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Secure Energy Efficient Data Transmission over WSNs

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Abstract - As wireless sensor network proposes a new low-energy adaptive clustering hierarchy (LEACH) protocol for wireless sensor networks that use a distributed cluster formation based on affinity propagation (AP). By using Distributed cluster formation generate Cluster. The proposed LEACH protocol (LEACH-AP) enables a fully distributed control and resolves practical limitations of conventional LEACH-based protocols by simplifying network functionalities. The results show that the proposed protocol outperforms existing LEACH-based protocols considerably in terms of network lifetime, energy dissipation rate, and total number of transferred bits. The main idea is to formulate the WSN setup into median-based clustering, which guarantees the center of a cluster to be a member of the cluster, and to learn the optimal cluster number adaptively according to network topology. In this system we are using K-means algorithm for cluster formation. Wireless sensor networks (WSNs) are subject to energy management for maximizing their lifetime. The result sending acknowledgement and data so require low energy and time for that operation.

Keywords - *LEACH-AP, Distributed Clusters Formation, energy- efficient operation, affinity propagation-means.*

1. Introduction

The Wireless Sensor Network is collection of various sensor nodes spreads in the environment. These nodes are continuously monitoring specific region in environment. These nodes are able to sense the environment change and send that sensed data to the base station (sink) with the help of intermediate sensor nodes. Each sensor node consists of various processing capabilities such as micro controllers, central processing unit and digital signal processing chips, memory and also the power batteries. Now a days wireless sensor networks are becoming very popular. It is not unreasonable to expect that in a decade the world will be covered with wireless sensor networks with access to them via the Internet. In current system the low-energy adaptive clustering hierarchy protocol is used with the objective of minimizing the energy consumption of wireless sensor network [1]. In wireless sensor networks, the power resources of each sensor node are limited. Minimizing energy dissipation and maximizing the network lifetime are important issue in the design of routing protocols for sensor networks. In this paper proposes a LEACH-AP protocol which is used to minimum energy consumption of the entire network and improved the lifetime of the network and network functionalities. In this System advances in battery-powered wireless sensors have enlarged their applications, including environmental monitoring, machine failure detection, surveillance, and internet-of things applications [5]. Low-cost and small-sized wireless sensors have gained particular interest in efficient monitoring that involves thousands of wireless sensors in the measurement and report within a target area. Wireless sensors network is a small network and inexpensive. Since recharging the battery is almost impossible, wireless sensor networks (WSNs) are subject to energy management for maximizing their lifetime. The low-energy adaptive clustering hierarchy (LEACH) protocol is a pioneering work in this type of applications [7]. The LEACH protocol forms multiple clusters of nodes and designates a single cluster head (CH) node in each cluster, with the objective of minimizing the energy of consumption of WSN. In this hierarchy, the cluster members of nodes send data to cluster head and cluster head compress data and encrypted and send to base station (BS) as illustrated in Fig. 1. Base station sends data to proper destination or receiver. This focuses on efficient distribution of the energy consumption over the WSN. LEACH-AP is a TDMA based MAC protocol is avoids the collision of data sent by member nodes and permits the member nodes to go sleep mode. LEACH-AP protocol uses intra cluster transmission mode of data sending that avoid collision and energy dissipation. It uses

K-means distributed cluster formation which has been known to be a very efficient clustering technique. This focuses on efficient distribution of the minimum energy consumption over the WSN.

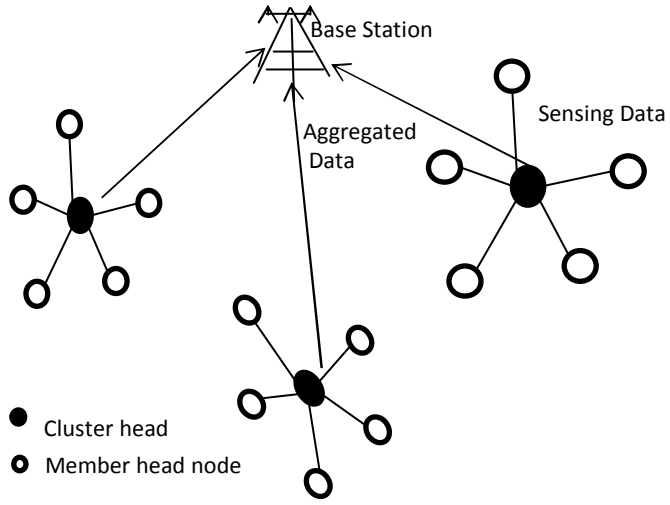

Fig.1.1.A WSN model with low energy adaptive clustering hierarchy based on affinity propagation.

