ISSN : 2347 - 8446 (Online)
ISSN : 2347 - 9817 (Print)
Vol. 4, Issue 2 (Apr. - Jun. 2016)
International Journal of Advanced Research in Computer Science & Technology (IJARCST 2016)

Energy Conservation in Sensor Nodes Using Sink Node Kinesis for Huge Data Collection in Compactly Distributed WSN

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Abstract
Big data has considered being gifted application in the field of information and communication technology (ICT). Wireless sensor networks are used to gather huge data in communication expertise. In many Case it Become important to Collect Information from many Sensor in distributed sensors. Because of limited power in Wireless sensor networks, big data collection becomes difficult job. To increase network Lifetime in Wireless sensor networks the route for data transfer are chosen in such a way that the total energy consumed along the path is minimized. To get good rate of data collection and high scalability, wireless sensor nodes are usually grouped into non-overlapping, disjoint subsets called clusters. Clusters create hierarchical Wireless sensor networks which incorporate efficient utilization of limited resources of sensor nodes and hence extends lifetime of network. In this paper we proposed an efficient new way for data collecting using cluster based technique. In the proposed system we used k-medoids clustering technique for the optimum number of clusters and created sink node path, used as efficient data collector. And we test this for Energy efficiency, data delivery etc. And also using novel approach for data encryption and decryption for providing security.

Keywords
Big data, Data aggregation, clusters, k-medoids, sink node trajectory.

I. Introduction

Wireless sensor networks (Wireless sensor networks) are used in many of the applications related to defense, medical, home, etc. The new technologies in wireless communications and electronics have led to the development of less-cost, less power consumer and multi-user sensor system. A WSN has several number of sensor nodes that are spread heavily within a network area. The location of sensor nodes are need not be preset or engineered. This allows random distribution in Remote area or disaster relief operations. They are also capable of self-organizing them self's, Another Special feature of wireless sensor networks is the cooperation between sensor nodes. Wireless Sensor nodes are fitted with an onboard processor. Instead of sending the unprocessed data to the nodes are responsible for further action, they use their reserving abilities to carry out simple operations and move only the required and partially processed data. The described features ensure a broad range of applications for Wireless sensor networks. Some of the applications are healthcare, defense and home. In defense, for example, the rapid deployment, self-organization, and fault tolerance of sensor networks make them very promising sensing techniques for defense operations, control, interactions, performing, intelligence, surveillance and targeting systems. Implementation of above mention and other Wireless sensor networks applications require wireless ad hoc networking techniques. Procedures used in wireless ad hoc networks were not healthy suited the exclusive features and application requirements of sensor networks. The key limits of wireless sensor networks their limited power storage sizes and prone to failures. Hence energy conservation is the major issue in wireless sensor network.

As information technology breeds quickly, amount of the data also increasing consecutively. Accessing the retrieving huge data is crucial for the user in many applications. Big data may be of both structured and unstructured data that is so huge that it's rough to process using database and software techniques. In most of these cases the data is too large or it moves rapidly or it exceeds present processing or computational capacity. Big data has the potential to help industries to improve operations and make quicker, more intelligent , optimized decisions. Collecting large amount data from sensor nodes is the major concern in the field of ICT. Single sensor nodes may not give correct information so it become necessary to collect data from many distributed wireless sensor nodes.

In order to get these data, the Wireless sensor networks are exhibited in following way, the wireless sensors send their respective data to the "sink" in single or relay hop format. However, in case of widely and densely distributed Wireless sensor networks there are two problems in gathering the data sensed by millions of wireless sensors. Primarily, the network is separated to some sub-networks groups because of the limited wireless communication range. Second, the energy is consumed while transmitting the data from one sensor to other. Even though the size of data generated by an individual WSN is not huge, each sensor requires a lot of energy to process the data formed by surrounding sensors. Especially in dense Wireless sensor networks, the life time of sensors will be very less because each sensor node compute a lot of data generated by enormous number of surrounding sensors. In order to overcome these problems, we need an energy-efficient method to gather huge volume of data from a large number of sensors in the densely distributed Wireless sensor networks.

