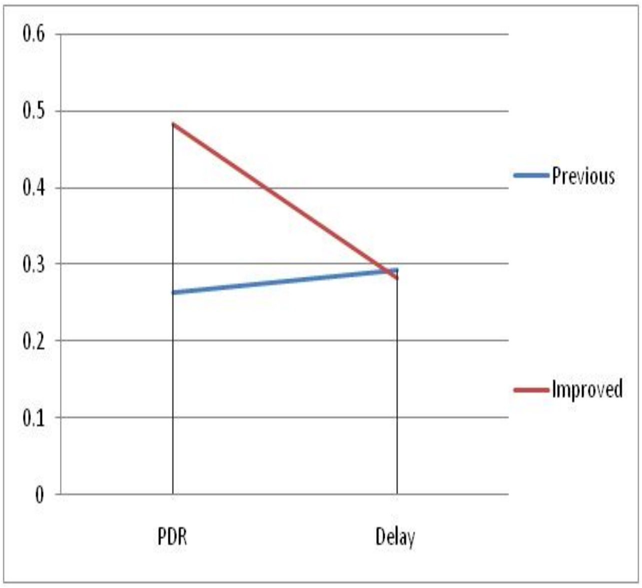

Fig 5: The above figure shows that the comparative performance evaluation graph for the previous and proposed methods using the number of nods is 6.

IV CONCLUSION AND FUTURE SCOPE

Wireless sensor networks (WSNs) are envisioned to be an important enabling technology for smart grid (SG) due to the low cost, ease of deployment, and versatility of WSNs. Limited battery energy is the tightest resource constraint on WSNs. Transmission power control and data packet size optimization are powerful mechanisms for prolonging network lifetime and improving energy efficiency. In this dissertation we proposed a zig-bee routing protocol to improve the performance of smart grid as compare with the previous approach. To enhance performance of the network we have decreasing the delay ratio and increasing the packet delivery ratio.

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