AN EFFICIENT LWSP TECHNIQUE IN WSN WITH SHORTEST PATH ROUTING FOR LESS LATENCY IN DATA TRANSMISSION

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ABSTRACT

Wireless network is an established connection for data transformation from one node to another node and the biggest issue in the data transformation is congestion and latency which destroys the transmitting function. In wireless sensor networks (WSNs), Shortest path routing can find multiple paths from source node to destination node for achieving high responsibility and high energy-efficiency. However, most of the existing Shortest path routing protocols in the literature construct multiple paths with long latency and high overhead and it is a common issue. In this paper, a fiction Shortest path routing protocol in WSNs is proposed named LWSP [Shortest path without Latency], which can discover shortest paths with short latency and low command processing overhead time. Performance analyses and simulation results shows that our proposed protocol has much better performance than the existing ones in terms of both latency and command processing overhead time.

Key words: Shortest path routing, latency, fiction protocol, overhead time.

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1. INTRODUCTION

WSNs consist of a large number of tiny low-power [1] devices capable of performing sensing and communication tasks. In WSNs, wireless devices are usually called nodes, which spontaneously form a network without the need of any infrastructure so that a multihop wireless network is constructed. The main task of a WSN is to sense, collect, [1] process and transmit data including physical parameters and events to a central base station where the collected information can be used for various purposes.

The key task of a node in a network is to direct the data from source to the base-station via intermediate nodes and further to outer world via gateway, but the resource limitations such as unreliable communication links, limited battery life restrict their applications [2,3,4].

Outlining suitable directing calculations for different applications, fulfilling the diverse system parameters and execution requests are careful taken into consideration as critical issues in wireless sensor communication and networking. In these circumstances numerous routing schemes have been suggested for various applications to enhance the performance demands through the system layer of the WSNs protocol stack [2,6]. However, majority of WSNs depend on single-way directing of the information. Use of single path routing protocols in WSNs consumes more power and they are prone to path failure, so delivery of the data to destination is not guaranteed in single path routing. These problems can be overcome up to some extent in multipath routing scheme [2,5].

Wireless Ad-hoc Networks (MANETs) [7,10] are characterized by the lack of infrastructure and frequent topological changes. On-demand routing protocols have been widely studied because they consume less bandwidth than their pro-active counterparts. Single-path, on-demand routing protocols [8,10][9,10] rely on a uni-path route for each data session. In the case of a failure of any active link between source and destination, the routing protocol must invoke a route discovery process and, in so doing, additional delay is incurred and overhead increase.

2. LITERATURE SURVEY

Ad Hoc Network is the best solution for the dynamic environment where wireless network cannot be implemented. An Ad Hoc Network is the one which is suitable for self defined network environment as they do not need any access point to communicate [12]. Unlike normal wireless network Ad Hoc Network needs the desired routing protocol for its data transmission. Mostly Ad Hoc Network follows multi-hop transmission [12]. This paper concentrates on implementing Hybrid Wireless Network which is the combination of wireless network and Ad Hoc Network. The hybrid network is based on an ad-hoc network with an embedded wired infrastructure [13] [14]. The Hybrid Wireless Network follows both the wireless communication and node to node communication. The Hybrid Wireless Network has desired number of base stations with respect to the network size. The proposed infrastructure should adopt large infrastructure and also should provide scalability. So a defined routing algorithm should be constructed for the proposed architecture [15] [16].

The popularity of mobile network in recent days is increasing really higher. The network should not restrict the node movement over the network. There is a limitation in the number of mobile users they can simultaneously handle. Service providers are reduced their cost of service due to market competition which increased the number of service consumers [17] [18]. To suite the proposed architecture a better algorithm has to be implementing to provide better throughput. The throughput of the Hybrid Wireless Network can be calculated by obtaining transmission rate between the random send to the random receiver [19]. When the sender node sends data to the receiver node all other nodes in the network act as the route node to transmit data [20].

To continue our proposed work some survey is made on routing and environmental setup of most of the Ad Hoc Network. Many approaches have proved that node to node communication in Ad Hoc Networking gives better throughput. But in the same way the properties of the Ad Hoc Network should not be altered in Hybrid Wireless Network [19]. Some papers proved that the possibility of implementing Ad Hoc Network in wireless network.

