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IMPROVED EFFICIENT OF QOS AWARE GEOGRAPHIC OPPORTUNISTIC ROUTING IN WIRELESS SENSOR NETWORKS

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ABSTRACT

QoS routing is an important research issue in wireless sensor network. Existing work exploits multipath routing and geographic opportunistic routing for QoS provisioning with both end to end reliability and delay constraints in WSNs but they are not efficient for QOS provisioning in WSNs. The proposed Improved Efficient QoS-Aware Geographic Opportunistic Routing (IEQGOR) is used to improve the energy efficient in WSNs. The quality of geographic opportunistic routing is improved by combining geographic routing with awake-asleep scheduling. The IEQGOR presents probability-based target prediction and sleep scheduling protocol (PPSS) to improve the efficiency of proactive wake-up and enhance the energy efficiency with limited loss. IEQGOR significantly increase the QoS in WSNs. The proposed IEQGOR is compared with the EQGOR routing approach through NS-2.34 software. Simulation results demonstrate that IEQGOR improves the energy efficiency, packet delivery ratio and reduce the delay.

Keywords: wireless sensor network, geographic opportunistic routing protocol (GOR), enhanced QoS-aware GOR (EQGOR).

1. INTRODUCTION

Wireless Sensor Network have been designed for monitoring physical or environmental conditions with distributed autonomous sensors and cooperatively passes the information or data to the main location [1]. The information sensing of wireless sensor network in decisive conditions at an emergency state deploys its main importance. Benefits of developing sensor network keeps on increasing based on its practical information in physical environment for different applications either manually or randomly [2]. The sensors operate under the extreme energy constraints which makes extremely challenging task in designing a new wireless sensor node and it involves assessing a number of different parameters required by the target application, which includes range, size, life time, storage, algorithm, computational cost etc. [3], in which providing reliable and timely communication in wireless sensor networks plays a vital role and is a challenging problem. This is because of varying network topology and connectivity change over time [4]. Many routing protocols [5-8] are proposed to maintain the security, reducing the time and improve the unreliable links.

This IEQGOR makes the following contributions:
1) To design a target prediction scheme based on both kinematics rules and theory of probability, which enhance the energy efficiency of proactive wake-up with both awakened node reduction and active time control efforts.
2) The proposed PPSS distributed algorithms runs on individual nodes, which makes PPSS scalable for large-scale WSNs.

2. LITERATURE SURVEY

Akkaya K. *et al.* [9], propose energy aware QoS routing protocol that runs efficiently in best-effort traffic. It finds a least-cost, delay-constrained path for real-time data in terms of link cost and maximizes the throughput for non-real-time data by adjusting the service rate for both real-time and non-real-time data at sensor nodes. The effectiveness is demonstrated by simulation results.

Zorzi M. *et al.* [10], the author study about the novel forwarding technique based on geographical location of the nodes involved in the network among receivers and provides the description of MAC scheme in its energy and latency performance on collision avoidance. Two steps are involved, first a simplified analysis is made based on relevant trade off and the semi-Markov model is developed which increases the performance evaluation. The stimulated results are provided for the analytical approach. Guidelines are designed on the network layer protocol with physical layer model. It is done by the base three layers about the probability of distance between the nodes in the network. Then optimal path finding with neighbor knowledge is described [11].

Zeng K. *et al.* [12], describes about geographic collaborative forwarding (GCF) scheme that exploits the broadcast nature and spatial diversity of the wireless medium to improve the packet delivery efficiency. First upper bound of the expected packet advancement is identifying which is achieved and proved by GCF. A new metric EPA per unit energy consumption is proposed with energy efficiency as a major concern, which balances the packet advancement, reliability and energy consumption. Finally an efficient algorithm is proposed which selects a feasible candidate set that maximizes the local metric.

Z. Wang *et al.* [13], propose energy efficient and collision aware (EECA) which is a node-disjoint multipath routing algorithm designed for wireless sensor networks. Based on the information of the node's position, EECA algorithm attempts to find two collision-free routes with constrained and power adjusted flooding and then finally transmits the data with minimum power through power control component of the protocol. The results provide improvement in overall Figure 1performance.

Long Cheng *et al.* [14], propose an Efficient QoS-aware GOR (EQGOR) protocol for QoS provisioning in WSNs, which improves the efficiency of QoS routing in terms of energy efficiency and computation delay at each hop in the network. It categorize base on the priority and select the forwarding candidate set in efficient manner which improve the overall performance of the routing protocol that is implemented with NS2 and evaluate the effectiveness of GOR for QoS in WSNs.

