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PERFORMANCE ANALYSIS OF QOS ORIENTED DYNAMIC ROUTING FOR DATA AGGREGATION IN WIRELESS SENSOR NETWORK

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Abstract:

The fundamental challenge in design of wireless sensor network is to enhance the network lifetime. Many components are considered for the maximization of life time of wireless sensor networks, for example, limiting the power consumption, ease operation, optimal routing algorithms. Sensor nodes have much excess and information collection that turns into a gainful methodology to eliminate the repetition. It limits the quantity of transmissions and thus it saves power. In this paper, we propose Zone Routing Protocol (ZRP) to enhance the QoS support capability of hybrid networks and redundant data used to further improve the transmission QoS. Particle Swarm Optimization (PSO) based effective clustering in Hybrid Wireless Networks is also proposed with Gravitational Search Algorithm (GSA) to achieve high QOS performance in network aanalytical and simulation results based on the random way-point model and the real human mobility model show that ZRP can provide high QoS performance in terms of throughput, transmission delay, packet delivery ratio, and energy consumption. The simulation outputs can be taken by using NS-2 simulator.

Keywords: Dynamic routing, data aggregation, zone routing protocol, particle swarm optimization and gravitational search algorithm.

1. Introduction

Wireless sensor is accumulation of hundreds or thousands of sensor node, along these lines it has different applications, for example, intrusion detection, fire detection, habitat monitoring, environment

monitoring and biological hazard detection [1]. Usually sensor nodes are low-powered sensing devices with, less computational limit, constrained memory and correspondence assets [2]. Wireless sensor networks have modest gadgets subsequently assets are extremely restricted. Expansive measure of vitality required for transmitting information and accepting information from node to node, it likewise relies on separation between nodes. Fundamental issue in WSN is to expand the lifetime of system that can be enhanced with the assistance of information conglomeration instrument. Information total instrument is the procedure of accumulation of information originating from various neighboring sensor node and expelling excess from information after that send those information to base station with proper steering system because of which enhance the general execution of system and boost lifetime of system.

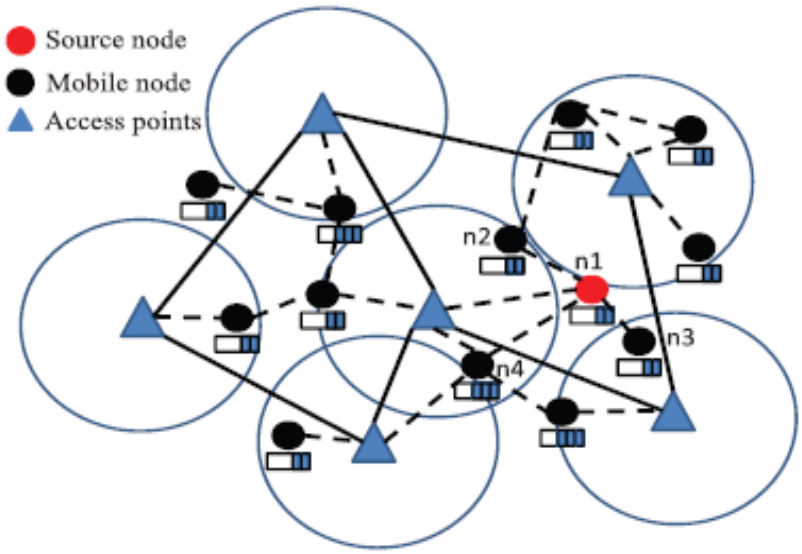

Figure.1 Overview of Data Aggregation in WSN.

In wireless sensor networks, benefit of data aggregation enhances when transitional sensor nodes execute data aggregation apparatus and data are advanced to the sink. Data aggregation process executes incessantly owing to which enhances the bandwidth and energy consumption, it may unconstructively cause of other recital metrics such as fault-tolerance, delay and accuracy, etc. [1]. Main aim of data aggregation apparatus to sorts data and create packets additional spatially in addition to temporally convergent to decrease Average Number of Transaction (ANT). For instance, in [3], if at least two sorts of sensors, for example, pressure sensors, traffic sensor is working in a same territory.

