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A Shuffled Leaping-Based Data-Gathering Algorithm for Industrial WSNs with a Mobile Sink

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Abstract: Wireless Sensor Networks (WSNs) is generally applied in various industrial applications, which involve gathering a huge amount of heterogeneous sensory data. The various data gathering techniques for WSNs cannot avoid the data loss problem in local or whole distribution area. Network loss problem affects the network connectivity and decreases the network lifetime. Hence, we propose a shuffled leaping algorithm data-gathering algorithm (SLA) for WSNs with a mobile sink. A novel Density based cluster formation method is introduced. The cluster head nodes of the constructed our Proposed algorithm balance the load of the whole network, reduce the energy consumption, solve the network loss problem, and increase the network lifetime.

Keywords: Data-gathering scheme, cluster, cluster head, mobile sink, wireless sensor networks.

I. INTRODUCTION

WSN has become an emerging field in research and development due to the large number of applications that can become significantly beneficial from such systems and has led to the development of cost effective, not-reusable, tiny, cheap and self-contained battery powered computers, also called sensor nodes. These sensor nodes can accept input from an attached sensor and process the input data gathered from the sensor nodes. After that the process data wirelessly transmits the results to transit network. WSNs are highly dispersed networks of lightweight and small wireless nodes, deployed in huge numbers, to monitor the system or environment by the measurement of physical parameters like pressure, temperature, or relative humidity. WSNs can be applied in industry, agriculture, military defence, environment monitoring, remote control and city management etc. that is why WSNs are becoming more and more popular. WSNs consist of tiny and low power sensor nodes that collect data through tiny sensors, process the data and send to particular location.[2]

A general WSN is composed of sensor nodes, a base station (or sink), and the events being monitored [8].
1.A sensor node typically consists of several parts including: a radio transceiver, a sensing unit, a microcontroller and power source usually a buttery. The sensor nodes might vary in cost from few to hundreds of dollars depending on the functionality of each sensor node. The constraints of cost and size of the sensor nodes led to constraints on its resources such as energy, communication and computation.
2.A sink node is a resourceful node having unrestricted communication and computational capabilities in addition to energy source, it can be stationary or dynamic and act as an interface between the sensor network and management centre.
3. The event being monitored may by stationary or mobile, depending on the application of WSN. Mounting sensor nodes on wild animals for behaviour monitoring, where these animal move in an unexpected manner, is an example of mobile sensor nodes applications. On the other hand, sensor nodes may be deployed on stationary and known locations

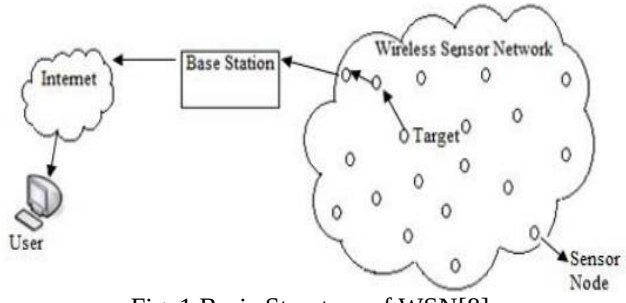

Fig. 1 Basic Structure of WSN[8]

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A.Clustering

Clustering can be considered the most important unsupervised learning problem; so, as every other problem of this kind, it deals with finding a structure in a collection of unlabelled data. A loose definition of clustering could be "the process of organizing objects into groups whose members are similar in some way". Cluster is therefore a collection of objects which are "similar" between them and are "dissimilar "to the object belonging to other clusters.

II. PREVIOUS WORK

A. Senthil Kumar et al [2015] [3] has explained data discovery and dissemination protocol for wireless sensor networks (WSNs) is responsible for updating configuration parameters of, and distributing management commands to, the sensor nodes. All existing data discovery and dissemination protocols suffer from two drawbacks. First, they are based on the centralized approach; only the base station can distribute data item. Such an approach is not suitable for emergent multi-owner-multi-user WSNs. Second, those protocols were not designed with security in mind and hence adversaries can easily launch attacks to harm the network. This paper proposes the first secure and distributed data discovery and dissemination protocol named (DiDrip).

