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The Energy Efficient Techniques for Wireless Sensor Networks: A Review

Neelam[1*] and Dishant Khosla[2]

[1*]Department of Electronic and Communication, Chandigarh Engineering College, Landran, India
[2] Department of Electronic and Communication, Chandigarh Engineering College, Landran, India

e-mail: neelammaurya30@gmail.com, cgccoe.ece.dk@gmail.com [9]

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***Abstract*— The wireless sensor networks are the type of network in which sensor nodes sense the environmental conditions and pass the sensed information to base station. The sensor network is deployed on the far places like forests, deserts etc. The size of the sensor node is very small due to which it is very difficult to recharge or replace battery of these sensor nodes. The various techniques has been proposed in the previous times, to reduce energy consumption of the network. Among various proposed techniques, clustering is the efficient technique to reduce energy consumption of the sensor networks. The clustering is of two types dynamic and static and in this article techniques of both type of clustering is reviewed and compared in terms of various parameters.**

Keywords- WSN, Clustering, Static and Dynamic, energy efficient

I. INTRODUCTION

A wireless sensor network (WSN) is a wireless network comprising of spatially distributed autonomous devices utilizing sensors to monitor physical or environmental conditions. A WSN system incorporates a gateway that gives wireless connectivity back to the wired world and distributed nodes. A sensor network comprises of multiple detection stations called sensor nodes, each of which is small, lightweight and portable. Each sensor node is equipped with a transducer, microcomputer, transceiver and power source. The transducer generates electrical signals based on sensed physical effects and marvels. The microcomputer processes and stores the sensor output. The transceiver gets commands from a central computer and transmits data to that computer. The power for every sensor node is derived from a battery [1].

Be that as it may, sensor nodes are constrained in energy supply and bandwidth. Along these lines, innovative techniques that eliminate energy wasteful aspects that would shorten the lifetime of the network are profoundly required. Such constraints combined with a typical deployment of substantial number of sensor nodes posture numerous challenges to the design and management of WSNs and necessitate energy-awareness at all layers of the networking protocol stack [2].

Low-Energy Adaptive Clustering Hierarchy (LEACH) is a sort of hierarchical protocol in which a large portion of the nodes communicate to cluster heads. In Low-Energy Adaptive Clustering Hierarchy Centralized (LEACH-C) as compare to the "Drain", the base station is utilized to build up the C.H, rather than nodes will be arranged themselves into the C.H. Power-Efficient Gathering in Sensor Information Systems (PEGASIS) is a "chain-bases protocol" and an upgrading of the LEACH [3]. In PEGASIS each node transfers just with a close neighbour to direct and get information. It receipts swings communicating to the BS, in this manner decreasing the quantity of energy consumed per round. The nodes are thusly that a chain ought to be created, which can be finished by the sensor nodes alongside utilizing an algorithm. Then again, the BS can register this chain and transmission of it to all the sensor nodes [4]. Threshold sensitive Energy Efficient sensor Network protocol (TEEN) is a hierarchical protocol designed for the conditions like sudden changes in the sensed attributes, for example, temperature. The responsiveness is imperative for each one of those situations, where the time critical applications are required, which for the most part happened in the network of responsive node. Adaptive Threshold sensitive Energy Efficient sensor Network (APTEEN) is an advancement of "TEEN" and goals at both taking episodic data gatherings and answering to time critical occasions [5]. When the BS formulates the clusters, the C.H transmits the features, the values of threshold and calendar of transmission to all nodes. Virtual Grid Architecture Routing (VGA) partners the "data combination and in-network processing" to get energy efficient system and expansion of network lifetime. This entire scheme can be distributed into two phases, first is "clustering" and the other is "routing of aggregated data" [6]. Energy Efficient Sleep Awake Aware (EESAA) has a fundamental objective which is to minimize the energy consumption by utilizing the idea of pairing. Sensor nodes of

same application and which are at the minimum distance between them will frame a couple for data sensing and communication. This protocol will likewise utilize the Cluster Heads selection method, by selecting CHs on premise of the remaining energy of the nodes [7]. This paper includes the introduction of wireless sensor network, what and how the energy of the network gets affected and few basic protocols for energy maintenance in section I. Section II of the paper shows the literature survey over the wireless sensor network. With the help of a comparison table in section III we considered few important techniques to enhance the efficiency of the network. Section IV represents the conclusion.