This focuses on efficient distribution of the energy consumption over the WSN. LEACH-AP employs a sophisticated clustering technique instead of different techniques and algorithm. It uses K-means clustering which has been known to be a very efficient clustering technique. However, the major goals for proposing LEACH-AP variants protocols for WSNs are the following Energy efficient communication in Wireless Sensor Network (i)Improvement in scalability and increasing the security in WSN and it minimize the network delay it also equal load distribution over entire network. (ii) The collection of the information required for clustering at the BS induces unnecessary signaling overheads. (iii) Clustering algorithms used in those protocols consider the energy consumption of links between the CH and member nodes only but fail to incorporate that of links between CHs and the BS, which has a significant impact on the cluster formation. In addition, those protocols rely on mean-based clustering where the center of a cluster is not necessarily a member. The resulting CH nodes chosen among nearby members may not be the most efficient. (iv) The optimal cluster number is very difficult to find for temporal variations in network topology. Fixing it to positive number K in existing protocols is obviously suboptimal this letter develops a new distributed energy-minimizing cluster formation strategy that resolves aforementioned drawbacks of existing LEACH-based protocols. The main idea is to formulate the WSN setup into median-based clustering, which guarantees the center of a cluster to be a member of the cluster, and to learn the optimal cluster number adaptively according to network topology. To this two-fold target, affinity propagation (AP), a state-of-the-art message-passing-based clustering technique, is modified to handle the cluster formation. AP proves very efficient in handling various wireless network optimization tasks, such as forming primary-secondary user pairs in cognitive radio networks and identifying the BS energy-saving status in green cellular networks. The proposed LEACH protocol using AP (LEACH-AP) determines the cluster formation via iterative exchanges of simple messages among neighboring nodes, enabling a fully distributed control.

2. System Model

Firstly Figure 2.1 shows that the low energy adaptive clustering using affinity propagation for wireless sensor networks. In this system sender send data from source to destination by using mobile and other device. This is sent the data to the cluster head. In cluster head there are many nodes connected to each other. Clusters are formed by the K-Means method. Each cluster comprises a set of nodes K-means is an algorithm minimization who alternated as a whole K, will seek to separate a set of points in K clusters. Cluster head is used for low energy data transferring, in that we are using the k-means algorithm. K-means algorithm allows the classification in a large network and saves more time to calculate. Cluster head connected to base station.

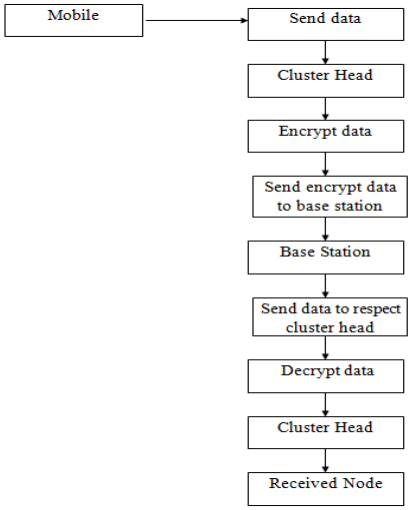

Figure 2.1 Low energy adaptive clustering hierarchy based on affinity propagation transferring data in WSNs.

Then cluster head send this data to the base station. BS is located apart from the region and collects the measurement from the nodes. And base station also performs energy discussion. in that system sender cluster head and receiver cluster head connected to common base station. For that using Distributed cluster formation algorithm. Then base station send data to the cluster head and the cluster head send data to the receiver or proper destination and data is send when first acknowledgement is received. Then data is sending to the receiver by using low energy and time.

2.1 Abbreviations And Acronyms

In this system there are numerous keywords are utilized, which are portray beneath.

