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A Review on Efficient Organization for Wireless Sensor Networks

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Abstract: In this paper we focus on achieving optimal path by taking load and delay as an important parameter. Recently WSNs has focused on the geographic forwarding mechanism. In order to reduce the energy consumption of nodes. It is now shifting toward duty-cycled WSNs in which sensors are sleep scheduled. But the shortest path found by using distance as a parameter may result in delay as the nodes along the path may be heavily loaded. Therefore Load balancing also proves to be equally important factor along with Distance. Hence this research work proposes the system that will calculate the best optimal path from source node to destination by taking into consideration the load on each node and delay incurred by each node in Duty-Cycled Mobile sensor networks along with geographic routing.

Keywords: Geographic Routing, Sleep Scheduling, Duty –Cycled Mobile Sensor Network, Network simulator-2 (NS2)

1. INTRODUCTION

Recent studies show that Geographic routing is the most important routing in wireless sensor networks (WSNs) as it serves with its simplicity, scalability, and efficiency. This routing principle relies on geographic position information. Location information is used to formulate an efficient route search toward the destination. It is much attractive for large multi-hop wireless networks in which the nodes are not reliable and their network topology is frequently changing. This type of routing only requires the propagation of single hop topology information, i.e. the best neighbor, to make correct forwarding decisions [1]. The efficiency of this scheme is decided by network density, the accurate localization of nodes and the forwarding rule. Some advantages of geographic Routing are as follows:

- The mobility support can be facilitated. As each node sends its coordinates periodically, all its neighbors update their routing tables accordingly. Thus all nodes aware of its alive neighbor nodes.
- It is scalable. The size of routing table depends on network density not on network population. Hence wider networks consisting of thousands of nodes can be realized without cluster formation.
- Minimum overheads are introduced. The entire interaction taking place in this network is localized. As the result bandwidth is economized. The processing and transmission energy is saved and the dimensions of routing table are decreased. Thus in this scheme the source sends a message to the geographic location of the destination instead of using the network address. In such a scheme determination of routing path from source to destination is done by forwarding the selected node at each intermediate node in a fully-distributed manner. Thus the forwarding decision is determined purely on the basis of the location of each node and not on the basis of the network size, but now the research of Geographic routing has moved towards duty cycled wireless sensor networks (WSN).

Duty Cycled WSN aims at reduction in use of power consumption in duty cycled WSN, according to some sleep scheduling algorithms some nodes are made to sleep and awake alternately. i.e It selects a subset of nodes to be awake in a given epoch while the remaining nodes are in the sleep state. Thus it leads to lesser power consumption.

Geographic routing is usually based on distance as its main parameter. Such routing schemes uses algorithm such as the geographic routing oriented sleep scheduling (GSS) & geographic-distance-based connected-k neighborhood (GCKN). But Geographic routing using distance as a parameter has many disadvantages too. The path selected using distance as a parameter results in delay and increase in retransmission cost. Thus the existing research was done to find out the shortest path from source to destination in Duty-Cycled Mobile sensor networks along with geographic routing as shown in fig 1.

But there may be the case where we have the shortest path and the nodes are heavily loaded. Therefore all these works overlook one important fact that Load balancing also proves to be equally important factor. Thus there is no load consideration. It leads to increase in Delay and transmission cost, also decreases packet delivery ratio and throughput and hence the shortest path thus obtained is not optimal. These are some of the problems identified in this paper.

Hence the need of research is to explore the various possibilities to determine the best optimal paths along with load balancing and all paths in Duty-Cycled Mobile sensor networks along with geographic routing and improving the network efficiency.

The structure of this paper is as follows **Section** II surveys work related to our proposal.

Section III describes the proposed system to determine the best optimal paths along with load balancing. Lastly section V presents the summary.

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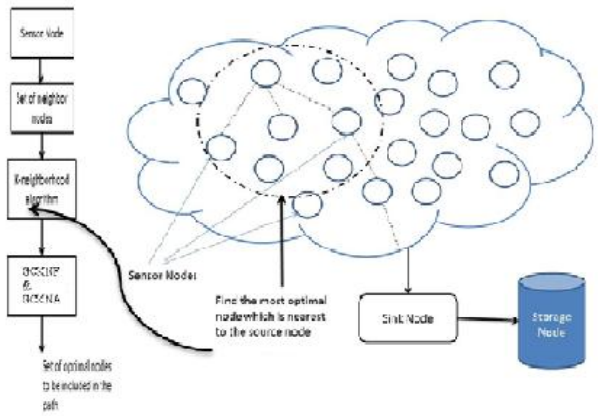

