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RESEARCH ARTICLE

An Energy Effective Minimum Hop Routing Scheme to Improve WSN QoS

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Abstract: To optimize the QoS for sensor network, it is required to improve the communication over the network. In this work, an effective routing scheme is defined to improve the network communication and to improve the network life. The proposed approach will identify the next neighbor based on the maximum distance in coverage range of node. Because of this approach, numbers of intermediate nodes are reduced and the overall energy consumption over the network gets reduced. It improves the network life and communication.

Keywords: WSN, Routing, QoS, Intermediate Nodes, Effective Routing

I. INTRODUCTION

A sensor network is one of the most growing network phenomenons that are having its importance in different real time applications. Sensor network has become the part of many application areas like vehicular network, medical application, body area network etc. With the increase of its importance, lot of advancement is already done in the sensor network in terms of its capacity, low power functionality, multifunctional nodes, low cost, smaller size etc. These sensor nodes are capable to communicate effectively for small size network and for short distances. One of such advancement is represented by the smart sensor nodes called smart dust. Smart dust has become most effective sensor devices that provide the autonomous sensing and computing along with memory storage.
Smart dust provides the easy way communication within the network as well as provides the interaction with other connected nodes or devices. The main advantage of the sensor nodes is its continuous monitoring capability, data gathering and the intelligent decision making capability. The basic properties of smart sensors are shown in figure 1.

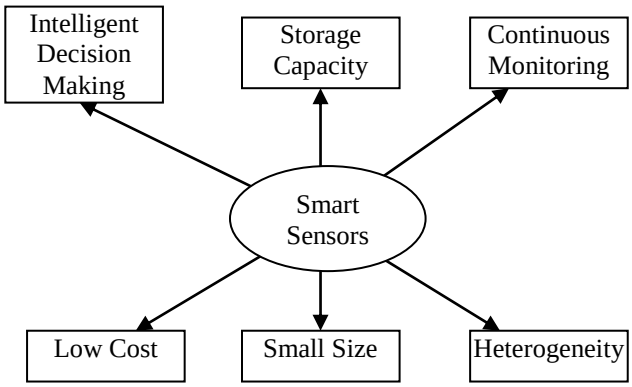

Figure 1 : Capabilities of Smart Sensor

Smart Dust networks are more effective than the traditional network as it provides the low power communication over the network with effective utilization of memory and capable to take dynamic decisions. These constraints show that the network is capable to provide the effective data propagation and the routing. The main features of the sensor network, that make it significantly effective low power communication, are given as under.

(i) Size: As the sensor network is provides intelligent decision making and memory storage, it able to handle large network with thousands of nodes. It can also be established in a network with large physical area as the power consumption in multi-hop communication is also lesser than traditional networks.

(ii) Mobility: In most of the cases, the sensor nodes are placed at fixed location. But smart sensors can be used in applications where the node mobility is required such as underwater sensor network, vehicular network etc.

(iii) Information Transfer: Smart Sensors can be deployed in such harsh environment and unexpected situations where the node failure is common such as sensor node placement in battlefield. In such networks, sensor node provides the information saving and transfer, if the node life is expectedly lesser.

(iv) Improved Life Span: Even the sensor nodes are defined with limited energy specification and with each communication some energy loss occurs. Smart sensors are capable to improve the node life because of its storage capability, lesser power consumption capability.

(v) Dynamic Decision: Smart sensors are capable to take the dynamic decisions about the information transfer.

The major challenge for the smart sensor network is to provide the reliable communication along with lesser power consumption. The basic characteristics of reliable communications given as under :

A) Reliable Routing

End-to-End Communication: The foremost requirement of smart sensor network is to provide high throughput. The end to end packet delivery must be higher and the packet loss over the network should be minimum.

Lesser Conflict: If the network is performing the multi path communication, the confliction should be lesser. It means the path selection must be effective so that the node repetition as the intermediate nodes will be minimum.

Lesser Latency: A sensor network can have congested communication but in all cases, the latency over the communication should be lesser. If the communication is performed over the alternate path, even then the communication delay should be lesser.

