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DMEERP: A dynamic multi-hop energy efficient routing protocol for WSN

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ABSTRACT

Balancing the energy efficiency and path reliability is the biggest task in Wireless Sensor Networks (WSNs). The existing schemes fail to improve the network performance. In this research, a dynamic Multi-hop Energy Efficient Routing Protocol (DMEERP) is proposed to balance the path reliability ratio and energy consumption. It contains three sections. In first section, network model and basic assumptions were made for cluster creation and multi-hop route establishment. The Super Cluster Head (SCH) stores and maintains all records of CH and cluster members. The node activation and weight factor are estimated to obtain new cluster head if existing fails. In second section, path reliability ratio is estimated for routing the packets quickly without making more packet loss. In third section, energy model is implemented based on channel capacity model. The simulation analysis are made using network simulator (NS 2.33) in terms of packet delivery ratio, network lifetime, data flow, energy consumption, path reliability ratio, control overhead and delay etc.

1. Introduction

Wireless Sensor Networks (WSNs) signify a key facilitating platform for emergency and pervasive computing areas. The development of WSNs has come with the fusion of data sensing and communication. It was recently for deployed for numerous applications such as object monitoring, environmental tracking [1], threat detection and so on. Including this, the usage of WSN is widely increasing in near future. In general, WSN consists of huge number of sensor nodes that are located in static manner with low energy, minimum processing and communicated with short range radio links. Since sensor nodes have minimum storage capacity, batteries and multi-function sensors to read the humidity readings, temperate values and so on. In such scenarios, sensor nodes are located in ad hoc fashion and communicated with intermediate nodes to form a network. Due to limited range of communication, the single hop communication was adopted to transfer the data.

There are three basic subsystems of WSN node i.e. processing subsystem for data processing, sensing subsystem for acquiring data and wireless communication subsystem for packet transmission. Including this, energy source is attached to sensor nodes to energy up the sensor node for doing the specific actions. It is observed that it is not possible to recharge the batteries once it is deployed for tracking and suffered from huge number of environment quantities. In the presence of all constraints, the sensor nodes are required to be designed with the basic constraints to fulfill the basic requirements for minimum duration. Based on these requirements, the WSN lifetime may be extended to prolong the lifetime of sensor nodes which can be adaptable to various applications.

If any fire or emergency situation, the data will be immediately sent to sink node by the source node. In case of fire detection [2], the energy spent is directly proportional to events held in the particular area. It is also identified that created data contains temporal and spatial correlations [3]. These correlations are exploited to make clusters based on some metrics. All sensor nodes send their data to cluster head instead of sending to sink node due to farthest location. Based on processing of data, the energy will be consumed. Instead of sending data packets periodically to sink node, data can be sent based on demand in order to save energy.

In this case, quick reply will be issued based on immediate response. Based on the requirements of applications, the energy can be saved by limiting queries due to transparent location of sensor nodes. Sensor nodes send their tracked data to sink node by finding its location instead of finding the paths to save more energy. If no tracked data is available, sensor nodes may go to idle mode. In active state, nodes may consume energy to send the data. Additionally duty cycling is added and tracked by the industries. The optimal energy savings are not possible and

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