The packets produced by the sensor nodes are transmitted to base station. Trait is described as recognition of packet [4]. In this paper we utilize Attribute Aware Data Aggregation i.e. it recognized the type of packets. If packet having similar attribute then apply Aggregation mechanism on that node. Even though the timing method proposed in [3] guarantees that all the packet of similar Attribute convene all other at same time for Aggregation. Static routing is describe as per characterize path between source node to destination node and that is set due to which take place a difficulty such as traffic conjunction, packet loss, packet delay and so on. Dynamic routing is characterized as way can be chosen at the run time of packet from source to destination [5]. To plan the dynamic routing, first we realize that the routing metric that can be resolved on node profundity, is resolved what number of number of hop is require achieving sink node, is considered to guarantee packets achieve the sink finally. In addition, the metric must be pertinent with the packet trait. Illuminated by the idea of pheromone, which will be drop along the way where the ants take a break, in subterranean insect province [6], we draw a similarity between the pheromone and the packet attribute. A packet will drop trait subordinate pheromone when packet passing a node to pull in towards packets with same characteristic node.

2. Existing Work

Hybrid wireless networks (i.e., multi-hop cellular networks) have been verified to be a superior system organization for the next generation wireless networks and can assist to undertake the rigorous end-to-end QoS requirements of various applications. Hybrid networks synergistically merge communication networks and MANETs to influence each other. Particularly, communication networks advance the scalability of MANETs, whereas MANETs involuntarily launch self-organizing networks, widening the exposure of the communication networks.

In a vehicle opportunistic access network (an instance of hybrid networks), people in vehicles require uploading or download videos from remote internet servers through access points (APs) (i.e., base stations) dispersal out in a city. Since it is improbable that the base stations face the whole city to preserve adequately brawny signal everywhere to maintain a relevance requiring high link rates, the

vehicles themselves can form a MANET to enlarge the exposure of the base stations, providing constant network connections.

In existing work, there are few drawbacks. That is,

- Difficult to assurance QoS in MANETs due to their exclusive features including channel variance errors, user mobility, and limited bandwidth.
- Although these protocols can enlarge the QoS of the MANETs to a positive level, they endure from invalid reservation and race condition problems.

3. Proposed Work

In proposed work, in order to improve the QoS support competence of wireless sensor networks, a Zone Routing Protocol (ZRP) is proposed. Generally, a wireless sensor network has extensive base stations. The data transmission in wireless sensor networks has two attributes. First, an AP can be a source or a destination to any mobile node. Second, the number of transmission nodes between a mobile node and an AP is small. The first attribute allows a torrent to have any radiate transmission along numerous transmission paths to its destination through base stations, and the second attribute permits a source node to attach to an AP through an intermediate node. The perceptions of Particle Swarm Optimization (PSO) are utilized for cluster formation. Assembling the optimal routing path to transmit the sensed data is a different challenging task in WSN. In the proposed system, Gravitational Search Algorithm (GSA) is also utilized for constructing an optimal routing path to transmit the sensed data to the base station.

In our proposed system, there are many features. In that, main features are listed below.

- To avoid delay and reliability data transmission
- Reduce the energy consumption
- The source node schedules the packet streams to neighbours based on their queuing condition, channel condition, and mobility, aiming to reduce transmission time and increase network capacity.

- Taking full advantage of the two features, ZRP transforms the packet routing problem into a dynamic resource scheduling problem.
- Improves the overall network lifetime.
- The individual nodes in WSN are eliminated by using Particle Swarm Optimization.
- This can be done by finding the fitness value of each and every node in the network.
- Gravitational Search Algorithm is used for finding the next best hop node.
- More security in data transmission.
- Reduce the energy consumption.
- Avoid the packet loss
- Reduce the possibility of link breakage often.

The flow diagram of the proposed system is shown in figure 2.