II. LITERATURE REVIEW

Jetendra Joshi, et.al proposed in this paper [8] that specific Forwarding, HELLO attack are a portion of the attacks through which the Wireless Sensor Topology can without much of a stretch be accesses by means of outsider. In this paper we are proposing an algorithm on rectifying the security issues by resolving the "Attacks" and subsequently increasing the security which prompts secure data transmission furthermore advance add-ups in the proficiency of the Sensor Node. To build the capacity of the gateway, data encryption and decryption techniques are applied in the sensor. In paper we have recognized the intrusion effect and the effect of flooding attack by simulating utilizing the network simulator NS2 and by applying the proposed algorithm to reduce its effect. It additionally demonstrated that the system knows about the Attack and algorithm is applied to reduce the effect in network.

Bhaskar Prince, et.al proposed in this paper [9], an energy efficient uneven grid clustering based routing (EEUGCR) protocol for larger network area. The proposed protocol is based on the centralized approach which utilizes fixed clustering. In this protocol, the BS isolates the entire network into fixed rectangular shaped clusters of unequal size. The size of the cluster is dependent on its distance from the BS. To overcome from more energy loss at the clusters closer to the BS because of more data handling, proposed protocol introduces unequal size grid clustering approach. It additionally guarantees that the transmission distance for any communication in the network is not exactly the threshold distance of the energy consumption model. It likewise increases load balancing in terms of energy consumption and data traffic. Energy loss of nodes is additionally reduced as the transmission distance for every communication is restricted up to threshold esteem. This guarantees the nodes lose their energy at a rate of d^2 which is much lesser than d^4. It handles the load balancing, clustering overhead and energy effectiveness routing issues together. Due to previously mentioned modifications, it can be considered as a more energy efficient protocol than other existing protocols.

Awatef Balobaid, et.al proposed in this paper [10] that there are a few MAC-Protocols with various goals. The point of this paper is to think about on some energy efficient MAC-Protocols in Wireless Sensor Network. This paper likewise investigates the performance of the MAC-Protocols in terms of energy proficiency in various situations. Finally this paper reaches an inference comparing the protocols. In this paper the energy proficiency is given higher priority than latency, throughput and so forth for comparison. Regardless of having lots of energy efficient protocols still none of the discussed protocols are acknowledged as the standard protocol. As the protocols depend on the applications, no protocol is still considered as the standard one. Be that as it may, the majority of the wireless sensor hardware does not following any standard in access layer.

Jing Yan, et.al proposed in this paper [11], that energy-efficient routing techniques for WSNs play an extraordinary part in doing as such. In this paper authors articulate this issue and classify current routing protocols for WSNs into two categories as per their orientation toward either homogeneous or heterogeneous WSNs. They are further classified into static and mobile ones. We give a diagram of theories protocols in every category by summarizing their characteristics, limitations and applications. At last, some open issues in energy-efficient routing protocol design for WSNs are indicated. As compared with static WSN's, routing protocols for mobile WSNs guarantee to convey more advantages to real-time delivery ensure and in addition high coverage, energy proficiency and energy balance yet require high implementation and deployment cost.