Saahirabanu Ahamed et al[2015][4] has proposed secure reprogramming is an important issue in Wireless Sensor Networks (WSN) to suit the sensor nodes for different applications. Reprogramming is the process of uploading a new code or changing the functionality of existing code. It enables users to extend or correct functionality of a sensor network after deployment at a low cost. The mobile sink is most widely used for the sensor programming. The existing protocols are based on the centralized approach in which only the base station has the right to begin reprogramming. It is desirable for multiple authorized network users to simultaneously reprogram sensor nodes without the involvement of base station called as distributed reprogramming. Therefore the base station or the network owner can also assign reprogramming privileges to different users. Reprogramming the sensor node faces security challenge such as, the attacker may send the malicious code image for reprogramming. Then the attacker can easily capture and compromise the node in the network. In this paper, we propose a Secure Localized Sensor Reprogramming Protocol (SLSRP) with mobile sink for wireless sensor networks. It allows the base station to authorize multiple network users with different privileges to simultaneously and directly disseminate data items to the sensor nodes. Every code update must be authenticated for security reasons to prevent an adversary from installing malicious code in the network. This scheme is also implemented in an experimental network of resource-limited sensor nodes to show its high efficiency in practice.

Kanchan Verma,et al [2015] [5]has proposed Wireless sensor network comprises of a set of sensor nodes that communicate among each other using wireless links and work in an open and distributed manner because of less number of resources on the nodes. The sensor nodes sense information about an event from the ambiance and then the information is forwarded to a sink node for further processing and analyzing. The sensed information can be forwarded in many ways, earlier uni cast routing was there to a single sink node, but due to the wide variety of WSN applications the presence of multiple sinks is realized which necessitates multicast routing for efficient data dissemination to multiple destinations. For any disaster surveillance or fire handling emergency scenarios various multicast routing protocols have been proposed by many researchers. This paper focuses on providing a survey of the existing multicast routing protocols by presenting approach, their advantages and disadvantages. Further a comparative study of various multicast protocols is done on the basis of different parameters to identify different issues and challenges that need to be resolved for each one of them.

Gao Weimin et al [2015] [6] the techniques of distributed data storage in wireless senor networks. Firstly, the challenge and the need for such techniques were summarized; Secondly, some representative distributed data storage and retrieval schemes were introduced in detail; finally, the future research directions and open issues were pointed out.

Sneha Ghormareet al.[2015].[7] In Wireless Sensor Network, the security of data and confidentiality of data is an important aspect. Hence the data cannot be interrupted by the intruder. For updating configuration parameters and distributing management commands, data discovery and dissemination protocol for wireless sensor network is responsible. But, it has drawback is that, some protocols were not designed with security. For this reason, The DiDrip protocol i.e. first secure and distributed data discovery and dissemination protocol is proposed. The main function of this protocol is for authorized multiple network user. So, with the help of different security parameters the system provides a high security to the wireless sensor network. Energy efficient new algorithm is also used because it is difficult to crack An easy way to comply with the conference paper formatting requirements is to use this document as a template and simply type your text into it.

H. M. Abdulsalam et al [2010 [8]]has explained the many applications deal with continues flows of data (data streams). One important area of applications that is based on data streams is the area of Wireless Sensor Networks (WSNs)

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application. Since sensors have limited lifetime, the need for developing algorithms for aggregating sensors data forms an important concern in the area of WSNs. They present W-LEACH, a data-stream aggregation algorithm for WSNs that extends LEACH algorithm by Hein Zelman et al. W-LEACH is able to handle non-uniform networks as well as uniform networks, while not affecting the network lifetime. It, instead, increases the average lifetime for sensors. Its simulate the algorthim to evaluate its performance. and W-LEACH increases the network lifetime and the average lifetime for sensors for uniform and non-uniform WSNs

III. PROPOSED WORK

In our Proposed algorithms. The cluster head is formed with the help of density .which find optimal path for data gathering. The dynamic cluster head is formed with the help higher density based value .if cluster head goes down a new cluster is formed on the basis of higher density value without disturbance in network .with this our proposed algorithm play vital role in data gathering in network.

