International Journal of Scientific Research in Computer Science, Engineering and Information Technology
ISSN : 2456-3307 (www.ijsrcseit.com)
doi : https://doi.org/10.32628/CSEIT206465

Comparison between Flat and Hierarchical Routing Protocols in Wireless Sensor Network

Mamta
Department of Computer Science, Haryana Engineering College, Jagadhri, Haryana, India

Article Info
Volume 6, Issue 4
Page Number: 364-369
Publication Issue :
July-August-2020

Article History
Accepted : 01 Aug 2020
Published : 05 Aug 2020

ABSTRACT

Wireless Sensor Network (WSN) has delivered the accessibility of small, tiny and low cost sensor nodes which are capable to sense various kinds of physical and environmental conditions, data processing, wireless communication and data gathering. In wireless sensor network routing protocols can be divided into two categories first is flat routing protocol and another is hierarchical routing protocol. In this paper flat and hierarchical routing protocols are evaluated and compared based on various performance parameters. In the last decade we have seen expanded enthusiasm for the potential utilization of remote wireless sensor systems (WSNs) in an extensive change of uses and it has turned into a unique research zone. So finally, in this research paper we are focusing on two different classes of routing protocols in WSN: flat routing and hierarchical or clustering routing.

Keywords : WSN, Routing Protocols, Simulator tool, Performance parameters.

I. INTRODUCTION

Progresses in remote communication made it possible to create wireless sensor network (WSN) comprising of small and tiny devices, which gather data by cooperating with each other. These tiny detecting gadgets are called hubs and contain of CPU, memory, battery and handset, CPU for information preparation, memory for information collection, battery for strength and handset for receiving and sending data or information beginning with one hub to another. The length of all sensor hubs changes according to need of applications. Its cost depends on upon parameters used like memory size, preparing speed furthermore, battery etc.

Today, wireless sensor networks are generally used as a portion of the business and modern regions, for example, natural checking, living space observing, social insurance, handle checking and reconnaissance. For instance, in a military zone, we can utilize wireless system systems to screen an action. Sensor hubs sense it and guide the data to the base station (called sink) by speaking with different hubs.

In this paper, a new protocol Circular ACO-PIN Routing Protocol (CASRP) has been proposed. The

nodes are deployed in a circular fashion. The circular architecture helps CASPR to run faster and with lesser Bit Error Rate (BER). CASPR is tested against Flat, Hierarchical and SPIN without ACO. WSN are prone to noise and Quality of Service (QOS) is a big challenge. For any network a Bit Error Rate (BER) is drawn to ascertain the quality of a signal. For the purpose the signal having Additive White Gaussian Noise (AWGN) was passed over the network to test the quality of transmission. It was found that after receiving the same at the receiver's end BER was maintained below the theoretical values which indicates good quality of the signal. It has been found that CASRP improves bandwidth usage by 20% compared to Hierarchical protocol when compared with Flat protocol 42%. The Time consumed by CASPR is also lesser than SPIN, (Packet Delivery Rate) PDR of CASPR is 14% better than SPIN without ACO.

II. LITERATURE REVIEW

[1] Gulab Singh, Deepinder Singh Wadhw, Sukhminder Kaushal (2016).“The networks implemented are named flat and hierarchical network. They presented an evaluation and comparison of two routing protocols. flooding and gossiping. These protocols suffer from issues related to reliability and delay information.”

[2] Rajashree Biradar, Dr. R. R. Mudholkar, Dr. S. R. Sawant, Dr. V.C.Patil (January 2011) “They described in their research paper that the wireless sensor networks have arisen in the past decade as the result of the recent advances in the microelectronic system construction, in wireless communications, and in the integrated circuit technologies.”

[3] Katayoun Sohrab, Jay Gao, Vishal Ailawadhi and Gregory J Pottie (September 1999) “They presented a set of algorithms for self-organisation of wireless sensor linkages, in which there is an evolutionary manner largely static number of nodes with very restricted energy resources.”

