Path Quality Measurement in Wireless Sensor Networks using Disjoint Path Vector metric

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Abstract— In wireless sensor networks path quality is very important to achieve high data delivery rate during the packet forwarding among nodes. Disjoint Path Vector (DPV) algorithm a distributed fault tolerance control topology is efficiently used to select good paths between source and destination. This can be achieved by collecting the required information among the neighbor nodes and update only wanted neighbors in the network. Hence node quality is increased and the unwanted neighbors are removed. By using this number of links used in the network is reduced and the redundancy for the routing is reduced.
Key words: Path Quality, Data Delivery, Node Quality

I. INTRODUCTION

Wireless sensor networks mainly consist of large number of autonomous sensor nodes that can be sensed with each other by using their sensing capabilities. Due to its mobility nature, it can be deployed in numerous areas for various applications like area monitoring, data logging, military surveillance etc and mainly designed for data collection. Many protocols are proposed for data collection to achieve high data delivery. Several path estimation metrics are designed to select efficient paths for packet forwarding. All the nodes in wireless sensor networks are not necessary to be active during the node communication and sensing. Hence to reduce the energy consumption nodes which are necessary for communication only to be active at that time, remaining nodes are move to sleeping mode. Suppose if any active node become fault during their communication the network becomes unreliable. So it is important to find the faulty nodes and increase the network reliabity.

Existing path estimation metrics such as ETX, ETF are analyzed the path quality among pair of neighbor nodes. Quality of Forwarding is one of the metric used to measure the path quality among both nodes and links. But during the packet forwarding some of the packets are dropped and it will give link unreliability. During the packet forwarding, if any packets does not reach the destinations it will retransmitted to the source and again it will sent to correct destination, So the number of retransmission for the failure packet is highly increased. Hence it will increase the channel contention among networks and it will affect the throughput severely. Hence a new metric is proposed to give high throughput and end to end delivery ratio.

Nowadays, during the development of wireless sensor networks it has many challenges in energy efficiency as well as capacity of the network. For that many topology control algorithms are proposed to increase the network capacity and reduce the energy consumption by the sensor node. By using disjoint path vector algorithm, the link and node quality is increased and also enhance the lifetime of wireless sensor networks. In this Route Collection technique is used to collect the necessary routes in which the packets can be forwarded among the selective path. After collecting the required path, the nodes which are required as wanted neighbors are updated. Hence in this metric, route discovery and node updating can be done and the failure nodes can be detected easily. This topology control algorithm reduce the network redundancy by means of reducing the number of links in the network. Thus the topology algorithm is more essential to predict the node failures in the network.

II. RELATED WORKS

Jiliang wang et al., [1] proposed QoF an efficient path quality metric to measure both node and link quality. It is used to measure both transmission cost and delivery ratio. By using this metric the path quality inside the node is analyzed easily. The data collection is made possible by using Collection Tree Protocol (CTP). It maintains ETX value for its neighbor nodes and which node has minimum value is consider for next hop. CTP consists of link estimator, routing engine and forwarding engine. The link estimator is used to estimate the link quality of the nodes and provide efficient path quality.

Douglas S. J. De Couto et al [3] proposed Expected transmission count (ETX) for throughput maximization and minimize the number of transmission required for the packets are successfully sent to their destination. Several metrics have been designed to analyze the node capability and link stability. ETX metric is used to measure the number of data transmissions that occur during the packet forwarding. It can be measured by forward and reverse delivery ratio of the link. But it may be increase the energy consumption of the node for each retransmission occurs in network.

Chandresh Parekh et al., [2] proposed an algorithm ELR to improve the lifetime of the network by considering the link quality and residual energy of the node. It helps to increase the reliability of the system. In this algorithm node which has highest least energy with minimum ETX, should be considered as the parent node. Thus the energy consumption in each node is measured.

Yonh oh Lee et al., [6] proposed techniques for reducing the length of backup without increasing the network overhead. For multi-path routing to recover the failures, the primary and the recovery path is made disjoint. In the disjoint path techniques, the packets to be forwarded to different sub tree by means of routing protocol. By using this techniques, the disjoint path use the same infrastructure for proactive failure recovery.

III. PROPOSED METHOD

Disjoint path vector algorithm determines the efficient path to forward the data packets in wireless sensor networks. If the nodes are disjoint, the routes between two given nodes are called diversified. This type of routes is more reliable and considers minimum total cost during communication.

Hence this algorithm describes the k node disjoint path with minimum length. The following fig 1 depicts the algorithm procedure.