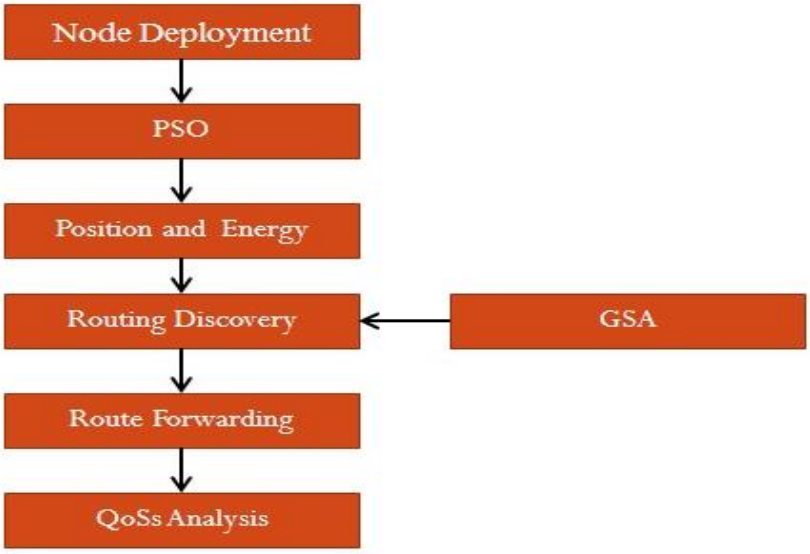

Figure.2 Flow Diagram.

Zone Routing Protocol (ZRP):

ZRP consolidates the benefits of the proactive and receptive methodologies by keeping up an a la mode topological guide of a zone fixated on every hub. Inside the zone, courses are quickly accessible. For goals outside the zone, ZRP utilizes a course disclosure strategy, which can profit by the neighborhood steering data of the zones.

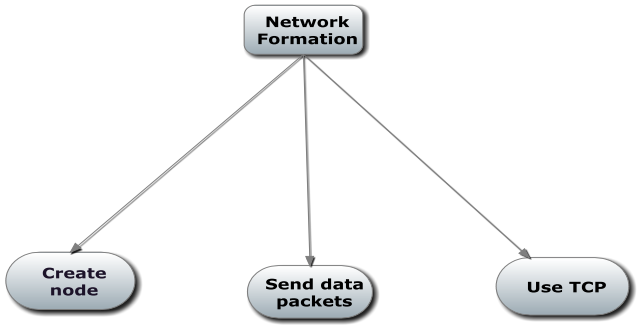

Figure.3 Network Formation.

ZRP reduces the traffic amount compared to pure proactive or reactive routing. Routes to nodes within the zone are immediately available. ZRP can recognize various courses to a goal, which gives expanded unwavering quality and execution. It guarantees that the courses are free from circles. It is a flat protocol, which diminishes blockage and overhead generally identified with hierarchical protocols. Network formation in ZRP protocol is shown in figure 3. Here nodes are made for sending and getting the data packets. ZRP routing protocol is is utilized for directing the data which was sent by source.

Particle Swarm Optimization (PSO):

PSO includes swarm of particles. In general, each and every particle occupies position in the search space. The position's quality is generally being demonstrated by the fitness of each particle which revolves in the search space with a specific velocity. Each particle's velocity is generously impacted by its best position set up in the hunt space up until this point and a fitting arrangement will be exhibited by the area positions. At last, the swarm will meet the optimal positions. Particles are made by considering two parameters specifically.

a. Position (x, y) and b. Velocity (v1, v2)

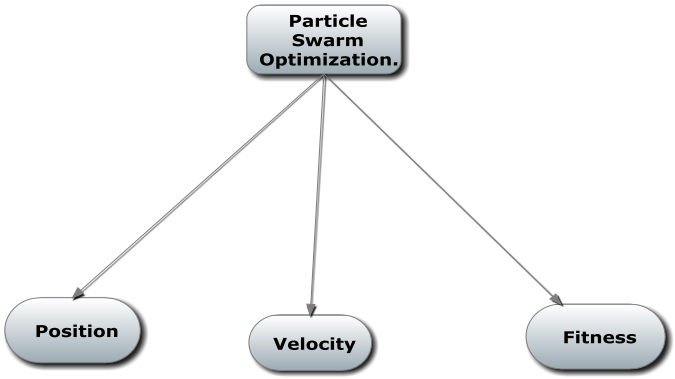

Figure.4 Particle Swarm Optimization.