- **LEACH-AP**: Enables a completely distributed control and resolves useful constraints of protocol LEACH based protocols by rearranging system functionalities and diminishing sensor cost **Error! Reference source not found.**.
- **Affinity propagation**: In measurements and information mining Affinity engendering (AP) is a clustering algorithm in light of the idea of "message going" between information focuses**Error! Reference source not found.**
- **AES Algorithm**: AES Algorithm is utilized to give security to information by encode and unscramble of information.
- **K-Means Algorithm**: Clustering of nodes is one of the procedures that can expand the lifetime of the whole system by conglomerating information to the cluster head. The last depends on a algorithm to join two classes of a parcel for a more total score and all the more precisely on the K-means algorithm**Error! Reference source not found.**

2.2 K-Means Clustering Algorithm

K-means is a one of the clustering algorithm which solves the practical limitation of the wireless sensor network for using distributed cluster formation. The procedure follows a simple and easy way to classify a given data set through a certain number of clusters (assume k clusters) fixed apriori. The main idea is to define k centers in the each different clusters of the network. These centers should be place in the different network because of different location causes different result. So, the better choice is to place them as much as possible far away from each other. The next step is in the each point of cluster head is to find the nearest member node and collect the data from the nearest member node. When no point is pending, the first step is completed and an early group age is done. At this point the cluster head is to calculate the distance of the member nodes in the network of the clusters resulting from the previous step. After we have calculate the distance from the nearest node of the center of the cluster head these k is a new center node of that cluster and send data to that the cluster head repeate all the procedures in the entire cluster. A loop has been generated. As a result of this cluster head find the nearest node and send data from member node to cluster head of that region and send to the cluster head and cluster head send to this data in base station. Finally, this algorithm aims at minimizing the energy consumption in the network and improved network functionalities an objective function know as squared error function given by:

$$J(V) = \sum_{i=1}^{c} \sum_{j=1}^{ci} (||Xi - Vi||)^2$$

where,

'$||x_i - v_j||$' is the Euclidean distance between x_i and v_j.

'c_i' is the number of member node in i^{th} cluster.

'c' is the number of cluster head.

Algorithmic steps for k-means clustering

Let X = {x_1,x_2,x_3,……..,x_n} be the set of member node and V = {v_1,v_2,…….,v_c} be the set of cluster head.

1) Randomly select 'c' cluster centers.

2) Calculate the distance between each member node and cluster head.

3) Assign the data point to the cluster head whose distance from the cluster head is minimum of all the cluster centers..

4) Recalculate the new cluster head using:

$$Vi = (1/Ci) \sum_{j=1}^{Ci} Xi$$

Where, 'Ci' represents the number of member node in i^{th} cluster head.

5) Recalculate the distance of cluster and nearest member node and new obtained cluster head.

6) If no data of the member node was reassigned then stop of data send or not find the nearest node that condition repeat the step 3).

2.3 Advanced Encryption Algorithm

AES Algorithm

- AES is a square figure with a piece length of 128 bits.
- AES takes into account three diverse key lengths: 128, 192, or 256 bits. The majority of our discourse will expect that the key length is 128 bits.

AES Encryption

- Derive the arrangement of round keys from the figure key.
- Initialize the state exhibit with the square information (plaintext).
- Add the underlying round key to the beginning state exhibit.
- Perform nine rounds of state control.
- Perform the tenth and last round of state control.
- Copy the last state cluster out as the encoded information (cipher text).
- AES Decryption
- Get scrambled information from system
- Perform unscrambling on that and get

3. Performance Analysis

Table 3.1: Performance analysis of energy consumption

Energy consumption without using algorithm	Low energy consumption using k-means and AES algorithm
35%	7%
48%	12%
34%	6%
24%	6%
46%	12%
31%	19%

The above table 3.1 shows the without using any algorithm send text file from source to destination the more energy consumption in the network. In Proposed system the k-means algorithm and Advanced Encryption Algorithm (AES) used for data sending from source to destination or sender to receiver and it provides security and aggregation of data removes spacing of different character and special character removed and send file from source to destination and confidential data are send securely in the system network.

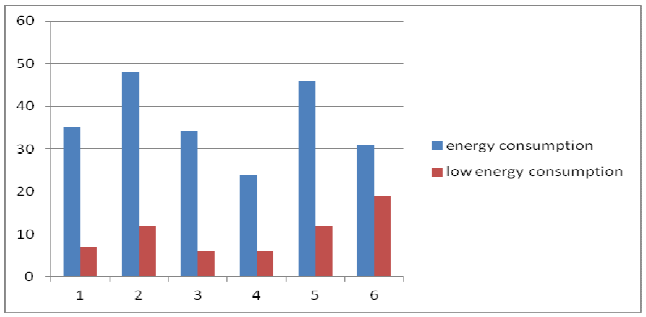

Figure 3.1 Graphical analysis of energy consumption using LEACH-AP protocol

Figure 3.1 represents for sending data from one node to another node in the clusters we have use K-means algorithm and AES algorithm. It compresses data and encrypts the files and send to source to destination or sender to receiver provides security. So it reduce the energy consumption by 80% for example before applying AES its energy consumption=35% and after encryption algorithm it goes to 7%.