[4] Dr. Pradeep Mittal, Swati Sharma, “Wireless Sensor Networks: Architecture, Protocols” (January 2013) “In this research paper, the author describes that the wireless sensor networks are an interconnection of a large number of nodes deployed to monitor the system by means of measuring parameters.”

[5] Surender Kumar, Manish Prateek, Bharat Bhushan, “Distance based (DBCP) Cluster Protocol for Heterogeneous Wireless Sensor Network” (August 2013) “In this research, energy efficient novel protocol based cluster distance (DBCP) for single hop heterogeneous wireless sensor network to increase energy efficiency and a lifetime of a sensor network is proposed.”

[6] Surender Kumar, M. Prateek, N.J. Ahuja and B. Bhushan, “Multihop Energy Efficient Protocol For Heterogeneous Wireless Sensor Network” (March 2014) “In this research, the proposal protocol combines the idea of grouping and multihop the communication. Heterogeneity is created on the network by using some high energy nodes.”

[7] Kamaldeep Kaur, Parneet Kaur, Er. Sharanjit Singh, “Wireless Sensor Network: Architecture, Design Issues, and Applications” (November 2014) “In this paper, the architecture of WSN is described.”

III. DESIGN

MATLAB is an interactive system designed for doing numerical computations.

MATLAB - MATrix LABoratory, is a high-level programming language and interactive environment for development of algorithm, visualization of data, analysis of data and numeric computation. Core

strengths of the MATLAB include rapid development of code, powerful built-in functionalities and also it is extensively application-specific, provided by both official toolboxes and user-contributed code. MATLAB makes use of highly integrated algorithms and hence we can be confident about our results. Powerful operations can be performed by using just one or two commands which are in the built in. We can build up our own set of functions for our particular program or application. Excellent graphics facilities are also available and we can insert pictures into LATEX and Word documents also.

IV. PROPOSED WORK

The proposed scheme is designed based on the user interface. The main aim to design user interface is to test and run the proposed technique. The User interface is the space where collaborations amongst people and machines happen. The objective of this connection is to certify compelling operation and control of the machine from the human end, while the machine at the same time supports back data that guides the administrators' basic leadership handle. Here, firstly user locally allocated the numbers of sensors nodes and after that wait for the signals generation. When signals are generated all the sensors are allocated.

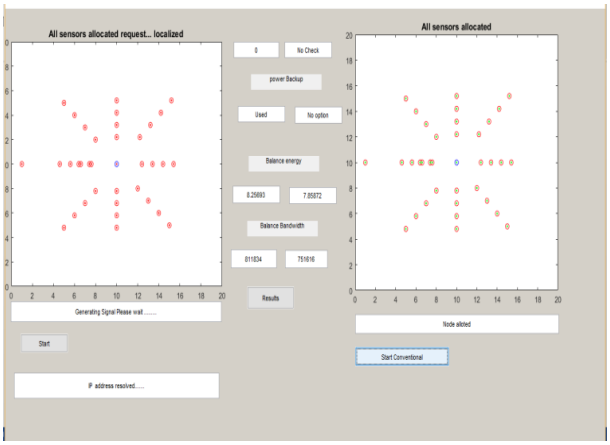

Figure 1: User interface to test and run the proposed technique

The figure shows user interface in which sensors first send allocation request to all nodes in the environment, after when all nodes receive request allocation message, all numbers of nodes are allocated in the environment which helps in for communication.

Simulation Parameters

Simulation Parameter	Values
Simulator	MATLAB R2016a
Channel Type	Wireless Channel
Network Area	100m X 100m
Grid Area	27m X 27m
Sensing Range of Node	100m
Initial Energy of Nodes	2J
Number of Developed Nodes	27
Traffic	20 MBPS
Size of Data Message	1024*1024*20 Bits
Total Bandwidth	1024*1024*27*20 Bits

Table 1: Simulation Parameter Table

CASRP Algorithm

A new protocol Circular ACO-PIN Routing Protocol (CASRP) has been proposed. The nodes are deployed in a circular fashion. The circular architecture helps CASPR to run faster and with lesser Bit Error Rate (BER). CASPR is tested against Flat, Hierarchical and SPIN without ACO.