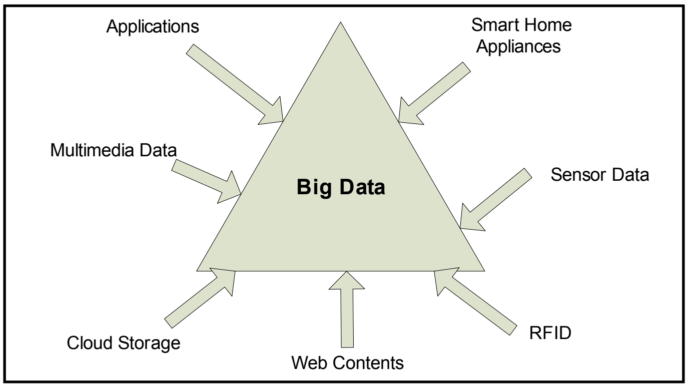

Fig. 1 : An Overview of Big Data Gathering

To attain energy-efficient data collection in widely distributed Wireless sensor networks, there have been many established

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methods. Clustering is one of the most used techniques to make Wireless sensor networks energy efficient. Low energy adaptive clustering hierarchical (LEACH) clustering algorithm is introduced to maximize the life time of wireless sensor network. In [] used expectation maximization clustering technique.
In this paper we proposed an better method to collect huge data in widely distributed sensor network using k-medoids clustering algorithm. K-medoids algorithm is used as clustering of Wireless sensor networks. K-medoids is not only efficient in clustering also optimized in selecting cluster heads in large Wireless Sensor Networks. Later we made sink node to go the each cluster head and collect information from cluster head .the path motion of sink node uses TSP (traveling sales man)algorithm

II. Related Work

[5]Recent days Big-Data has been used in Artificial intelligence and data-driven decision-making is now being familiar mostly, and there is growing interest for the notion of "Big Data". Heterogeneity, scale, timeliness, complexity, and privacy problems with Big Data impede progress at all phases of the pipeline that can create value from data. The problems start right away during data acquisition, when the data tsunami requires us to make decisions, currently in an ad hoc manner, about what data to keep and what to discard, and how to store what we keep reliably with the right metadata. Most of the data that are generated by wireless sensor node are not structured for example, tweets and blogs are weakly structured pieces of text, while images and video are structured for storage and display, but not for semantic content and search: transforming such content into a structured format for later analysis is a major challenge. The value of data explodes when it can be linked with other data, thus data integration is a major creator of value. Since most data is directly generated in digital format today, we have the opportunity and the challenge both to influence the creation to facilitate later linkage and to automatically link previously created data. Data analysis, organization, retrieval, and modeling are other foundational challenges. Data study became a critical issue in many applications, due to absence of scalability of the underlying algorithms and due to the difficulty of the information that needs to be studied.
[4]In this paper, we express a flow control optimization problem for wireless sensor networks with lifetime restriction and link intervention in an asynchronous setting. Our formulations based on the network utility maximization frame work, in which a general utility function is used to characterize the network performance such as throughput. To solve the problem, we propose a fully asynchronous distributed algorithm based on dual decomposition, and theoretically prove its convergence. The proposed algorithm can attain the supreme usefulness. Wide simulations are lead to prove the efficiency of our algorithm and validate the analytical results.
[2]This paper grants and analyzes three-tier architecture for gathering sensor data in light sensor networks. Our approach exploits the presence of mobile entities (called MULEs) present in the environment. When in close range, MULEs pick up data from the sensors, buffer it, and deliver it to wired access points. This can lead to substantial power savings at the sensors as they only have to transmit over a short-range. This paper focuses on a simple analytical model for understanding performance as system parameters are scaled. Our model assumes a two-dimensional random walk for mobility and incorporates key system variables such as number of MULEs, sensors and access points. The performance metrics observed are the data success rate (the fraction of generated data that reaches the access points),latency and the required buffer capacities on the sensors and the MULEs. The exhibiting and simulation outcomes can be used for future study and provide some protocols for deployment of such systems.
[3] Clustering is a normal way for attaining well-organized and scalable presentation in wireless sensor networks. Usually, clustering algorithms aim at making a number of disjoint clusters that satisfy some standards. In this paper, we formulate a novel clustering problem that aims at generating overlapping multi-hop clusters. Overlapping clusters are useful in many sensor network applications, including inter-cluster routing, node localization, and time synchronization protocols. We also propose a randomized, distributed multi-hop clustering algorithm (KOCA) for solving the overlapping clustering problem. KOCA aims at generating connected overlapping clusters that cover the entire sensor network with a specific average overlapping degree. Through analysis and simulation experiments we show how to select the different values of the parameters to achieve the clustering process objectives. Moreover, the results show that KOCA produces approximately equal-sized clusters, which allows distributing the load evenly over different clusters. In addition, KOCA is climbable; the clustering formation terminates in a constant time regardless of the network size.
[8]A WSN is a specialized wireless network made up of a large number of sensors and at least one base station. The foremost difference between the WSN and the traditional wireless networks is that sensors are extremely sensitive to energy consumption. Energy saving is the crucial issue in designing the wireless sensor networks. Since the radio transmission and reception consumes a lot of energy, one of the important issues in wireless sensor network is the inherent limited battery power within network sensor nodes. In order to maximize the lifetime of sensor nodes, it is preferable to distribute the energy dissipated throughout the wireless sensor network. The data gathering schemes should be power efficient. In our proposed work we are changing the idea related to the data gathering and transmission protocol Chiron. The main goal of our research is reduce of energy consumption and improve the lifetime of network as chain leader belonging to the certain covering angle will only transmits the gathered data to the another chain leader of the same covering angle and then we send the data of the another covering angle in sequential manner . So the data is transferred to some angle based chain leader rather than to the nearest chain leader. By this method of data gathering we found that energy consumption is reduced and lifetime is improved significantly.