3. IEQGOR DESIGN

A promising routing scheme in wireless sensor networks (WSNs) is shifted towards duty-cycled WSNs in which sensors are sleep scheduled to reduce energy consumption. IEQGOR Improved Efficient QoS Aware Geographic Opportunistic Routing is designed in a way that, it integrates awake/asleep schedules. According to which nodes alternate between awake/asleep modes from independent wake-up schedules with fixed duty cycle 'd'. Packet forwarding is implemented by having the sender polling for availability its awake neighbors by broadcasting an RTS (Real Time Strategy) packet for jointly performing channel access and communicating relevant routing information (cross-layer approach). Available neighboring nodes respond with clear-to-send (CTS) packet carrying information through which the sender can choose the best relay. Relay selection is performed by preferring neighbors offering "good performance" in forwarding packets. Positive geographic advancement toward the sink (the main relay selection criterion in many previous solutions) is used to discriminate among relays that have the same forwarding performance.

The IEQGOR presents probability-based target prediction and sleep scheduling protocol (PPSS) to improve the efficiency of proactive wake-up and enhance the energy efficiency with limited loss on the process of tracking. It is a target prediction scheme, which follows both kinematics rules and theory of probability. PPSS prediction and sleep schedule not only predicts a target's next location, it also describes the probabilities with which it moves along the directions. The target prediction of PPSS provides a directional probability as the foundation of differentiated sleep scheduling in a geographical network. The next steps after the prediction results; PPSS enhances the energy efficiency by reducing the number of proactively awakened nodes and control their active time in an integrated manner. In addition a distributed algorithm is designed for PPSS that can run on individual nodes which will improve the scalability of PPSS for large-scale WSNs. The efficiency of PPSS is evaluated with both simulation-based method.

A. Flowchart

Flowchart for IEQGOR protocol is shown in Figure-1

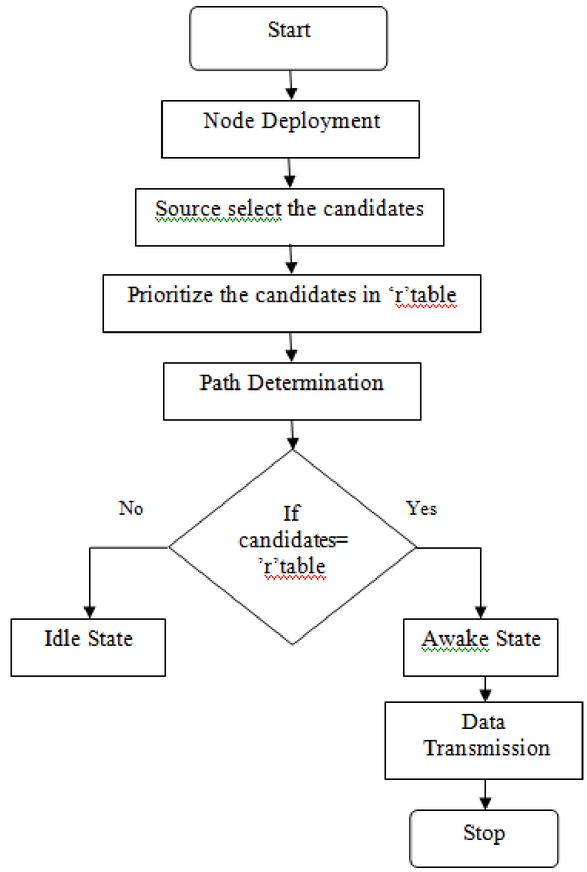

Figure-1. Flowchart of IEQGOR.

B. IEQGOR algorithm

Step-1: Declaration and initialization of nodes
Step-2: Set an energy level
Step-3: Collects neighbor energy, I.P address.
Step-4: Prioritize the candidate according to energy and distance in rtable (routing table).
Step-5: Determine the transmission path.
Step-6: If the candidate in the 'r'table, awake the candidate and perform data transfer.
Step-7: If the candidate not in the 'r'table, make the candidate in idle mode until data transmission.

C. Performance analysis

Finally, performance has to be analyzed based on:

End-to-end delay: The time taken by a packet for transmission from source to sink node. It gives the end-to-end delay of QoS requirement, and measures the on-time packet delivery ratio.

Packet delivery ratio: Packet delivery ratio provides the ratio of the amount of packets received by the destination to the total amount of packets sent by the source.

Packet delivery ratio = total amount packets received /total amount of packet send.

Data transmission cost: It Measures the total number of data transmissions for a successful end-to-end data delivery.

4. RESULT ANALYSIS

The simulation analysis of selfish node isolation method and awake-asleep scheduling is shown in the help of network animator window by using Network simulator. The following graph shows the performance analysis of IEQGOR and it compared with EQGOR.

A. The packet delivery ratio increases by sleep and awake method

The packet delivery ratio of EQGOR for 25 nodes is 92.97% but the IEQGOR has the packet delivery ratio 93.78%.In Sleep and Awake method the packet delivery ratio increases rapidly compared with EQGOR shown in Figure-2 in this the quality of service in the wireless sensor network improved in terms of packet delivery ratio.

