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Route Trace Reduction Based Leader Election Approach to Improve Communication in Mobile WSN

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Abstract: A wireless sensor network (WSN) consists of spatially distributed autonomous sensors to monitor physical or environmental conditions. When we work on a distributed sensor network then to control the communication over the network, some controller nodes are defined at various points over the network. These controller nodes are used to improve the effectiveness of the network by performing the routing as well as to identify the reliable communicating next node. This controller node is called the leader node that reduces the network communication and improves the network life. The election of the leader node is itself a challenging task and it affects the network reliability. In this paper, a multi parametric route tracing based approach is suggested to define a leader node in such a way so that the network life can be improved.

Keywords: WSN, leader node, effective route, network life.

I. INTRODUCTION

The emerging field of wireless sensor networks combines together the features like sensing, computation of sensed data and communication into a single tiny device. Wireless networks are broadly divided into infrastructure and infrastructure less network where infrastructured network consists of wireless node with a network backbone and infrastructure less network consist of independent, distributed, low-power, dynamic topology and task-oriented wireless node.

Cellular wireless network falls under the category of infrastructure network whereas ad-hoc and wireless sensor network (WSN) are the part of infrastructure fewer networks. In ad hoc mode, the wireless devices integrated and communicated to each other by making an on-support dynamic wireless link[1]. A node in a wireless sensor network is very small in size and has some fixed amount of energy that in some cases cannot be replenished easily. So the life of a node relies on the life of the battery. In a hop by hop sensor network every node plays two roles, one is of data originator and other one is of data router. So if some of the nodes stop working then there can be changes in the structure of the network and there may arise a need might be a need of re-routing the packets and the network may need to organize itself again needing more power. Saving of power and its supervision are taken into consideration in this paper.Congestion control is an important issue that should be considered in transport protocols. Congestion is an essential problem in wireless sensor networks. Congestion in WSNs can lead to packet losses and increased transmission latency has a direct impact on energy efficiency and application QoS, and therefore must be efficiently controlled. The general task of a WSN is to perceive, collect and process information in a cooperative way in the region covered by sensor nodes, and to deliver the information to the destination node via certain communication paths. In a sensor node, as data traffic becomes heavier, packets might be put into node's buffer and wait for access to medium that is shared by a number of communication entities. In such situations, congestion happens in the network. If network congestion becomes severe, certain packets will be dropped due to limited buffer size. This will potentially result in loss of packet, decrease in throughput, and waste of energy. For these reasons, congestion control is a critical challenge facing WSNs.

The paper is organized as follows. Section II of this paper includes the related work done by various authors in this field. Section III includes the proposed technique in detail. Experiment design for the simulation is present in section IV. The work is concluded in section V.

II. RELATED WORK

Kamal Kumar Sharma in [2] suggested, to detect congestion, each node calculates its node rank based on the parameters buffer Size, hop count, channel busy ratio and MAC overhead. When the node rank crosses a threshold value T, the sensor node will set a congestion bit in every packet it forwards. If the congestion bit is set, the downstream node calculates the Rate Adjustment Feedback based on the rank and propagates this value upstream towards the source nodes. Basaran, Kyoung-Don Kang in [3] defined “Hop-by-Hop congestion control technique and load balancing in Wireless Sensor Networks”, used the Effective Queue Length (EQL). EQL is used to determine whether the congestion is occurred or not. The technique called CONSEQ (CONtrol of Sensor Queues) is used to control the congestion. Chieh-Yih Wan, Shane B. Eisenman,Andrew T. Campbell In [4], CODA, propose it as an energy efficient congestion control scheme for sensor networks. CODA (COngestion Detection and Avoidance) comprises three mechanisms: (i) receiver-based congestion detection; (ii) open-loop hop-by-hop backpressure; and (iii) closed-loop multi-source regulation. CODA detects congestion based on queue length as well as wireless channel load at intermediate nodes. [5] proposes a Prioritized Heterogeneous Traffic-oriented Congestion Control Protocol (PHTCCP) to control congestion. It uses packet service ratio to detect congestion. Packet service ratio is defined as the ratio of average packet service rate and packet scheduling rate in each sensor node. Hull B., Jamieson K., and Balakrishnan H. assumed that congestion is detected by measuring the queue length. The congestion is controlled by using three techniques i) hop-by-hop flow control , ii) source rate limiting, and iii) prioritized MAC. Even in high offered load it claims to achieve good throughput and fairness. [7]. Ee C. and Bajcsy R. in hop-by-hop congestion control technique, Congestion Control and Fairness (CCF), which uses packet service time to infer the available service rate and therefore detects congestion in each intermediate sensor node. CCF ensures simple fairness. However, it lacks efficient utilization of the available link capacity when some nodes do not have any traffic to send or nodes remaining in sleep mode or the nodes whose flows do not pass through the congested area. [8]. In [9], Hop-by-Hop Rate control Technique (HRCT) is implemented to control congestion. The sensor/transmission rate of the node is adjusted based on depth of congestion and overall sensor priority.