Fig 1

II. RELATED WORK

According to the taxonomy presented Chunsheng Zhu, Laurence T. Yang, Lei Shu, Joel J. P. C. Rodrigues, Takahiro Hara in [2] proposed a geographic routing oriented sleep scheduling (GSS) in order to deal with the latency issue imposed by duty cycling on geographic routing. The author analyzed the first transmission path's performance of the two-phase geographic forwarding (TPGF) in a CKN based WSN and further propose a geographic routing oriented sleep scheduling (GSS) algorithm to shorten the first transmission path of TPGF in duty-cycled WSNs. TPGF can be executed repeatedly to find multiple paths and nodes in any path explored by TPGF cannot be reused, which makes the first transmission path of TPGF have access to all neighbor nodes thus tend to be the shortest and most likely utilized path compared with other paths. As geographic routing is moving towards sensor networks with duty-cycle, it can be used save energy consumption which is a very important design factor in practical WSN application scenarios.

In [3] Can Ma1, Lei Wang1, Jiaqi Xu1, Zhenquan Qin1, Ming Zhu1, Lei Shu discussed about topology coverage problem. The paper, focus on achieving better energy conservation for geographic routing algorithms in duty-cycled WSNs when there is a mobile sink. Thus, the author proposed a multi-metric geographic algorithm (MMGR) which uses multi-metric candidates (MMCs) for geographic routing. However existing researches is either concern with duty-cycle or with mobile sinks, but MMGR considers the both aspects in geographic routing, for energy conservation.

The author Chunsheng Zhu, Laurence T. Yang, Lei Shu,, Victor C. M. Leung, Joel J. P. C. Rodrigues,, and Lei Wang in [4] , have explored geographic routing in duty-cycled mobile WSNs and proposed two geographic-distance-based connected-k neighbourhood (GCKN) sleep scheduling algorithms for geographic routing schemes to be applied into duty-cycled mobile WSNs which can incorporate the advantage of sleep scheduling and mobility. The first geographic-distance-based connected-kneighborhood for first path (GCKNF) sleep scheduling algorithm minimizes the length of first transmission path explored by geographic routing in duty-cycled mobile WSNs and the second geographic-distance based connected-k neighborhood for all paths (GCKNA) sleep scheduling algorithm reduces the length of all paths searched by geographic routing in duty-cycled mobile WSNs. Both the algorithms are very effective in shortening the length of the transmission path explored by geographic routing in duty-cycled mobile WSNs compared with the CKN sleep scheduling algorithm and the GSS algorithm. Sleep scheduling is a worthy research direction to adapt geographic forwarding methods into duty-cycled mobile WSNs. This will help us in our proposed system to find out the optimal path.

In [5] Pedro Pinto, António Pinto, Manuel Ricardo proposed a novel real-time and end-to-end delay estimation mechanism, which considers processing times and two new RPL metrics. Current research focus on EED estimation by using probabilistic estimation of delays, network calculus, or routing metrics. But a novel EED estimation mechanism that combines path delays and node processing delays .The concept of delay will help us in our proposed system to find out the optimal path.

In [7] the basic principal of Packet forwarding in geographic routing is done by using intelligent forwarding geographic routing protocol called GPSR. Despite of several advantages, original greedy forwarding technique it causes congestion problem. Thus the author BiJun Li, MinJung Baek, SeUng Hyeon, and Ki-Il Kim proposed new parameters to balance load and to avoid congestion problem. For this the author used two parameters i.e. Node stress and Link Quality. The node stress is related to how much overheads are expected to be caused at each node whereas link quality is related to current wireless link status between adjacent nodes. As low quality wireless medium causes several problems on the links, therefore, new parameter to consider link quality is required. Hence the author introduced Packet Delivery Ratio as an important parameter for Load balancing..Thus we can conclude that PDR can be used as an important parameter in our proposed system.

In [7] Packet Delivery Ratio (PDR) as a metric to select the best route and transmission rate. It is estimated either by counting the number of received hello/data messages in a small period of time, or by taking the history of PDR into account. But fails to achieve good accuracy. Thus we propose a novel estimation method which takes advantage of receiving signal strength. But the result obtained by this method is satisfactory. Hence we use PDR Estimation using Received hello Packets method to estimate PDR in our proposed system.