Algorithm

Step 1: Generate WSN scenario using NS2

Step 2**:** Start with some initial elements like no of nodes, neighbor node, Base Station.

Step 3: Initialize with N no. of nodes.

Step 4: Implement shuffled leaping algorithm technique.

Step 5: initially Start shuffled leaping algorithm for efficient resource switching and cluster head formation Technique

Step 6: In shuffled leaping algorithm if any cluster head will stop working another available cluster head will be used for transmission

IV. RESULT ANALYSIS

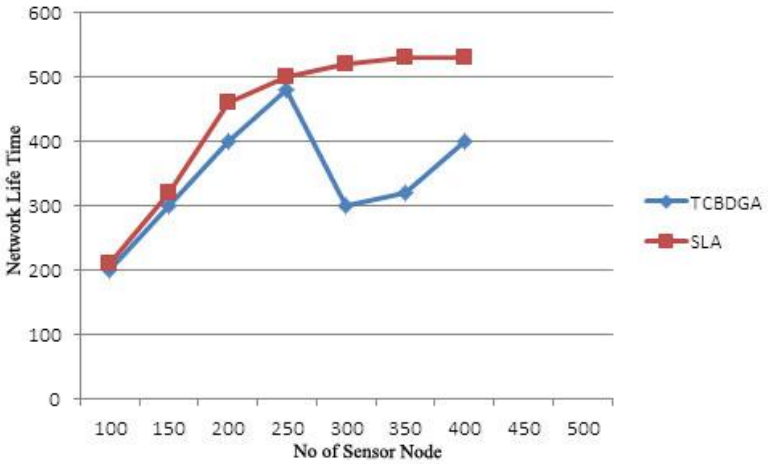

Fig 2 Comparison of Network Life time

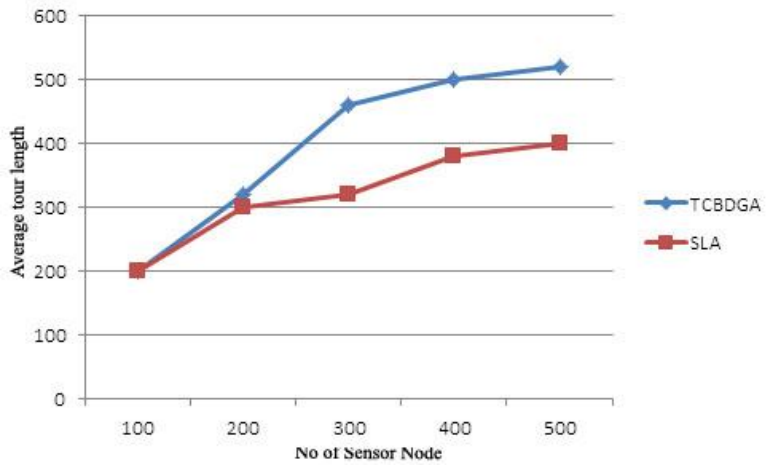

Fig 3 Comparison of Average Tour Length

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From Fig. 2 and 3, we can see that the network lifetime of our SLA is almost 9:4 times than that of TCBDGA when N is set to a small number 200, and even the SLA with no reconstructions has a longer lifetime than that of TCBDGA. As the number of nodes increases, the network lifetime in TCBDGA decreases, but SLA life time is longer than that of TCBDGA