The fitness value is calculated for choosing a cluster particle depends on the following three factors namely,

a. Energy of the particle or node EN.

b. Energy of particles or sensors with in a radio range from a particular particle.

c. Distance of those particles within the radio range from a particular particle.

Gravitational Search Algorithm (GSA):

GSA is an optimization algorithm utilized in the proposed technique for assembling an optimal path for transmitting the sensed data to the base station. The node which has the data to transmit is called source node. Such node checks for the next best hop to transmit the sensed data towards the destination or Base Station. For finding the next best hop, a route request message is sent to all the neighbors. This route request message contains the information like the node's own position, velocity and energy to the neighbor. Neighbor nodes forward the same request to its available neighbors by replacing the received position, velocity and energy value by its own value. The same process is repeated until it reaches the Base Station. GSA is used for finding the next best hop in the proposed method. Figure 5 shows the Gravitational Search Algorithm, which is used for finding the next best hop during route construction in Wireless Sensor Networks.

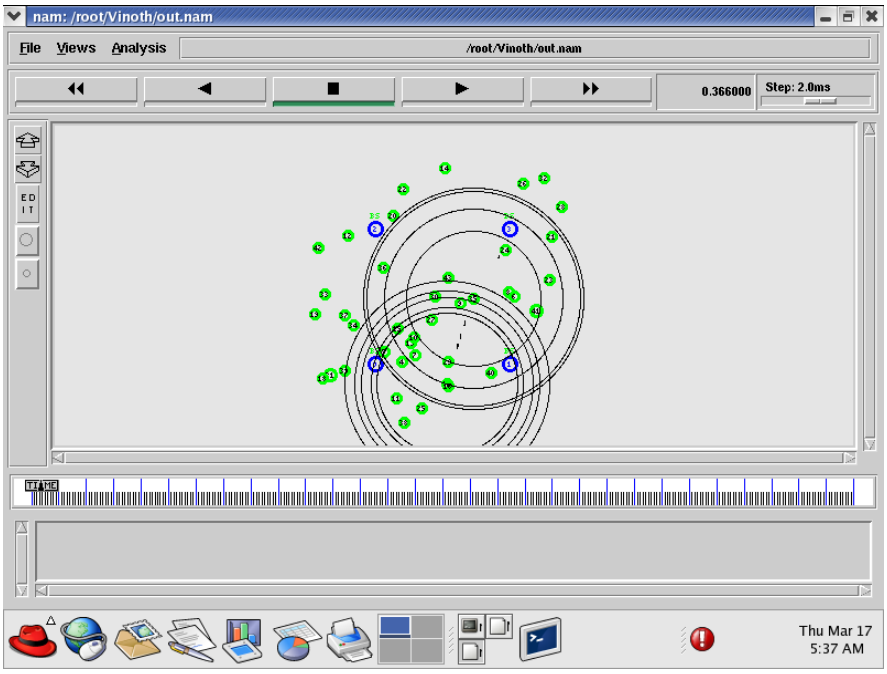

Figure.5 Gravitational Search Algorithm.

4. Performance Evaluation

A different network parameter analysis is being done for the proposed and existing protocols. Parameters like total energy consumption, throughput, packet delivery ratio and delay are compared for the proposed and the existing protocols. Delay: It is defined as the average time taken by the packet to reach the server node from the client node.