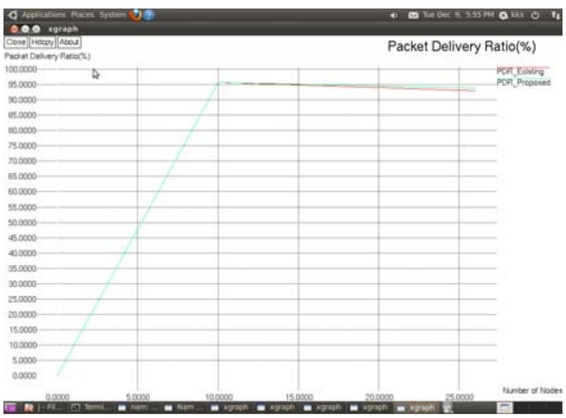

Figure-2. Output waveform for packet delivery ratio versus number of nodes.

B. Delay decreases by sleep and awake method

The delay of EQGOR for 25 nodes is about 1.1923ms but for IEQGOR 0.8228ms is the delay .Sleep and Awake method delay increases compared with EQGOR shown in Figure-3.In this the quality of service in the wireless sensor network improved in terms of delay.

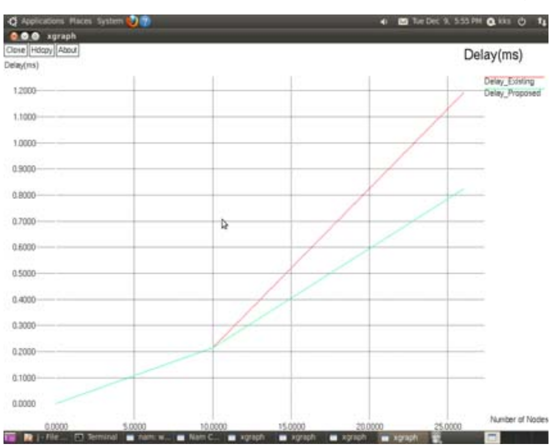

Figure-3. Output waveform for delay versus number of nodes.

C. Energy efficiency increases by sleep and awake method

The Energy consumption of EQGOR for 25 nodes is about 17.19 J but the IEQOR has the energy 17.123 J. Sleep and Awake method energy consumption decreases significantly compared with EQGOR shown in Figure-4. In this the quality of service in the wireless sensor network improved in terms of energy.

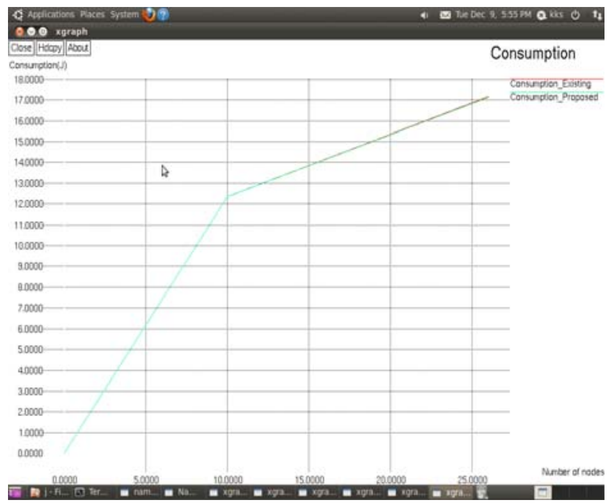

Figure-4. Output waveform for energy consumption versus number of nodes.

D. Comparison table

Table-1. Comparison of existed and proposed system.

EQGOR	IEQGOR
Delay is about 1.1923ms	Delay is about 0.8228ms
Energy consumption is about 17.19 J.	Energy consumption is about 17.123J
Packet delivery ratio is about 92.97%	Packet delivery ratio is about 93.78%

5. CONCLUSIONS

The proposed Improved Efficient QoS-Aware Geographic Opportunistic Routing (IEQGOR) improves the energy efficient in WSNs compare to EQGOR in terms of packet delivery ratio and Delay with sleep and awake method. The quality of geographic opportunistic routing is improved by combining geographic routing with awake-asleep scheduling and back-to-back data packet transmission for achieving an energy-efficient data gathering mechanism. The IEQGOR presents probability-based target prediction and sleep scheduling protocol (PPSS) to improve the efficiency of proactive wake-up and enhance the energy efficiency with limited loss. The efficient relay selection performs the back-to-back transmission. IEQGOR significantly increase the QoS in WSNs. Simulation results demonstrate that IEQGOR performs better than EQGOR by improving the energy efficiency, packet delivery ratio and reduce the delay in the network.

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