Assumption

1. Nodes are placed in circular form and are moving uniformly.
2. Each node has equal energy.
3. Each node can talk with its neighboring node.

V. RESULT

The results are shown and compared with the existing approach. We have calculated the Network throughput, energy consume, bit error rate, packet

delivery rate and bandwidth and represent them in the graphical form so as to make the visualization easier.

BIT ERROR RATE

The bit blunder rate (BER) is the quantity of bit mistakes per unit time. The bit error proportion (likewise BER) is the quantity of bit mistakes separated by the aggregate number of exchanged bits amid a considered time temporary. Bit mistake proportion is a unit less execution measure, regularly communicated as a rate.

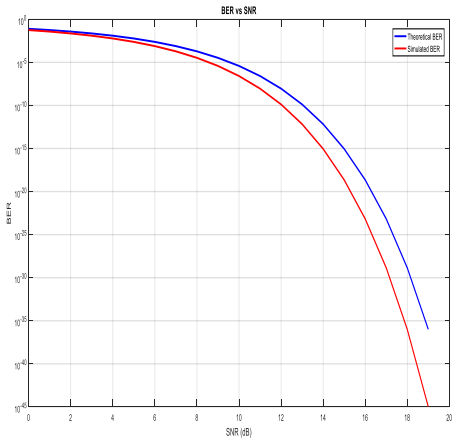

Figure 2: Bit Error Rate

TIME CONSUMED

The result shows that the time consumed by SPIN (Sensor Protocol for Information via Negotiation) and SPIN with ACO (Ant Colony Optimization). The time consuming is basically is something that is impossible rapidly however which rather requires a long stretch to finish.

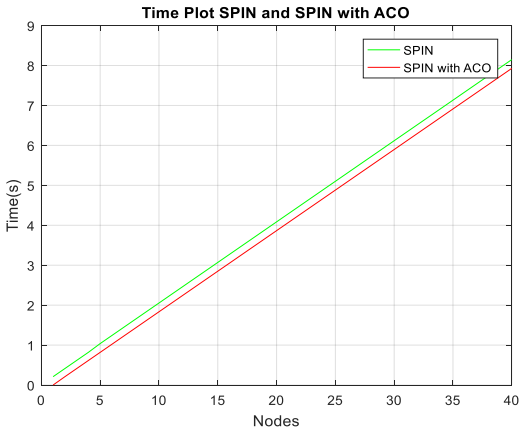

Figure 3: Time consumed by SPIN and SPIN with ACO

TOTAL ENERGY REMAINING

Energy is the major concern in most of the present day devices in wireless network. In wireless sensor network , energy is a limited factor. As the technology developed day by day new devices or protocols invented that take less energy as campared to previous devices or protocols. Here we plot a graph on energy remainig between SPIN and SPIN with ACO.

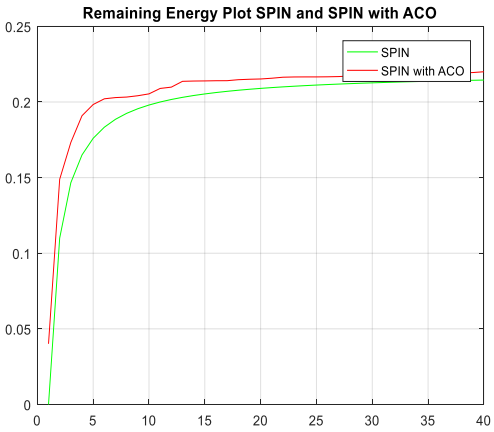

Figure 4: Remaining Energy Plot

PACKET DELIVERY RATE

The estimation of Packet Delivery Ratio (PDR) depends on the got and produced packets as recorded in the follow document. As a rule, PDR is characterized as the proportion between the got

packets by the goal and the created bundles by the source.