This paper also proves that the Ad Hoc Network is also mobility resilient network. But some problems should be faced while using Ad Hoc Network it is prone to energy loss so a better algorithm has to be implemented to manage energy efficiency. A new distributed routing protocol for mobile, multi-hop, wireless networks can be implemented. This algorithm concentrates on diffusion of data via nodes in link reversal manner to reduce data loss. The protocol is proved to be suitable for large network environment. To overcome link failure this algorithm uses the single pass manner. The protocol should be stable, adaptive to any network environment. They refer to the protocol as the Temporally-Ordered Routing Algorithm (TORA) [19].

The purpose of this paper is to analyze the routing algorithms that how support full with wireless network. The comparison is done by varying the number of nodes periodically in the network. A new network environment with nodes under particular base station is with desired space can be provided where the nodes will follow the Ad Hoc manner. Some research shows that bottleneck problems may occur at Multi-Hop Transmission. Results obtained on actual throughput of data confirm our findings in Ad Hoc network the node act as router based on its routing situation. In such environment the node may not be able to transmit data or may fail due to power loss. This paper presents a protocol for routing in ad hoc networks that uses Ad Hoc Nodes to include in the routing table [20].

3. METHODOLOGY

The Proposed technique gradually deals with three main functions,

- Dual Conquer tree construction.
- Data transmission
- Routing Analysis

Dual Conquer Tree Construction

This construction has two phases: query tree which is established at sink node and finding tree which is established at source node. When the development of two trees starts, sink node communicates question messages and source node communicates look messages. When one hub gets a question message, it enters the inquiry tree, when one node gets a hunt message, it enters the inquiry tree.

The development of two trees closes in the meantime. The time of development is pre assigned, which decides the measure of two trees, i.e. the quantity of hubs in two trees. After two trees have been built, there are a few hubs which have a place with both of two trees, called shared hubs. The more extended the development time of two trees is, the more the common nodes are.

Data Transmission

When source node has collected sensing data, it sends the data along multiple paths discovered in the previous phase to sink node.

Routing Analysis

In this function, various paths from source node to sink node will be introduced. The dual conquer trees are constructed in the first phase, for each middle node, only single path can be introduced from source node to this middle node then to sink node. One middle node can define single path. Since there are multiple middle nodes, multiple paths can be introduced.

3.1. Proposed Technique

During the time spent two fold directing trees development, query and search messages are transmitted by communicating from sink node and source node to outside. There is a expectation that the conveyance speed of question and search messages is equivalent, and that the conveyance speed of the messages in different ways is the equivalent.

In this way, question and search messages shape two circles whose focuses are sink node and source node individually. As time goes, the two circles are bigger and bigger. When they cross, the mutual nodes rise. The development time of two trees decides the span of the two circles, accordingly decides the number of shared nodes.

3.2. Latency of Proposed Technique

The latency of our proposed convention is made out of the time of twofold directing trees development and the season of course exposure. In the first place, the proposed technique analyses the previous, and after that it assess the entire dormancy through recreation.

The time of dual conquer trees construction is the time progress when the messages propagate from sink node and source node to the delimitation and is defined as M.

M can be divided into two parts: the extension time in the space, M_p , and the time during which the message settles at nodes, M_s . So,

It is given that,

$$M = M_p + M_s \quad (1)$$

At each node, the time taken by the message is divided into the receive time, t_p , and the send time, t_q . So,

$$M_s = (n-1)t_p + (n-1)t_q \quad (2)$$

From (2) it is clear that, The extension rate of question and unknown messages in the space is defined as y

$$M_p = x/y \quad (3)$$

Now by substituting the (2) and (3) values

$$M = [x/y + (1/2(n-1)t_p) + (1/2(n-1)t_q)] \quad (4)$$

$$M = [x/y + (1/2(n-1)(t_p + t_q))] \quad (5)$$

It can be seen that the latency of our proposed protocol is shorter than any other protocol used in wireless networks by securing the node as it is possible .

3.3. Shortest Path

LWSP [Shortest path Without Latency]ALGORITHM

PRELIMINARIES

N_i : List of nodes

SN_j : List of supporting nodes

PI: Supporting node for data transfer

P_k : List of process in processing Queue

$I, j, k \in N, j < i // N \leftarrow \text{Natural Number}$

// Assuming each node is having some load, Some of those supporting nodes may have load without knowing of its destination where it transfers the data by reference of the middle layer node//

$N_i \leftarrow \text{Load}, s_j \leftarrow \text{Load}$

//load defines some process in which the data transfer without latency that takes place in a initial node N on basis of its destiny//

Procedure: Main()

{

Suppose a node N_t is heavily loaded with load ξ

Where $0 < t < I, \epsilon P_k$

//Two situations are possible as in step II. ξ ----- defines the load that is the node is overloaded

If(Search_node)

// Search node will find and checkout whether a light weighted primary node is available, if primary node is available it will give index of available node//.