III. PROPOSED SYSTEM

The proposed system focuses on finding the most optimal first transmission path and all transmission paths in duty cycled mobile WSN's employing geographical routing. The system introduces the concept of Load Balancing and delay as one of the factors to be considered for finding the optimal paths along with Geographic Distance Based Connected k-neighborhood sleep scheduling algorithm. The figure shown below shows the system flow diagram of proposed system. The working of each of the module is

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explained in detailed below

A. Calculation of Distance

Initially we find the distance between the neighboring nodes. The distance between the two nodes and all the neighboring nodes is calculated by using two geographic-distance-based connected-k neighborhood (GCKN) sleep scheduling algorithms. First is geographic-distance-base connected-k neighborhood for first path (GCKNF)sleep scheduling algorithm, which is designed to explore shorter first transmission paths for geographic routing in duty cycled mobile WSNs. While the second is geographic-distance-based connected-k neighborhood for all paths (GCKNA) sleep scheduling algorithm aims at shortening all routing paths for multipath transmissions in duty-cycled mobile WSNs. These GCKN algorithms incorporate the connected-k neighborhood requirement and geographic routing requirement to change the asleep or awake state of sensor nodes. Thus we get set of nodes sorted according to distance.

B. Calculation of delay.

The proposed scheme considers Delay as the main parameter. The nodes may be heavily loaded along the optimal path and may result in causing delay in a network. Thus the delay of each node is calculated by sending hello packets. Sending time – Receiving time gives delay. [8]

C. Calculation of Packet Delivery Ratio.

The proposed scheme considers Packet Deliver Ratio as a parameter for load balancing.

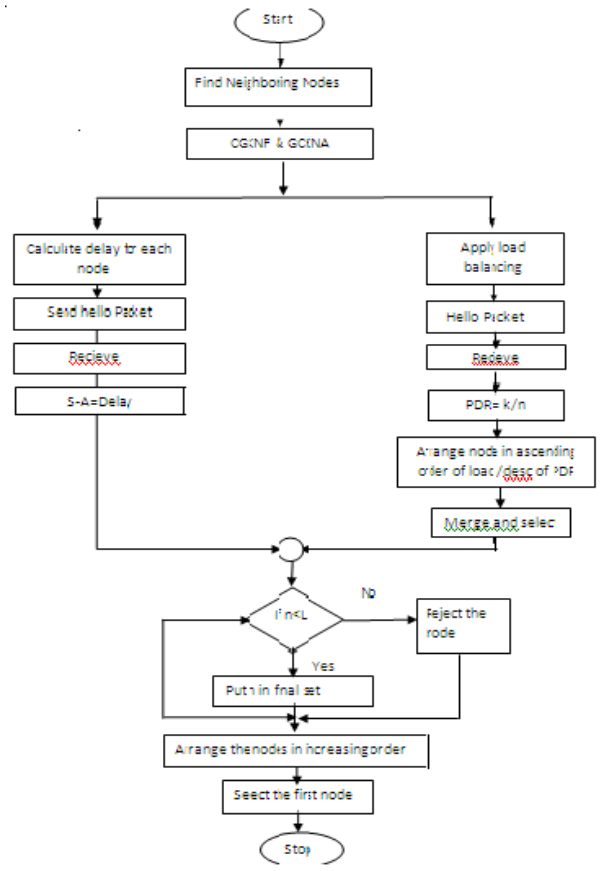

Fig 2

[9][10] PDR will be calculated for each of the nodes which are found using GCKNF and GCKNA. Then among those nodes, the nodes which are having better PDR will be selected to be included in the path. PDR is one of the newest parameters which can be used for load balancing in WSN. It comes under Link quality attribute. The PDR gives a better view of which nodes among the selected nodes have performed well in terms of reception of packets from the source of the packet. Higher PDR also ensures that the packets will be sent/ received with utmost efficiency which will reduce the cost of resending the packets if the PDR for certain node is on the lower side. The complete system evolves to a Novel approach which will help in reducing the end to end delay and throughput of duty cycled mobile WSN using geographical routing.

IV. SUMMARY

In this review paper we calculate optimal path by taking load and delay as the important parameters. The proposed system will calculate the best optimal path from source node to destination by taking into consideration the load on each node and delay incurred by each node. The path finding methodologies based on such parameters will increase the efficiency of the network. The proposed scheme considers Packet Deliver Ratio as a parameter for load balancing. PDR will be calculated for each of the nodes which are found using GCKNF and GCKNA. The PDR gives a better view of which nodes among the selected nodes have performed well in terms of reception of packets from the source of the packet. The complete system evolves to a Novel approach which will help in reducing the end to end delay and throughput of the duty cycled mobile WSN using geographical routing.

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