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Design an Implementation of Energy Aware Routing Protocol in WSN

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Abstract:- According to this, we propose an energy efficient data forwarding protocol called Energy Aware Geographic Routing Protocol (EAGRP) for wireless sensor networks to increase the life time of the network. In EAGRP, both position information of nodes and energy are available at nodes used to route packets from sources to destination. The routing protocol design of EAGRP is based on two parameters: location of nodes and energy levels of nodes. Each node knows the location and energy level of its neighbouring node. The performance calculates have been analyzed with variable number of nodes. The simulations had been carried out for different number of nodes. The proposed protocol was compared with Greedy Perimeter Stateless Routing (GPSR) protocol. The simulation results show that EAGRP performs competitively against the (GPSR) in terms of packet delivery ratio, throughput, energy consumption, and delay in given network. Consequently, it can be shows that EGARP does efficiently and effectively extend the network lifetime by extend the successful data delivery rate.

Keywords – Routing protocol, Wireless Sensor Networks, Energy aware, Position information, Life time.

1. INTRODUCTION

Recent advances in Micro-Electro-Mechanical Systems and low power and high integrated digital electronics have lead to the development of micro-sensors. These sensors are small, with limited processing and calculating resources and they are low in prise compared to traditional sensors. These sensor nodes can sense, measure, and gather information from the environment and, based on local decision process, they can transmit the sensed data to the user. The sensing circuitry measures all environmental condition related to the environment surrounding the sensor and transforms them into an electric signal. Processing such as a signal reveals some properties about objects position and events happening in the near of the sensor. The sensor sends such collected data via radio transmitter, to a command centre (sink) directly or through a data concentration centre (a gateway. It is based on assumption that the node knows the geographical position of the destination node. This approach to routing involves relaying the message to one of its neighbours that is geographically near to the destination node of all neighbours, and is geographically near to the destination. This approach attempts to find a shortest path to the destination, in terms of either distance or number of hops. It is based on the geographical position distances between the nodes. A node that required sending a message acquires the address of the destination. After preparing the message, it measures the distance from self to the destination.

Next, it measures distance from each of its neighbours to the destination. The greedy routing protocol approach always tries to shorten the distance to be travelled to the destination to the maximum possible extent. That's why; the node considers only those neighbours that are closer to the destination than itself. The sending node then selects the node closest to the destination and relays the message onto the neighbour. A node collecting a message may either be the final destination, or it may be one of the intermediate nodes on the route to the destination nodes. If the node is an intermediately hop to the message being relayed, the node will measure the next hop of the message.

2. EAGRP ALGORITHM

We propose an EAGRP stands for Energy Aware Geographic Routing Protocol that operates as follows:

1. Source node first determines a candidate set of neighbouring nodes; the nodes that lie near to the destination than itself.

2. The weight of each candidate neighbour node is then computed to be the sum of the fraction of the initial energy currently available in that neighbour node and the progress (i.e., the fraction of the covered between distance the forwarding node and the destination) obtained with the choosing of the neighbour node.

3. The candidate neighbour node that has the highest weight value is the chosen next hop node to receive the data packet.

Let (UD, WD) and (US, WS) respectively denote the locations of the destination node D and the source node S that has been the data packet addressed to the destination node D.

Expression for the pseudo code for the proposed the greedy algorithm used at a source node in EAGRP. We first form a candidate set of some neighbouring nodes, Candidate Neighbour List (S), which is a subset of the Neighbour List (S). For each and every neighbour I ∈ Neighbour List (S), I ∈ Candidate Neighbour List (S), if and only if, the distance between the number of neighbour node I and the destination node D is less than the distance between the Source node S and D. For each and every neighbour node I ∈ Candidate Neighbour List (S), we then calculate a Weight (I), defined as the sum of the:

1. Fraction of the initial power currently available at me, referred to as Residual Energy (I).
2. The Fraction of the distance covered with the potential selection of I, referred to as Progress (S, I), which would be the difference in the distance between S and D and distance between I and D divided by the distance between S and D.

Among such neighbour nodes, the neighbour node that has the highest Weight value is chosen by S as the next hop node to extend the data packet. If the forwarding node S could not search a neighbour node that lies closer to the destination than itself, the Candidate Neighbours list is empty and the node switches to perimeter forwarding.

With the above described energy aware approach, the neighbour node that lies farthest away from the forwarding node position need not be always selected as the next hop node and a neighbour that has a relatively bigger available residual energy and located relatively near to the destination, compared to the forwarding node, could be select as the next hop. This could significantly increases the time of first node failure, where there are no a significant neighbourhood changes. The energy aware neighbour selection of EAGRP has the potential to very well equals the forwarding load among all the neighbour nodes rather than always using the neighbour node that lies farthest away from the forwarding node and near to the destination. Note that the % of time instants a node gets into perimeter forwarding is the same in the condition of both GPSR and EAGRP. In other words, if greedy forwarding is successful working in GPSR, greedy forwarding would also be successful working in EAGRP and vice-versa.

3. SIMULATION MODEL

A. Simulation Tool (ns-2)

The well known ns-2 simulation tool is used, and the scenarios of simulation are described. Ns-2 provides a comprehensive development environment for modeling and performance calculation of communication networks and distributed systems. The package consists of a number of design tools; each one is focusing on particular aspects of the modeling task. These tools fall into three major categories that correspond to the three phases of modeling and simulation projects: Specification, Data Collection and Simulation and Analysis.

B. Simulation Setup

This scenario presents a motionless network. The main aim of analyzing the behaviour of such network whose nodes maintain their location over the time is to recognise the improvements of the main features of each protocol. In the simulation, all nodes generated data message that are routed to the destination node. Random topology considered in this implementation. Simulation time for each scenario was set to 600 seconds and repetitive simulations for each scenario were performed to verify the performance of our results. The network was modelled on an area having dimension of 400 x 400 meters. The packet size is of 1024 bytes, and the packet rate is 5 packets /sec. All nodes in this network are considered as source nodes communicating with constant bit rate 2 Mbps.

The numbers of nodes chosen are 30, 40, 50, 65, 70, 90 and 100 nodes. The input parameters used for these all scenarios.

Fig.1 formation of nodes

4. CONCLUSION

A geographic routing through the greedy forwarding has been proposed and calculated. In greedy

forwarding uneven load distribution results in heavily loaded nodes to discharge quickly when compared to other nodes. This causes few large-utilized nodes which may fail and result in formation of holes in the network, resulting in more message loss. So there is a need for an of such energy efficient routing Protocol strategy that should equals the load of the network and prevent the holes formation. Many excellent protocols have been developed for secondary networks. However, sensor networks have additional requirements that were not specifically addressed in these researches. This paper has proposed new routing algorithm called Energy Aware Geographic Routing Protocol for efficiently and reliably routing data packets from source nodes to sink through a multiple-hop wireless sensor network. EAGRP was compared with GPSR. Simulation experiments were carried out for different number of nodes using variable evaluation metrics.

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