{

Available Node $\leftarrow K$

//Overload node is assigned to be as available node given by Search_node()//

Load(N)=Load(N)

}

Else

{

Call Search_S_node()

//find out a light weighted or minimum weighted supporting node with index as S for showing its unity and provides the cal to it for receiving the data from the neighbor as the data is valuable to it//

Available_S_node $\leftarrow K$

Load(N)=Load(N)- ξ

IN_S(Available_s_node, ξ)

Procedure :Search_node()

{

For each N_i except node initiating the search_

Node procedure

{

Check the node with minimum load

//Minimum load includes the number of processes as well as structure or configuration of node and node should be able to accept data from the neighbor node and shows the efficiency to the //

}

If Desired Node available finds shortest path

{

Return(index of available node) index

//defines the node property to identify the destination Node which has the shortest path//

Load N with shortest path without latency G

}

End

The proposed LSWP algorithm defines the shortest and the available path for reducing latency on data transfer by finding the shortest path and load the data into equal amount in every nodes.

4. RESULT AND DISCUSSIONS:

The efficiency of WSN is categorized in three main constraints, they are,

- Security.
- Data transmission Efficiency
- Less Latency

4.1. Security

The proposed model has the highest security compared with other techniques [LWSP] When a sender sends the any information to receive the intermediate cannot see that information but forward those data to the receiver in proper manner. In those condition the proposed technique divides the data into equal size and lode the data in a node and defines the shortest path and the receiver receives the data without latency Thus this security is more efficient to both the sender and receiver.

Graph 1 Security level of LWSP Technique

The Graph.1states the security level, generally in the WSN network the security is the biggest issue and has lots of data missing due to it, hence the proposed technique shows the highest security with less latency on comparing with multi path routing and partial disjoint routing.

4.2. Data transmission Efficiency

The data transmission efficiency is the ratio of the number of nodes received in the destination to the number of data nodes created by the source node. The Proposed framework performs the best as far as data transmission with other multi-path and partial disjoint technique. This is on the grounds that the setup course by the proposed convention is remained alive longer time contrasted with that of other conventions and stable in nature. Consequently, the quantities of

nodes are divided into equal size and the data nodes are sending through the shortest path from the source node to destination.

Graph 2 Data Transmission Efficiency.

The Graph.2.states the data transmission level, generally in the Wireless network the data transmission wavelength is the major issue and has lots of data missing due to it, hence the proposed technique shows the highest transmission efficiency with less latency on comparing with multi path routing and partial disjoint routing.

4.3. Less Latency

When large set of data are send through the node, there is a chance for congestion and the latency, many technique has been introduced for congestion control, but here the proposed technique handles a way of partitioning the data into equal size and finds the shortest path on regarding to the receiver node, this makes a simple and efficient way in reducing the data loss and makes the destination node to receive the data node without latency.

Graph 3 Latency Rate Efficiency

The Graph.3 describes the latency rate and it shows that the proposed technique has the less latency when compared with previous data transferring techniques , the efficiency is calculated by the data transmission rate from one node to another in a similarity strength.

5. CONCLUSION

In this paper, a LWSP shortest path routing protocol in WSNs is proposed to discover shortest paths with short latency and low overhead. Our proposed protocol is composed of three phases: dual conquer trees construction, routing analysis and data transmission efficiency. On comparing all those multi-path technique the proposed technique provide the better efficiency in all the three prospects. The data are being partitioned into equal size and loaded on the node is being send to the destination node without latency. In future this technique may be implemented as data transmission with security key without latency.