Delay = Number of packets sent / Simulation time

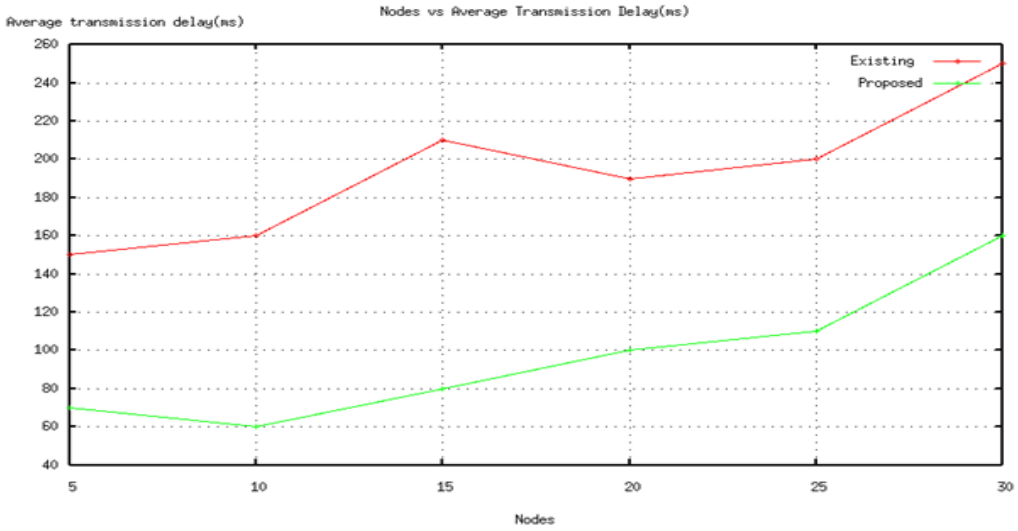

Figure.6 Performance of delay.

Delivery Ratio: Packet Delivery Ratio is defined as the average of the ratio of the number of data packets received by each receiver over the number of data packets sent by the source.

Delivery ratio = Number of packets received / Number of packets sent

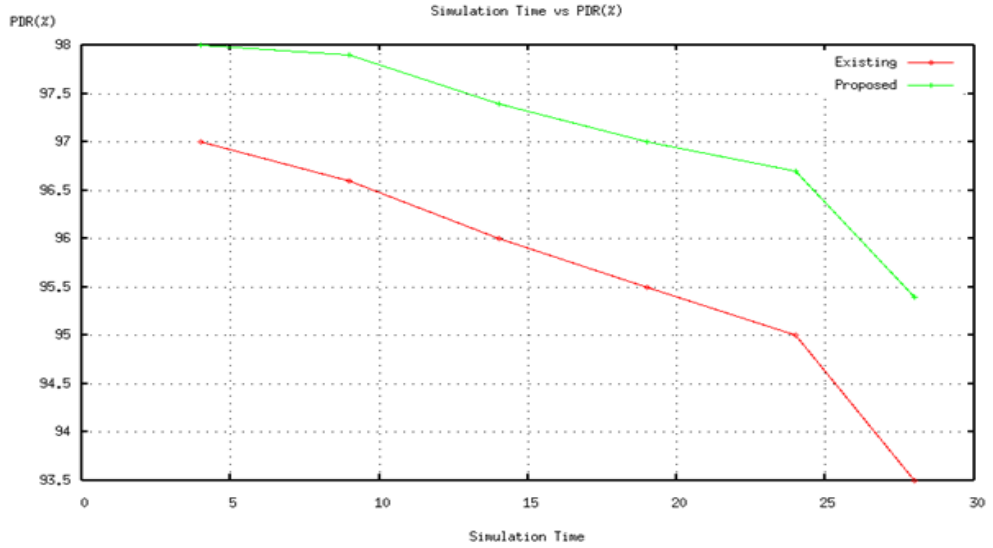

Figure.7 Performance of packet delivery ratio.

Throughput: Throughput is the number of useful bits per unit of time forwarded by the network from a certain source address to a certain destination, excluding protocol overhead, and excluding retransmitted data packets.