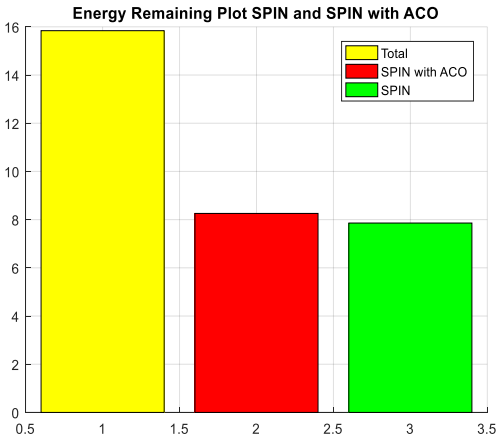

Figure 5: Packet Delivery Rate

BANDWIDTH

Transfer speed is additionally characterized as the measure of information that can be transmitted in a settled measure of time. For advanced gadgets, the data transmission is typically communicated in bits per second (bps) or bytes every second. For simple gadgets, the transfer speed is communicated in cycles every second, or Hertz (Hz).

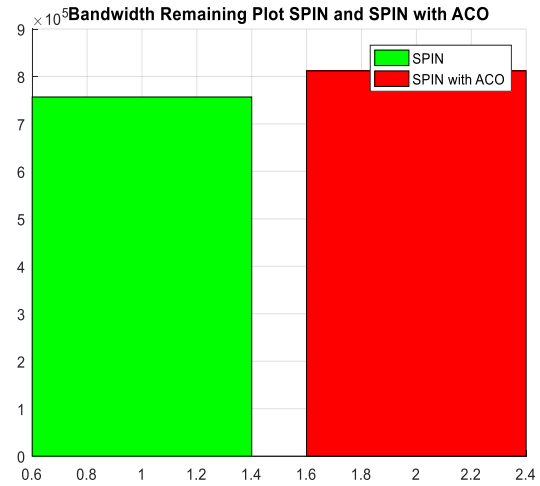

Figure 6: Bandwidth Remaining Plot

THROUGHPUT

A standard can be utilized to quantify throughput. In information transmission, arrange throughput is the measure of information moved effectively starting with one place then onto the next in a given day and age, and commonly measured in kilobits per second (kbps) bits every second (bps), as in megabits every second (Mbps) or gigabits every second (Gbps).