REFERENCES

- [1] Li-Ming He(2008)“Novel Multi-Path Routing Protocol in Wireless Sensor Networks”*IEEE Transactions* p:1-2
- [2] Gururaj S. Kori(2017) “Energy Aware Multipath Routing Scheme for Wireless Sensor Networks”*IEEE 7th International Advance Computing Conference* p.p:313-314.
- [3] Jennifer Yick, Biswanath Mukherjee and Dipak Ghosal.(2008)“Wireless Sensor Network Survey”, *International Journal of Computer and Telecommunications Networking, Elsevier*, Vol. 52, No.12, pp.2292–2330.
- [4] Priyanka Rawat, Kamal Deep Singh, Hakima Chaouchi, Jean Marie Bonnin.(2014.)“Wireless Sensor Networks: A survey on Recent Developments and Potential Synergies” *The Journal of Super computing, Springer*, Vol. 68, No. 01, pp. 1-48.
- [5] Kamalrulnizam Abu Bakar Marjan Radi, Behnam Dezfouli and Malrey Lee(2012)., “Multipath Routing in Wireless Sensor Networks: Survey and Research Challenges”, *MDPI Sensors*, Vol. 12, No. 01, pp.650–685.
- [6] Kemal Akkaya and Mohamed Younis.(2005)“A Survey on Routing Protocols for Wireless Sensor Networks”, *Ad Hoc Networks, Elsevier*, pp. 325–349.
- [7] IETF Mobile Ad-hoc Networks (MANET) Working Group, <http://www.ietf.org/>
- [8] D. Johnson, Y. Hu and D. Maltz, (2007)“The Dynamic Source Routing Protocol for Mobile Ad-hoc Networks for IPv4”, *RFC 4728*, .
- [9] C. E. Perkins, E. M. Royer, S. Das and M. Marina,(2001) “Performance Comparison of Two On-demand Routing Protocols for Ad-hoc Networks”, *IEEE Personal Communications*, , pp. 16–28
- [10] Khondaker M. Salehin and Roberto Rojas-Cessa,(2012) “Active Scheme to Measure Throughput of Wireless Access Link in Hybrid Wired-Wireless Network”, *IEEE Wireless Communications Letters*, VOL. 1, NO. 6, DECEMBER
- [11] M. d. P. Salamanca, N. M. Peña and N. L. S. da Fonseca,(2013)“A Distributed Envelope-Based Admission Control for Multihop IEEE 802.11 Ad Hoc Networks”, *IEEE Latin America Transactions*, Vol. 11, No. 3, May 2013.
- [12] Haiying Shen, Senior Member, IEEE, Ze Li, and Chenxi Qiu,(2015) “A Distributed Three-Hop Routing Protocol to Increase the Capacity of Hybrid Wireless Networks”, *IEEE Transactions On Mobile Computing*, Vol. 14, No. 10, 5
- [13] Fan Wu, Member, IEEE, Sheng Zhong,(2010) Member, IEEE, and Jiqiang Liu, Member, IEEE, “An Optimal, Strategy-Proof Scheme for Multi-Path Traffic Assignment in Non-Cooperative Networks”, *IEEE Transactions On Wireless Communications*, Vol. 9, No. 3, .

- [14] Yi Song, Jiang Xie, Senior Member, IEEE, and Xudong Wang(2014), “A Novel Unified Analytical Model for Broadcast Protocols in Multi-Hop Cognitive Radio Ad Hoc Networks”, *IEEE Transactions On Mobile Computing*, Vol. 13, No. 8, .
- [15] Haiying Shen, Senior Member, IEEE, Ze Li, Student Member,(2015) IEEE, and Lei Yu, “A P2P-Based Market-Guided Distributed Routing Mechanism for High-Throughput Hybrid Wireless Networks”, *IEEE Transactions On Mobile Computing*, Vol. 14, No. 2,
- [16] Weihuang Fu, Member, IEEE, and Dharma P. Agrawal, Fellow(2014), IEEE, “Capacity of Hybrid Wireless Mesh Networks with Random Aps”,*IEEE Transactions On Mobile Computing*, Vol. 12, No. ,
- [17] Guanglin Zhang, Youyun Xu(2010), Member, IEEE, Xinbing Wang, Member, IEEE, and Mohsen Guizani, Fellow, IEEE, “Capacity of Hybrid Wireless Networks with Directional Antenna and Delay Constraint”, *IEEE Transactions On Communications*, Vol. 58, No. 7,
- [18] Khajonpong Akkarajitsakul(2013), Member, IEEE, Ekram Hossain, Senior Member, IEEE, and Dusit Niyato, Member, IEEE, “Cooperative Packet Delivery in Hybrid Wireless Mobile Networks. A Coalitional Game Approach”, *IEEE Transactions On Mobile Computing*, Vol. 12, No. 5, May
- [19] Shiva Murthy G, Robert John D’Souza, and Golla Varaprasad,(2012) “Digital Signature-Based Secure Node Disjoint Multipath Routing Protocol for Wireless Sensor Networks”, *IEEE Sensors Journal*, Vol. 12, No. 10, October 2012.
- [20] Bin Wang, Dongmei Zhao, and Jun Cai, (2011). “Joint Connection Admission Control and Packet Scheduling in a Cognitive Radio Network with Spectrum Underlay”, *IEEE Transactions On Wireless Communications*, Vol. 10, No. 11, November 2011.