III. ROUTE TRACE REDUCTION BASED LEADER ELECTION APPROACH

A sensor network is defined with vast number of tiny sensor that performs the short distance communication. Because of this multipath communication in smaller network, the attack over the network increases. The attack in such network results the packet drop and energy loss. In this section a leader node selection approach is defined to provide the effective communication in sensor network. The approach identifies the effective communication path in sensor network to provide the energy effective communication. The leader node selection is here defined on the periodic history communication analysis in the specific set of intervals. This leader selection is performed on the neighboring node analysis that can be set as the leader node. The parameters for the leader selection considered are energy, distance, communication rate and communication delay. Once these parameters are evaluated for the neighboring nodes, the election of the best neighbor is done based on these parameters. The leader node is defined for the specific period and loss analysis. After the defined period of the loss limit, the re-election is called. During the lifetime of the leader, the node also stores the tracking of its neighboring nodes so that the effective substitution decision can be taken. The leader node also track the bad node based on communication analysis so that the packet drop rate can be decreased. The leader nodes also hold the effective route path to improve the communication efficiency.

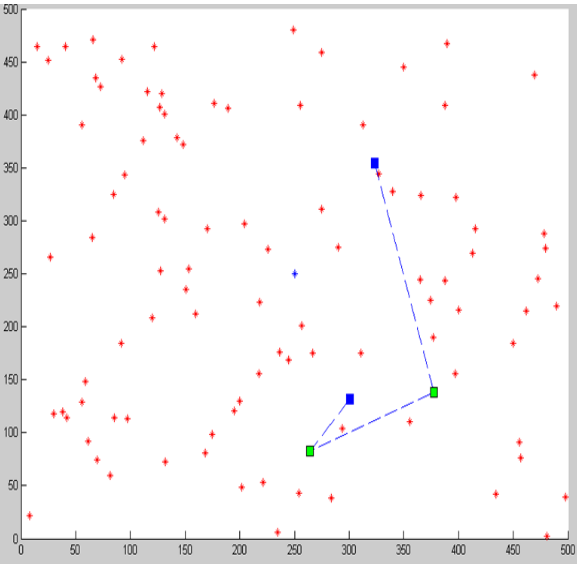

Fig 1 Network Architecture

Figure 1 is showing the network architecture. Here the red nodes are the normal nodes and the blue nodes are the end points of the path. Green nodes represent the generated path. The nodes are distributed over the network at random position in area 800x800.The proposed approach assigns the priorities to the communication over the network based on distance vector. It means the higher the distance between nodes, higher the priority will be. The proposed approach is about the generation of such an approach that solves the congestion problem at the early stage but the algorithmis implemented dynamically by observing the communication over the network.

ALGORITHM

The proposed approach is based on following algorithm.

```
Algorithm(Nodes,N)

/*Define a network with N nodes with
energy constraint specification*/
{
1.          Include the fault over the network
on random nodes.
2.          For i=1 to MaxIterations
            {
3.          Define Source and Destination Node
4.          Perform Communication bteween
source and destination under path tracking
5.          For j=1 to Length(PathNodes)
            [Aanlyze the path nodes for failure
nodes]
            {
6.          if (FailureNode(PathNodes(j))
            {
10.         For j=1 to NumberofNodes
            [Process all network Nodes]
            {
9.          For i=1 to MaxIterations
            [Process the communicaiton over the
network under leader node specification]
7.          BadNodeList.Add(PathNodes(j)
            [Include the fault node in bad node
list]
8.          Perform Re-routing by bad node
exclusion
            }}
11.  if (Nodes(i).Energy >EnergyThreshold)
[Leader node must have a specific energy]
            {
12.         if
(Nodes(i).ConnectivityCont>Threshold)
[A Leader Node must be connected with
multiple nodes in sensing range]
            {
13.         Nodes(i).Type="LeaderNode"
            }}
14.         for j=1 to NoofNodes
            [All nodes that want to
communicate]
            {
15.         Leader=FindLeader(Nodes(j))
            [Identify the Nearest Leader]
16.GeneratePath(Nodes(j).Leader,BadNodes)
            [Leader will Generate the Path over
the network with bad node exclusion]
17.         Perform Node communication
            }
18.         Track the communication and obtain
analysis parameters.
}
```