4. Conclusions

In this paper the system addresses an enhancement of low-energy adaptive clustering hierarchy (LEACH) protocol for wireless sensor networks that uses a distributed cluster formation based on affinity propagation (AP). LEACH-AP mostly used to improve the network functionality and system lifetime. We have used distributed cluster formation algorithm for cluster generation by using AES algorithm and k-means algorithm. We concluded that the proposed Low energy adaptive clustering hierarchy-Affinity Propagation protocol (LEACH-AP) enable a fully distributed control and resolves practical limitations of conventional LEACH-based protocols by simplifying network functionalities and simply transferred data between different nodes over the network. Wireless sensor networks (WSNs) are subject to energy management for maximizing their lifetime. Keeps the signaling overhead minimal regardless of network size, does not require the predetermination of the optimal number of clusters. In

result sending acknowledgement and data, so require low energy and time for that operation.

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References

[1] IIlsoo Sohn, Jong-Ho Lee and Sang Hyun Lee, "Low Energy Adaptive Clustering Hierarchy Using Affinity Propagation For Wireless Sensor Networks", 2016, pp.1-5.

[2] ZHENGGUO SHENG1, CHINMAYA MAHAPATRA2, CHUNSHENG ZHU2 AND VICTOR C. M. LEUNG2, "Recent Advances in Industrial Wireless Sensor Networks toward Efficient Management in IoT", VOLUME-3, June1, 2015, pp.621-637.

[3] Sang Hyun Lee and Illsoo Sohn, "Affinity Propagation for Energy-Efficient BS Operations in Green Cellular Networks", VOL.14.NO.8AUGUST 2015, pp.4534-4545.

[4] Manohar Shamaiah, Sang Hyun Lee, Sriram Vishwanath and Haris Vikalo, "Distributed Algorithms for Spectrum Access in Cognitive Radio Relay Networks", VOL.30.NO.10, NOVEMBER 2012,pp.1947-1957.

[5] Javad Vazifehdan, R. Venkatesha Prasad, Martin Jacobsson, and Ignas Niemegeers, "An Analytical Energy Consumption Model for Packet Transfer over Wireless Links", Vol.16.NO.1, JANUARY 2012.

[6] Ali Jorio, Sanaa El Fkihi *y*, Brahim Elbhiri*z*, and Driss Aboutajdine, "Low Energy Adaptive Clustering in Wireless Sensor Network Based on Spectral Clustering", vol 7 no 3 & 4, year 2014,pp.138-147.

[7] Lalita Yadav1, Ch. Sunitha2,"Low Energy Adaptive Clustering Hierarchy in Wireless Sensor Network (LEACH)", Vol. 5 (3) , 2014,pp.4661-4664.

[8] Nitin Mittal#1, Davinder Pal Singh*2, Amanjeet Panghal#3, R.S. Chauhan+4, "Improved LEACH communication protocol for wireless sensor networks", 19-20 March 2010,pp.153-156.

[9] X. Liu, "A Survey on clustering routing protocols in wireless sensor networks"Sensors, vol. 12, no. 12, pp.11113-11153, Aug.2012.

[10] F.Zhao, Y. Xu, and R. Li, "Improved leach routing communication protocol for a wireless sensor network" Int. J. Distr. Sensor Netw., vol.2012, Article ID 649609, 6 pages, 2012

[11] M. Tripathi et al., "Energy efficient clustered routing for wireless sensor networks." In Proc. IEEE MSN'13.pp.330-335. 11-13 Dec.2013.

[12] D. Mechta, S. Harous, I. Alem, and D. Khebbab, "LEACH-CKM: Low energy adaptive clustering hierarchy protocol with K-means and MTE," in proc.IIT'14, Al Ain, pp. 99-103,9-11 Nov.2014.

[13] A Survey on Successors of LEACH Protocol, Sunil Kumar Singh, Prabhat Kumar, Member, IEEE, and Jyoti Prakash Singh, Senior Member, IEEE. 2017, pp.1-32.