Throughput = Number of Packets Received / Simulation time

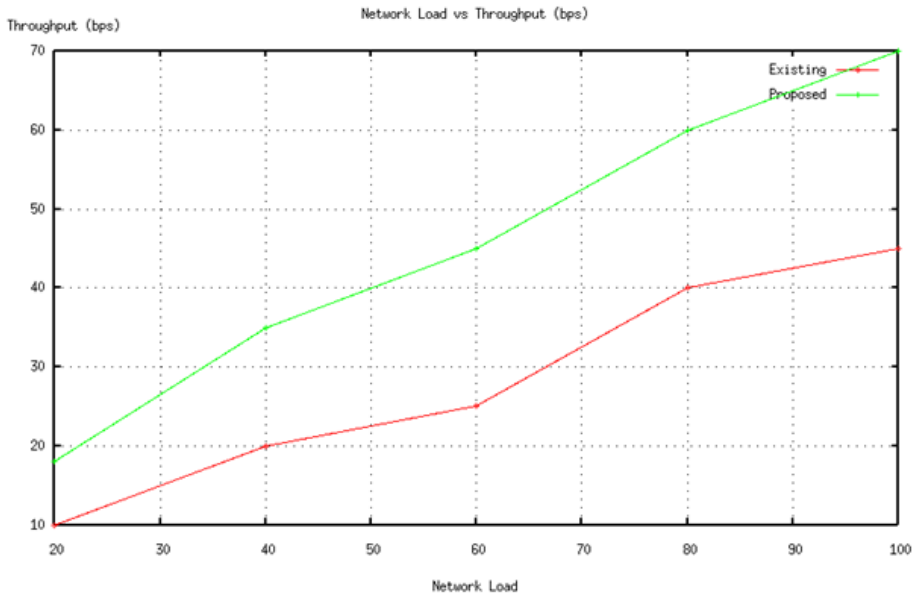

Figure.8 Performance of throughput.

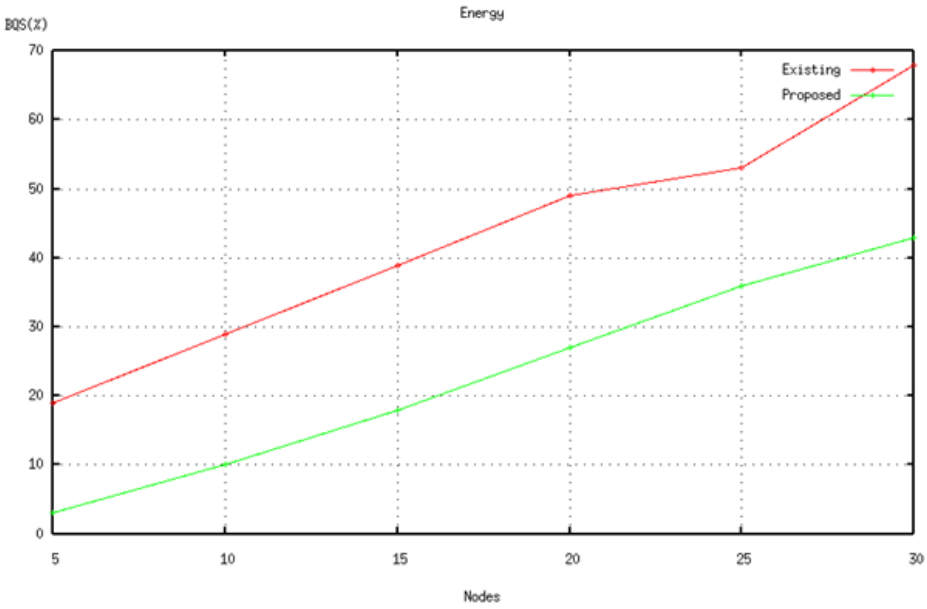

Figure.9 Performance of energy consumption.

5. Conclusion

The data aggregation is a productive means to save limited energy in WSNs. For this task, ZRP combines the advantages of the proactive and reactive approaches by maintaining an up-to-date

topological map of a zone centered on each node. ZRP protocols are used to enhance the QoS support capability of this networks and redundant data used for further improvement of QoS transmission. Here, PSO based effective clustering is also proposed with GSA to achieve high QOS performance in network analytical and simulation results based on the random way-point model and the real human mobility model show that ZRP can provide high QoS performance in terms of throughput, transmission delay, packet delivery ratio, and energy consumption. The simulation outputs are taken by using the simulation software NS-2 simulator.

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