IV. RESULTS

To calculate the impact of proposed approach, simulation is done using MATLAB. The proposed approach is about the generation of such an approach that solves the congestion problem at the early stage but the work can be implemented dynamically by observing the communication over the network. The proposed system gives the benefit in terms of Efficiency and accuracy. The network is designed with some defined parameters given as in table 1 shown below:

Parameter	Value
Number of Nodes	75
Topography Dimension	800 m x 800 m
Traffic Type	CBR
Topology	Clustered network
Packet Size	4000 bytes

Table 1.Common parameters

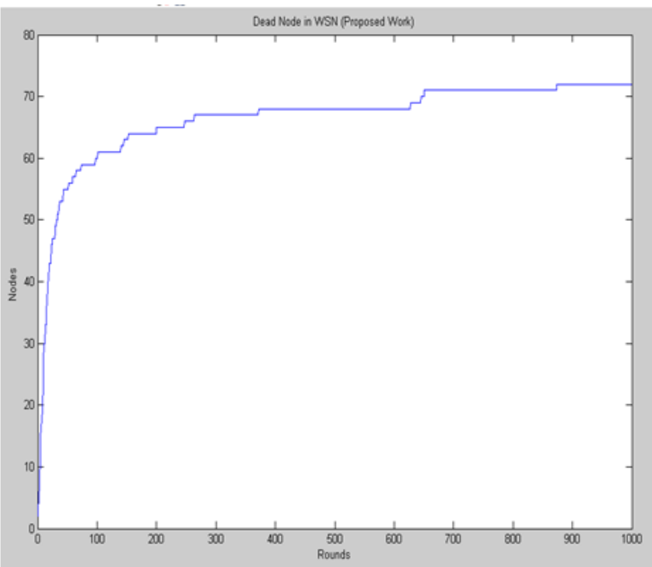

Fig2. Dead nodes in WSN

Here figure 2 is showing the dead node analysis over the network in case of proposed approach. Here, X axis represents the number of rounds and Y axis shows the number of dead nodes. But as the communication is performed, the node start losing the energy. Upto 1000 rounds about 72 nodes are dead. As we can see, the nodes are not losing energy very fast.

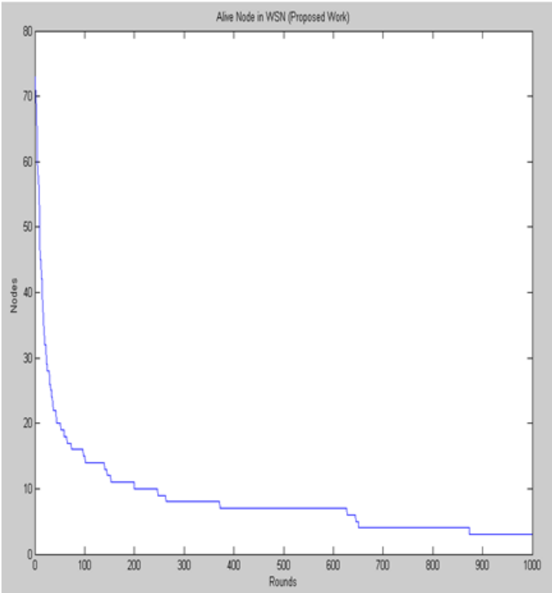

Fig 3 Alive nodes in WSN

Here figure 3 is showing the alive node analysis over the network. Here, X axis represents the number of rounds and Y axis shows the number of alive nodes. As we can see, initially all nodes are alive over the network. But as the communication is performed, the node start loosing the energy.Upto 1000 rounds only 5 nodes are alive.

