AMALGAMATIVE MULTIPATH ROUTING IN WIRELESS SENSOR NETWORK

Abdullah S. Alotaibi¹, Sivaram Rajeyyagari²

¹Computer Science Department, Shaqra University, Shaqra, Kingdom of Saudi Arabia.
²Deanship of Information Technology and E-learning, Shaqra University, Shaqra, Kingdom of Saudi Arabia.

Corresponding Author: Abdullah S. Alotaibi
E-mail: a.shawan@su.edu.sa

https://doi.org/10.26782/jmcms.2019.12.00021

Abstract

Routing is the most widely seen in many wireless sensor network (WSN) applications. Some networks work routinely on single path and this is limited. Many issues are identified in routing in WSN such as traffic, malicious nodes, etc. In this paper, the new enhanced threshold-based policy (BP-T) and a heuristic policy, which seriously controls traffic bifurcations at overlay focused. This will reduce the traffic and find the optimal with multiple routing can be identified. Results show the performance of the proposed system.

Keywords: Wireless sensor network, routing, BPT, OBP.

I. Introduction

Optimal Routing Design gives the gadgets and procedures, learned through significant lots of contribution with network plan and association, to make a broad scale or versatile IP routed orchestrate. Dynamic backpressure is known to be an optimal routing policy [III, VII] Backpressure routing is a count for continuously controlling traffic over a multi-hop network out by using stop up edges anyway. BP routing protocol is the tree-based in WSN which are having a greater number of attack chances. Some of the attacks are if the compromised node takes data packets from the other nodes this may cause the DOS attacks by losing all the data packets at every node and transfer the data selectively [I, V]. From figure 1, it is explained that the red colour nodes denote the normal nodes and white nodes are called as malicious nodes. The routing in this network passes from the red nodes that calculate the routing based on the node behaviour and distance of every node and transfer the data from source to destination. The ABP routing is the dynamic routing that identifies the misbehaviour nodes that presents the integration techniques.
II. Literature Survey

In this section, various routing algorithms are discussed according to the advantages and dis-advantages. The routing algorithm is the set of instructions that perform operations to reduce the traffic and improve the performance between the nodes [II]. When the packet starts transferring from source to destination multiple routes are available for the nodes for efficient transfer. The routing algorithm helps the nodes to transfer the data from source to destination. Finding the best path from the multiple paths is also the task for the nodes. In WSN, flooding is the most important method for packet transfer. When the node starts receiving the packets, the routers send the packets continuously this will create more loading to the nodes because of the duplicates. Various schemes and techniques are introduced in WSN and also the WSN. With the security techniques data privacy, integrity, access control, authentication, and non-repudiation. In WSN various types of nodes are available such as compromise nodes, malicious nodes, selfish nodes and attacker nodes, etc. Various soft security-based schemes are addressed various challenges in many applications. All the attacks in the network are detected by monitoring the behaviour of the nodes such as anomalies to get better results. With this technique, all the bad neighbours easily find out and another routing which can achieve genuine communication in the network with less usage of resources. Shortest path is one of the important tasks in WSN routing. Many algorithms work on the shortest path [IV, VI, IX]. Finding the shortest path becomes more vital in WSN. Many Algorithms are showing their performance.

Common shortest path algorithms :
- Dijkstra's algorithm
- Bellman Ford algorithm
- Floyd Warshall algorithm

Open Shortest Path First (OSPF) :
OSPF is one of the shortest path algorithms that will reduce traffic and improves the packet transfer rate. But due to lack of consistency, over time becomes more issue for this algorithm and also this will not work under various types of networks.

Fig. 1 Nodes in the Network.

Copyright reserved © J. Mech. Cont.& Math. Sci.
Abdullah S. Alotaibi et al

317
Drawbacks:
- More time for data transfer.
- Difficult for dynamic path finding.
- Single path routing.
- Data lose in routing.

III. New Enhanced Threshold-based policy (ABP-T) and a heuristic policy

This algorithm finds the optimal and multiple routing between the nodes. BP-T is the most widely used to controls the traffic between the nodes and maintains the consistency between the nodes. With the heuristic policies the multiple routing is done within the nodes. Figure: 1 show the nodes with network setup. In this network, the source and destination nodes are having the movement and data transfer between the nodes. Four dynamic paths are identified by the proposed policies. For every path the time is parameter to transfer the data based on the BP-T technique.
Fig. 3 ABP Architecture.

Fig. 4 Node setup in Network.
Fig. 5 Dynamic paths.

Advantages:
- Dynamic paths.
- Low time for path finding.
- Multiple paths.
- No data loss.

Table 1. Shows the Time taken for path finding.

| Paths   | Time (Sec) OSPF | Time (Sec) ABP-T |
|---------|-----------------|------------------|
| Path-1  | 7.67            | 4.76             |
| Path-2  | 8.45            | 3.54             |
| Path-3  | 9.34            | 2.45             |
| Path-4  | 6.56            | 3.65             |

Fig. 6 Performance of OSPF and ABPT.
IV. Conclusion

In this paper, the new algorithm finds the optimal and multiple routing between the nodes. BP-T is the most widely used to controls the traffic between the nodes and maintains the consistency between the nodes. This model works in many heterogeneous networks. Various parameters such as time and multiple paths are identified with better results with the proposed system.

References

I. D. Xu, et.al, “Link-state routing with hop-by-hop forwarding can achieve optimal traffic engineering” IEEE/ACM Trans. Netw., vol. 19, no. 6, pp. 1717–1730, Dec. 2011.

II. J. Han, et.al, “Topology aware overlay networks,” in Proc. IEEE INFOCOM, Mar. 2005, pp. 25542565.

III. K. Kondaveti, T. K. Latha and Md. Amanatulla, "Data Integrity and Delay Differentiated Services with Dynamic Routing in Wireless Sensor Networks", IJDCST @ Jan,-2017,Issue-V-5,1,SW-12.

IV. L. Bui, et.al, “Novel architectures and algorithms for delay reduction in backpressure scheduling and routing”, in Proc. IEEE INFOCOM, Apr. 2009, pp. 2936–2940.

V. L. L. Peterson et.al "Computer Networks: A Systems Approach", 4th ed. San Francisco, CA, USA: Morgan Kaufmann, 2007.

VI. M. J. Neely, et.al, “Dynamic power allocation and routing for time-varying wireless networks” IEEE J. Sel. Areas Commun., vol. 23, no. 1, pp. 89–103, Jan. 2005.

VII. Rai, C.-P, et.al “Loop-free backpressure routing using link-reversal algorithms”, IEEE/ACM Trans. Net., vol. 25, no. 5, pp. 2988–3002, Oct. 2017.

VIII. S. A. Khan et.al, “Performance Analysis of a ZigBee Beacon Enable Cluster Tree Network”, Proc. Int l Conf. Electrical Eng. (ICEE), Apr.

IX. W. Khan, L, et.al, “Autonomous routing algorithms for networks with widespread failures” in Proc. IEEE MILCOM, Oct. 2009, pp. 1–6.

X. Yu-Kai Huang, et.al, "Distributed Throughput Optimization for ZigBee Cluster-Tree Network", IEEE Trans. Paral. Distr. Syst., vol. 23, no. 3, pp. 513-520, Mar. 2012.