Somasekhar Kandukuri, et.al proposed in this paper [12] an adaptive data aggregative window function (A-DAWF) for a distributed sensor network model in which nodes store data in their trait window functions, and give non-correlated data towards the base station (BS). Not at all like past works, in particular data accumulation or data gathering management systems, has the paper proposed a novel approach that expects to process temporal redundant techniques in sensor nodes and additionally providing spatial redundant filtration strategies in cluster-head (CH) nodes. In such manner, preliminary results demonstrate that A-DAWF can suppress up to 90% of temporal redundant data among the considered sensor nodes by an optimal threshold of the window sizes, and their spatial relationships in CH node by a maximum mistake threshold compared to either periodic or a continuous data transmission system. The preliminary results demonstrate that the proposed instrument can suppress up to 90% of temporal redundant data among the considered sensor nodes by an optimal threshold of the window sizes and additionally their spatial relationships are being suppressed effectively in a considered CH node compared to either periodic or a continuous transmission system.

Abdul Razaque, et.al proposed in this paper [13], that LEACH features the dynamicity however has limitations because of its cluster-based design, while PEGASIS defeats the limitations of LEACH yet needs dynamicity. This paper introduces PEGASIS-LEACH (P-LEACH), a close optimal cluster-based chain protocol that is an improvement over PEGASIS and LEACH. This protocol utilizes an energy-efficient routing algorithm to transfer the data in WSN. To validate the energy effectiveness of P-LEACH, authors reproduce the performance utilizing Network Simulator (NS2) and MATLAB. The performance of P-LEACH is compared with the LEACH and PEGASIS protocols. With simulation we watched that P-LEACH performs much superior to anything LEACH and PEGASIS in terms of network lifetime, number of dead nodes and energy consumption. MATLAB is utilized for evaluating the performance of the protocol. Based on the simulation results, we determined that P-LEACH performs superior to anything LEACH and PEGAIS in terms of energy and lifetime of the network. The simulation results validate that our proposed approach could augment the network for WSNs applications.

III. COMPARISION OF ENERGY EFFICIENT TECHNIQUES

Name	Year	Description	Results
Jetendra Joshi, Prakhar Awasthi, Sibeli Mukherjee, Rishabh Kumar, Divya Sara Kurian and Manash Jyoti Deka	2016	In this paper we are proposing an algorithm on rectifying the security issues by resolving the "Attacks" and subsequently increasing the security which prompts secure data transmission furthermore advance add-ups in the proficiency of the Sensor Node.	In paper we have recognized the intrusion effect and the effect of flooding attack by simulating utilizing the network simulator NS2 and by applying the proposed algorithm to reduce its effect.
Bhaskar Prince, Prabhat Kumar, M. P. Singh and Jyoti Prakash Singh	2016	The proposed protocol is based on the centralized approach which utilizes fixed clustering. In this protocol, the BS isolates the entire network into fixed rectangular shaped clusters of unequal size.	This guarantees the nodes lose their energy at a rate of d^2 which is much lesser than d^4.
Awatef Balobaid	2016	This paper likewise investigates the performance of the MAC-Protocols in terms of energy proficiency in various situations.	As the protocols depend on the applications, no protocol is still considered as the standard one.
Jing Jing Yan, Meng Chu Zhou, and Zhi Jun Ding	2016	In this paper authors articulate this issue and classify current routing protocols for WSNs into two categories as per their orientation toward either homogeneous or heterogeneous WSNs.	As compared with static WSN's, routing protocols for mobile WSNs guarantee to convey more advantages to real-time delivery ensure and in addition high coverage, energy proficiency and energy balance yet require high implementation and deployment cost.
Somasekhar Kandukuri, Jean Lebreton, Nour Murad, Richard Lorion, and Jean-Daniel Lan-Sun-Luk	2016	In this paper an adaptive data aggregative window function (A-DAWF) for a distributed sensor network model in which nodes store data in their trait window functions, and give non-correlated data towards the base station (BS).	The preliminary results demonstrate that the proposed instrument can suppress up to 90% of temporal redundant data among the considered sensor nodes by an optimal threshold of the window sizes and additionally their spatial relationships are being suppressed effectively in a considered CH node compared to either periodic or a continuous transmission system.