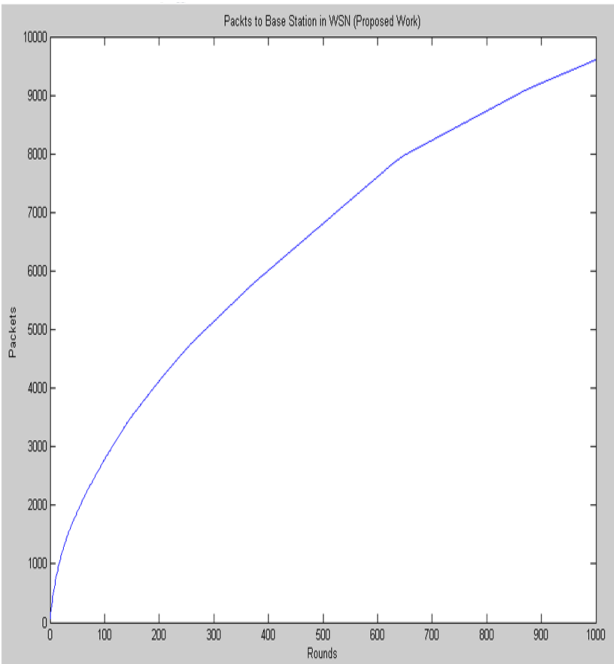

Fig 4. Network communication

Here figure 4 is showing the overall network communication over the network. This communication is performed by the nodes to cluster head and from cluster head to base station. Here, X axis represents the number of rounds and Y axis shows the number of packets transmitted. As we can see, at the earlier stage when all nodes are alive, the network communication is increased very fast but as the nodes start losing the energy, some nodes get dead.

V. CONCLUSION

As communication is performed over the network some amount of energy loss occurs. This energy criticality becomes worst when the communication is performed in attack network. Attack in a network can occur because of heavy network requirement or because of some communication attack. In this paper, a leader election scheme is defined under parametric analysis. The presented approach performs the leader election periodically and analyzes the next leader so that the effectiveness of leader election is improved. The leader identifies the effective communication path over the network so that the network is improved. The leader node avoids communication on a lossy node as a result of which reliability of the network is improved.

VI. REFERENCES

[1] C. Chong, S. Kumar and B. Hamilton, "Sensor networks: Evolution, opportunities and challenges," Proceedings of the IEEE, 9(18), pp.247-256, 2003

[2] Kamal Kumar Sharma, Dr. Harbhajan Singh and Dr. R.B Patel "A Hop by Hop Congestion Control Protocol to Mitigate Traffic Contention in Wireless Sensor Networks" , in Proceedings of International Journal of Computer Theory and Engineering, December, 2010.

[3] Basaran, kyoung-Don Kang, Mehmet H. Suzer "Hop-by-Hop Congestion Control and Load Balancing in Wireless Sensor Networks", in proceedings of 2010 IEEE 35th conference on Local Computer Networks, 2010.

[4] Chieh-Yih Wan, Shane B. Eisenman, Andrew T. Campbell," Energy-Efficient Congestion Detection and Avoidance in Sensor Networks ", in proceedings of ACM Transactions on Sensor Networks2011.

[5] Muhammad Monowar, ObaidurRahman, Al-Sakib Khan Pathan, and ChoongSeon Hong "Prioritized Heterogeneous Traffic-Oriented Congestion Control Protocol for WSNs" in proceedings of The International Arab Journal of Information Technology, 2012.

[6] RekhaChakravarthi, C.Gomathy "IPD: Intelligent Packet Dropping Algorithm for Congestion Control in Wireless Sensor Network", in Proceedings of IEEE, 2010.

[7] Hull B., Jamieson K., and Balakrishnan H., "Mitigating Congestion in Wireless Sensor Networks," in Proceedings of the 2nd International Conference on Embedded Networked Association for Computing Machinery Sensor Systems, USA, , 2004.

[8] Ee C. and Bajcsy R., "Congestion Control and Fairness for Many-to-One Routing in Sensor Networks," in Proceedings of the 2nd International Conference on Embedded Networked Association for Computing Machinery Sensor Systems, USA.

[9] R.Then Malar "Congestion Control in Wireless Sensor Networks Based Multi-Path Routing in Priority Rate Adjustment Technique ", in proceedings of International Journal of Advanced Engineering & Applications, 2010.

[10] RekhaChakravarthi, C. Gomathy "Hop-by-Hop Rate Control Technique for Congestion Due to Concurrent Transmission in Wireless Sensor Network" in proceedings of World of Computer Science and Information Technology Journal (WCSIT), 2011.