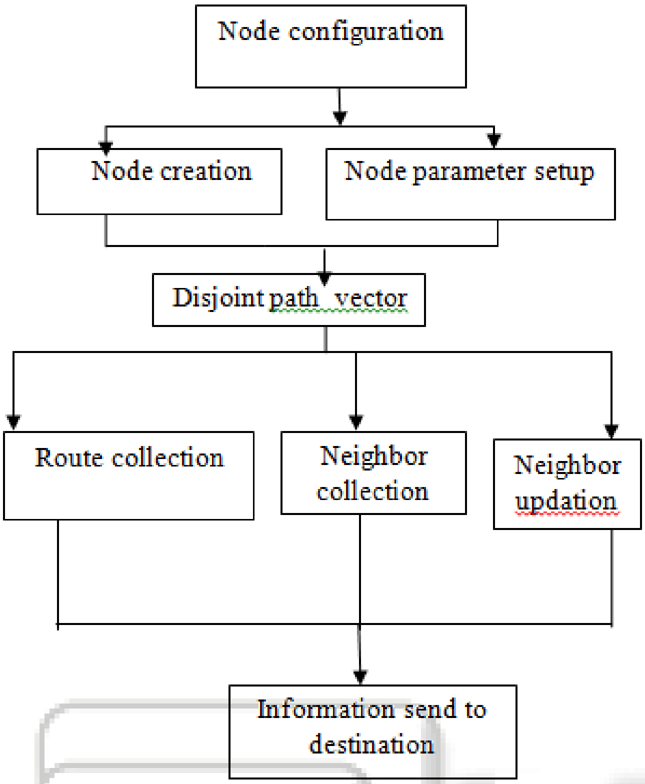

Fig. 1: Disjoint Path Vector Metric

A. Node Sensing:

The needed number of nodes is generated by using the node command in NS2. The nodes are disseminating in a wireless environment. The random motion is set as true. So, the nodes are moving in a random direction. Each node is considered as an autonomous node. The nodes are configured as to process in WSN environment. The node configuration is done by using node- config command. We have to specify the Channel used by the node, Radio propagation model, Link layer type, Physical layer type, Type of interface queue and the protocol used to route the packets dynamically.

B. Route Collection:

It is used for collecting the path information of sensor nodes between source to destination. Sensor node updates its local path information table transmits a Path Info message containing the updated path information table. Note that if a Path Info message does not cause an update in the receiver node's disjoint paths list, the previous path list is used.

During the route collection phase, if the route is find Route reply message is send to the destination. Otherwise the route reply will select the route from path information table. Thus the required packets are sent without any failure in their routing path. There is any path failure during the packet forwarding, disjoint path is used. The disjoint path can be identified by sending the information to all its neighbor node using the path identifier.

C. Neighbor Collection:

To guarantee that all nodes in a selected disjoint path are labeled as required neighbors, we need to notify all the nodes on that path. To achieve this, each node sends a Notify message for each of its selected disjoint paths by using their position and ids. A Notify message is forwarded along the disjoint path for which it was created. Each neighboring node in the disjoint path marks each other as required neighbors. In order to find the faulty nodes in the network, dynamically routing method is used between the source node and the destination node. The failure node can be identified by using the Random number generation. Each node finds its all neighbors by using randomized neighbor node collection with randomly chosen times.

D. Neighbor Updation:

It is used for updating only the wanted neighbor from path and unwanted neighbor to be eliminated. Each node maintains information of its parent node. If the parent node failed under any circumstances, the node under the parent ask information from its neighbor node and make their connection.

All neighbors are defined to be required because it is not known which neighbors can be removed. Such a node cannot decide which neighbors are required and which are not, because it has not sufficient local information. In that case all neighbors are kept since all can potentially be a part of a disjoint path.

IV. CONCLUSION

This paper provides an efficient path metric to improve the lifetime of the wireless sensor networks and also achieve energy efficient data transmission. The Disjoint Path Vector metric used to forwards the data packets to the correct destination with high packet delivery ratio. By using this metric the neighbor nodes can also be measured and the faulty nodes are analyzed effectively. In wireless sensor networks the cooperation between the nodes are more important for efficient data transmission. So if any nodes in the path in which the packets are forwarded is faulty, the network efficiency is decreased. Hence this algorithm is very much essential to identify the fault nodes among the neighbors and increase the network lifetime.

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REFERENCES

[1] J. Wang, Y. Liu, Z. Li,W. Dong, and Y. He. "QoF: towards comprehensive path quality measurement in wireless sensor" IEEE Trans distributed systems VOL. 25, NO. 4, April 2014

[2] Chandresh Parekh ,Dhaval Patel and Bijal Chawla, "Energy Aware and Link Quality Based Routing in Wireless Sensor Networks under TinyOS-2.x,"

International Journal of Modern Engineering Research,Vol.3, Issue.3, May-June. 2013 pp-1357-1365.
[3] D. Couto, D. Aguayo, J. Bicket, and R. Morris, “A High-Throughput Path Metric for Multi-Hop Wireless Routing,”Proc. ACM MobiCom, 2003.
[4] A. Cerpa, J. Wong, M. Potkonjak, and D. Estrin, “Temporal Propertiesof Low Power Wireless Links: Modeling and Implications on Multi-Hop Routing,” Proc. ACM MobiHoc, 2005.
[5] K. Kim and K. Shin, “On Accurate Measurement of Link Quality in Multi-Hop Wireless Mesh Networks,” Proc. ACM MobiCom,2006.
[6] Yong Oh Lee, A. L. Narasimha reddy,”Constructing disjoint paths for failure recovery and multipath routing,” Computer Networks 00 (2011) 1–12
[7] Sumathy S1, Dr.R Saravanan, “ETX Metric for Extremely Opportunistic Routing to improve the performance of Hybrid Wireless Networks.” International Journal of Ad hoc, Sensor & Ubiquitous Computing (IJASUC) Vol.2, No.4, December 2011
[8] J. Wang, W. Dong, Z. Cao, and Y. Liu. On the delay performance analysis in a large-scale wireless sensor network. In *IEEE RTSS, 2012.*
[9] S. Lin, G. Zhou, K. Whitehouse, Y. Wu, J. Stankovic, and T. He, “Towards Stable Network Performance in Wireless Sensor Networks,” Proc. IEEE 30th Real-Time Systems Symp. (RTSS), 2009.
[10] H. Zhang, L. Sang, and A. Arora, “Comparison of Data-DrivenLink Estimation Methods in Low-Power Wireless Networks,”IEEE Trans. Mobile Computing, vol. 9, no. 11, pp. 1634-1648, Nov.2010.