In this paper, an improved routing scheme is suggested under the capabilities of the sensor network. In this section, a brief introduction to sensor network and smart sensor network is defined. The work also defined the properties of reliable

routing and reliable network. In section II, the work already done in the area of shortest path routing and alternate path routing is defined. In section III, the presented work methodology and routing scheme is explored. In section IV, the conclusion driven from the work is defined.

II. LITERATURE SURVEY

Lot of work is already done to optimize the routing in mobile and sensor network. Some of work done by the earlier authors to optimize the routing is described in this section. In year 2003, Chao Gui has defined an optimized routing approach for the self healed mobile network. Author defined the optimality under different communication metrics such as energy consumption, route length, number of intermediate nodes, energy awareness and the load analysis. Author defined a framework to provide the optimize route selection in mobile network. Author defined a subpath analysis based scheme under the node monitoring scheme to optimize the routing[1]. Another work on region based routing was defined by Hao Wen in year 2009. Author defined a region aware storage friendly approach for route generation. Author defined a history analysis approach so that the node tracking will be done effectively and a parametric analysis will be performed under the mobility model to provide effective routing in vehicular network[2]. A work on on-demand routing approach was proposed by Jiejun Kong in year 2003. Author defined the effective routing in hostile critical environment. Author focused on two main network problems called route anonymity and the back flow effecting destination effective routing so that the location privacy will be achieved. Author defined the routing in real scenarios[3].

To provide the secure routing in indoor environment, Kyu-Hwan Lee, presented an authentication specification routing scheme. Author defined the work to achieve the high performance and the secure transmission. The analytical work is also defined by the author to achieve the reliable communication over the network[4]. Another work to improve the routing performance in mobility sensitive mobile network by Athanasios Bamis in year 2006.Author defined the communication under the standard and effective properties of mobile network as well as provides the analysis at different speed mobile nodes. Author defined the key authentication to elect the reliable node for communication[5]. In year 2009, Khaleel Ur Rahman defined an integrated routing approach for mobile network. Author defined the bidirectional analysis in infrastructure based mobile network. Author defined a bridge oriented gateway selection to provide effective routing over the network[6]. S.Satish provides the route optimization using Ant Colony approach. Author defined the cache oriented analysis under the source initiated routing approach so that adaptive energy optimization will be achieved[7]

In year 2011, Giovanni Comarela has defined the robot routing in sensor network under the Ant Colony optimization. Author defined the inclusion of travelling salesman approach to provide the effective routing and also provide the improvement by using the heuristic search. Author defined the comparative analysis with different approaches [8]. Another work in same year was proposed by C. D'Souza to obtain the energy effectiveness by performing the effective node placement in sensor network. Author used the swarm optimize approach to reduce the energy consumption[9]. A route selection based routing protocol was suggested by Taesoo Jun in year 2007. Author presented the network deployment under the dependentcy analysis so that the effective supporting routing will be obtained under the performance analysis, cost analysis and the lesser delay[10]. In year 2012, Jing-Hui Zhong has defined ACO based routing approach to improve the network life and to increase the network communication. Author utilizes the network characteristics in an effective way and increase the network responsiveness[11]. To provide the attack preventive routing Mohsen Saffarian has defined an ACO based approach in year 2008. Author defined the work to mitigate the network threat and improves the network communication. Author defined the agent based approach to provide secure and reliable routing[12].

III. PROPOSED METHODOLOGY

A sensor area network is one of the most critical energy specific sensor network in which small amount of data is transmitted continuously to keep the updation about some critical information. Any associated network operation associated with sensor area network requires the effective consideration of memory and distance. There are number of existing routing approaches to reduce the network energy consumption so that effective path selection would be done. One of the phenomenon associated with routing in such network is the hop count. Each participating node to the communication path consumes some amount of energy either it is a transmission node, receiver node or the forwarder. If

the number of hops over the path will be reduced, the energy consumption over the route will also get reduced. This work is focused on same concept. In this work, multi-parametric approach is suggested to improve the network path in terms of energy. The parameters considered in this work are energy, distance and hop count. The work will generate the energy effective route so that reliable communication will be drawn over the network.