V. SIMULATION SCENARIO

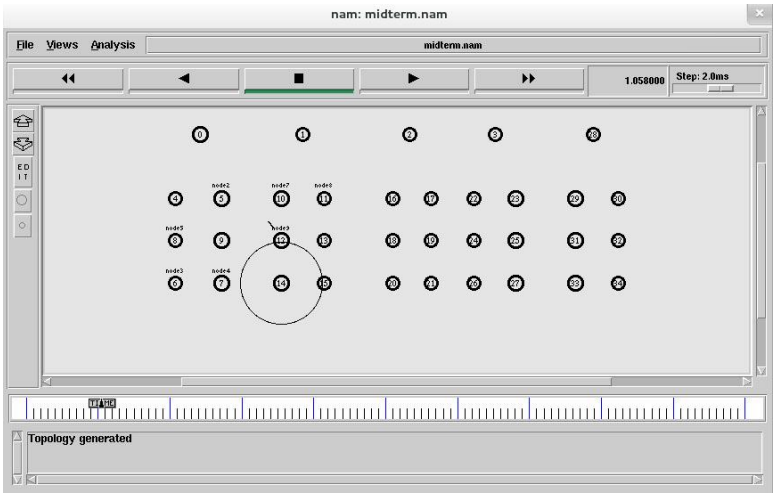

Fig4. Topology Generated

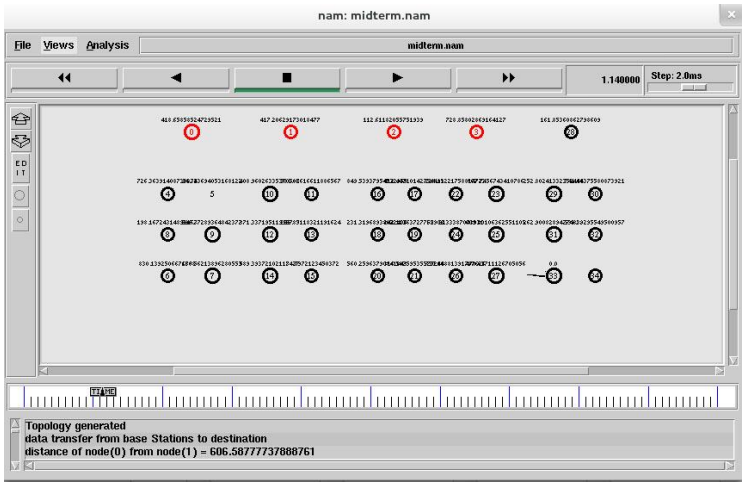

Fig5. Cluster Head Formation Process Started

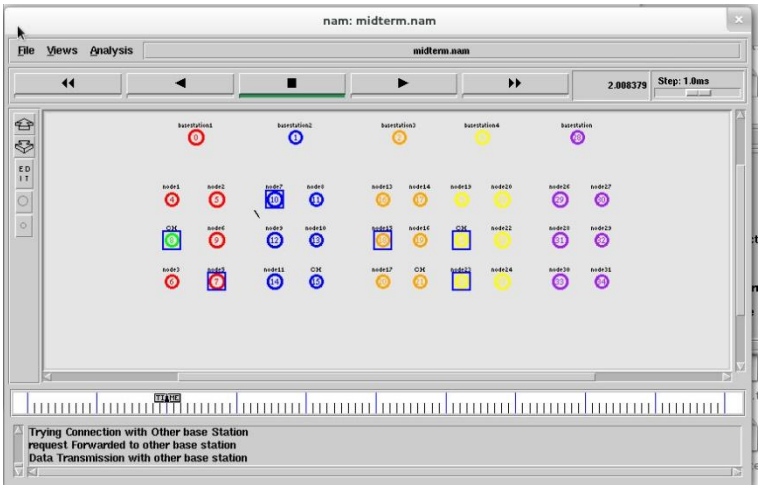

Fig4. Cluster Head formed by SLA Technique

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The Fig 4,5,6 shows the automatic cluster head formation with the help of SLA technique which shows optimal data gathering in the network.

VI. CONCLUSION

In this paper, we explore recent various we proposed dynamic cluster head formation on data gathering Based on the comparison and analysis, we propose a SLA base data gathering algorithm with a mobile sink for WSNs. First, we introduce a density base tree construction method, where the density of each sensor node jointly considers the average residual energy, the distance to the BS, and local node Densities. We also introduce an adjusting method for the cluster head reselection, in order to reduce the base station network down time. The simulation results demonstrate that our SLA can prolong the network lifetime significantly compared with the other data gathering algorithm TCBDGA It is more fit for wide area, especially in industrial environment involving massive amount of heterogeneous sensory data

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