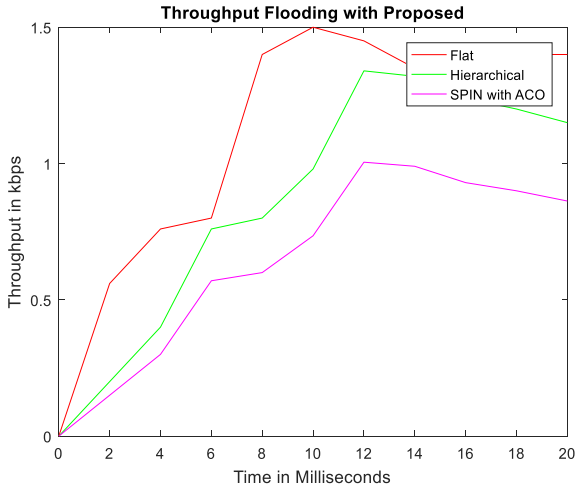

Figure 7: Throughput Flooding with Proposed

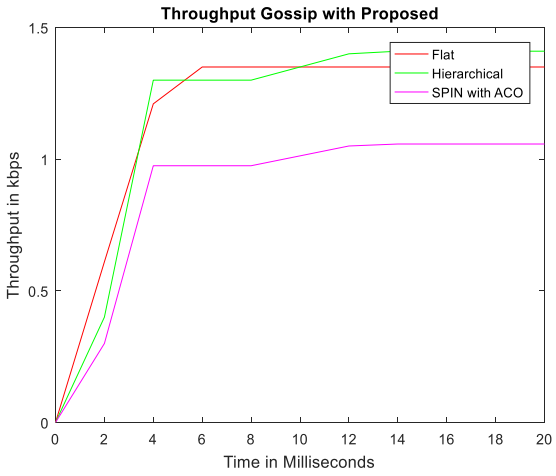

Figure 8: Throughput Gossip with Proposed

VI. CONCLUSION

The results obtained clearly show that the proposed protocol outperforms the Flat and Hierarchical protocols as proposed by Gulab Signh et.al. in their paper which has been considered for comparison of the results obtained by our proposed protocol. The

prosed protocol puts the nodes in a circular form improving the overall performance of the network. The architecture helps ACO to run faster. The bandwidth improved by over 20%. The proposed method has been tested with and without ACO and it is found that ACO gives better results. The signal having AWGN is passed over the network and after receiving the same at the receivers end a BER plot is drawn which clearly indicated that the quality of the transmission of the signal is maintained. The Time consumed, PDR of ACO with SPIN is 14% better than SPIN without ACO. It is recommended that SPIN with ACO should be the preferred protocol.

VII. FUTURE SCOPE

Since more and more network attacks are being carried out by the hackers leading to the network to be vulnerable security would play a crucial role without compromising the speed. In future number of nodes can be increased and ACO can be replaced by PSO which may further improve the packet delivery rate. To give robustness to the protocol, two level securities can be added. Where, signatures to each node can be given for initial link and encrypted data.

VIII. REFERENCES

[1]. Gulab Singh, Deepinder Singh Wadhw, Sukhminder Kaushal, “Implementation and Comparison using NS2 of Flat and Hierarchical Wireless Sensor Networks by using Multihop and Gossiping Protocols”, International Conference on Advances in Emerging Technology (ICAET 2016).

[2]. Rajashree.V.Biradar, Dr. S. Sawant, Dr. R. R. Mudholkar, Dr. V.C.Patil, " Multihop Routing In Self-Organizing Wireless Sensor Networks", IJCSI International Journal of Computer Science Issues, Vol. 8, Issue 1, January 2011.

[3]. Katayoun Sohrabi, Jay Gao, Vishal Ailawadhi, Greg Pottie, "Self-Organizing Wireless Sensor Network", Electrical Engineering Department UCLA.

[4]. Swati Sharma, Dr. Pradeep Mittal “Wireless Sensor Networks: Architecture, Protocols”, International Journal of Advanced Research in Computer Science and Software Engineering, Volume 3, Issue 1, January 2013.

[5]. Surender Kumar, Manish Prateek, Bharat Bhushan, “Distance based (DBCP) Cluster Protocol for Heterogeneous Wireless Sensor Network” International Journal of PC Applications (0975 – 8887) Volume 76– No.9, August 2013.

[6]. Surender Kumar, M. Prateek, N.J. Ahuja and B. Bhushan, “Multihop Energy Efficient Protocol For Heterogeneous Wireless Sensor Network” International Journal of Computer Science and Telecommunications Volume 5, Issue 3, March 2014.

[7]. Kamaldeep Kaur, Parneet Kaur, Er. Sharanjit Singh, “Wireless Sensor Network: Architecture, Design Issues, and Applications” International Journal of Technical Engineering and Research www.ijser.in ISSN (Online): 2347-3878 Volume 2 Issue 11, November 2014.

Cite this article as :

International Journal of Scientific Research in Computer Science, Engineering and Information Technology (IJSRCSEIT), ISSN : 2456-3307, Volume 6 Issue 4, pp. 364-369, July-August 2020. Available at doi : https://doi.org/10.32628/CSEIT206465
Journal URL : http://ijsrcseit.com/CSEIT206465