Abdul Razaque, Musbah Abdulgader, Chaitrali Joshi	2016	This paper introduces PEGASIS-LEACH (P-LEACH), a close optimal cluster-based chain protocol that is an improvement over PEGASIS and LEACH.	The simulation results validate that our proposed approach could augment the network for WSNs applications.

IV. CONCLUSION

The wireless sensor network is self configuring network in which no central controller is present and due to small size of sensor nodes it is very difficult to recharge or replace battery of these nodes. In this work, various techniques which reduce energy consumption of the network is reviewed and discussed in this article. It is been concluded that clustering is most efficient technique to reduce energy consumption of the network.

References

[1] Michael Stein, Dominic Lerbs, Mohamed Hassa, Mathias Schnee, "Evaluation Study for Clustering in Wireless Sensor Networks", 2016, IEEE, 978-1-5090-2526-8

[2] Sushanta Mohan Rakshit, Michael Hempel, Hamid Sharif," Wireless Sensor Networks in Surface Transportation", 2016, IEEE, 978-1-5090-2526-8

[3] Prof Chayapathi A.R, Ravitheja .S," Energy Efficient Routing Techniques In Wireless Sensor Network", 2014, (IJSRET), ISSN 2278 – 0882, Volume 3, Issue 8

[4] Zain ul Abidin Jaffri, Sundas Rauf," A Survey on "Energy Efficient Routing Techniques in Wireless Sensor Networks Focusing on Hierarchical Network Routing Protocols", 2014, ISSN 2250-3153, Volume 4, Issue 2

[5] Himangi Pande, M. U. Kharat," Adaptive Energy Efficient MAC Protocol for Increasing Life of Sensor Nodes in Wireless Body Area Network", 2016, IOTA, 978-1-5090-0044-9

[6] Jamal N. Al-Karaki, Ahmed E. Kamal," Routing Techniques in Wireless Sensor Networks: A Survey", 2010, ICUBE, volume8, issue 1

[7] Saman Siavoshi, Yousef S. Kavian, Hamid Sharif," Load-balanced energy efficient clustering protocol for wireless sensor networks", 2014, IET Wireless Sensor Systems, Vol. 6, Iss. 3

[8] Jetendra Joshi, Prakhar Awasthi, Sibeli Mukherjee, Rishabh Kumar, Divya Sara Kurian and Manash Jyoti Deka," SEED: Secure and Energy Efficient Data Transmission in Wireless Sensor Networks", 2016, IEEE, ISBN: 978-1-4673-9879-4

[9] Bhaskar Prince, Prabhat Kumar, M. P. Singh and Jyoti Prakash Singh," An Energy Efficient Uneven Grid Clustering based Routing Protocol for Wireless Sensor Networks", 2016, IEEE, 978-1-4673-9338-6

[10] Awatef Balobaid," A Survey and Comparative Study on Different Energy Efficient MAC-Protocols for Wireless Sensor Networks", 2016 International Conference on Internet of Things and Applications (IOTA) 978-1-5090-0044

[11] Jing Jing Yan, Meng Chu Zhou, and Zhi Jun Ding," Recent Advances in Energy-efficient Routing Protocols for Wireless Sensor Networks: A Review", 2016, IEEE, 2169-3536

[12] Somasekhar Kandukuri, Jean Lebreton, Nour Murad, Richard Lorion, and Jean-Daniel Lan-Sun-Luk," Energy-Efficient Cluster-Based Protocol using An Adaptive Data Aggregative Window Function (A-DAWF) for Wireless Sensor Networks", 2016, IEEE, 978-1-5090-2185-7

[13] Abdul Razaque, Musbah Abdulgader, Chaitrali Joshi," P-LEACH: Energy Efficient Routing Protocol for Wireless Sensor Networks", 2016, LISAT, 7494137-3456-546-54