A) Methodology

In an adhoc network distance is the major factor respective to which routing algorithm. But in these presented work we have considered multiple parameters to identify the right communication path. The parameters included in this work are

(i) Distance
(ii) Energy
(iii) Maximum Coverage Range

Based on these all vectors the reliable and efficient communication path will be generated and that path will be taken as the main routing path on which the communication will be performed. As the algorithm begins, the source and the destination nodes are specified explicitly between which the communication path will be generated. Now it will send the request to the source node and the wait is performed for the reply. As the reply is obtained it signify the right communication can be taken place. Now to perform the effective communication between the source and the destination the effective parameters are required to identify for each neighbor node of current node.

Now to perform the effective communication we need to find the next effective neighbor over which the communication will be performed. In this work, the parametric analysis is performed on each node to identify the best neighbor. The parameters considered here are the distance, energy, delay analysis on each node. In the simple form, a minimum distance neighbor is considered as the effective next node. But in this work, the maximum distance node within the coverage range with maximum energy is considered as next effective node. Set this node as the best neighbor and the communication will be performed over that node. The process is repeated till the destination node is not arrived.

IV. RESULTS

The presented work is implemented in matlab environment. The proposed work is about to find the optimal solution of any broken link or data loss in a high speed Sensor network. The proposed work is about the generation of such an approach that will dynamically compensate the problem of link failure and provide the optimize solution without any data loss. The proposed system will give the benefit in terms of Efficiency and accuracy. The network is designed with some defined parameters given as

Parameter	Values
Number of Nodes	14
Area	500x500
Topology	Fixed
Initial Energy	1 J
Transmission Energy	50nJ
Receiving	50nJ
Forwarding Energy	10 nJ

The analysis result is shown in figure 2

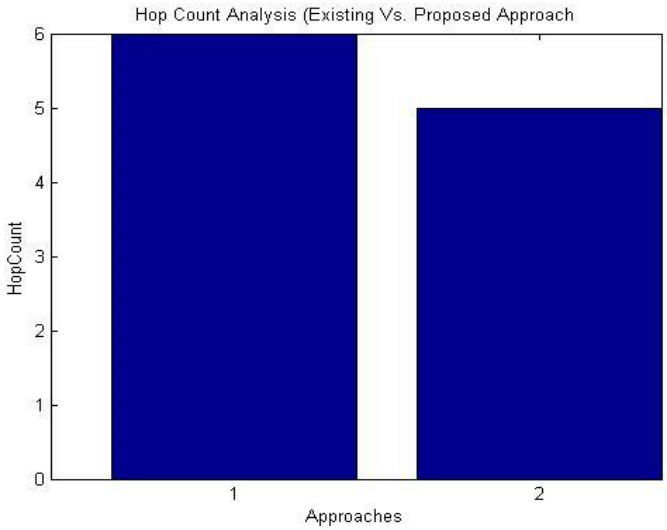

Figure 2 : Hop Count Analysis (Existing Vs. Proposed Approach)

Here figure 2 is showing the hop count analysis of existing and proposed approach. As shown in the figure, the proposed work has reduced the number of intermediate nodes. It will reduce the energy consumption and improve the network life

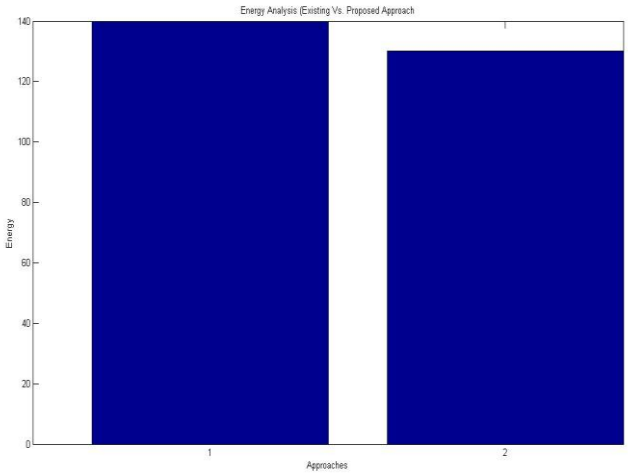

Figure 3 : Energy Consumption Analysis (Existing Vs. Proposed Approach)

Here figure 3 is showing the energy consumption analysis of existing and proposed approach. As shown in the figure, the proposed work has reduced the energy consumption over the network.

V. CONCLUSION

In this paper, an effective mechanism for routing in sensor network is defined. The proposed approach has reduced the number of intermediate nodes so that the network communication and network life is improved.

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