III. Problem Statement

There are mainly three Problems in gathering the data sensed by millions of wireless sensors network nodes.
1. because of limited wireless communication range, Network is divided to some sub-networks
2. The energy of the sensors nodes will be consumed while transmitting the data in wireless mode.
3. To reduces delay in data-gathering. There should be only one sink node for each sub-network

IV. Proposed System

1. Network initialization.
2. Cluster formation.
3. Calculating cluster centroids.

4. Identifying sink node and evaluating trajectory.
5. Efficient data gathering using sink node.
6. Result analysis.

Network initialization:
In this phase we initialization the positions of each node and define energy of each node and also bandwidth and channel details of each node

Cluster Formation:
Distributed sensor nodes will be grouped together to form cluster using k-mediod . it works based on concept of related
Nodes are grouped together to form cluster

Calculating cluster centroids:
Cluster head among each cluster is formed using k-mediod algorithm .where randomly one node will be selected as cluster head and then using k-mediod, we will choose a node with optimal distance from other nodes in each cluster

Identifying sink node and evaluating trajectory:
Identifying dynamically the sink node position and evaluating the distance between the sink node and cluster head and using traveling salesman problem the trajectory path is chosen

Efficient data collection between cluster and cluster head
On the arrival sink node the data will be transmitted to cluster head in scheduled manner

Efficient data gathering using sink node:
Sink node moves to each node in TSP algorithm manner and efficiently in scheduled manner

Result analysis:
In this we are comparing the Existing and proposed system with reference to
Energy efficiency
Data delivery
Delay

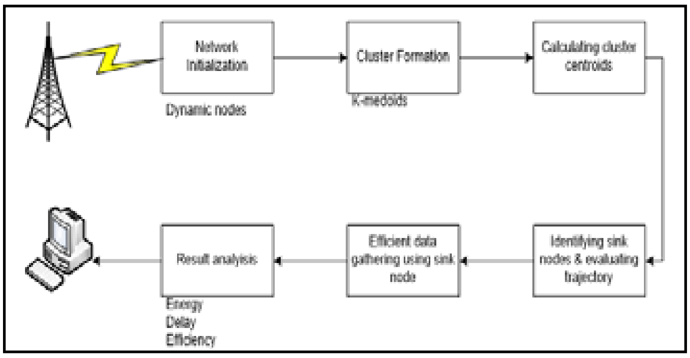

Fig 2: Proposed Architecture For Data Collection And Cluster Formation

V. Algorithm

Input: the network graph G(V,E) the number of clusters to be formed; Y, the fading factor of physical channel
Conditions: a set of clusters involving all nodes
1: chose k nodes randomly as initial cluster heads, and use M to denote the set of those k cluster heads.
2: Establish an empty set C_i for head h_i of M, and initialize C_i by $C_i \cup h_i$
3: Establish a set N initialized empty
4: while any node u of V/M do
5: u chooses h_i of M as its head such that
$\arg_{h_i} \min\{d^{\lambda}_{u,h_i} \mid \forall h_i \in M\}$
Where d_{u,h_i} is the Euclidean distance from u to h_i.
6: $C_i \leftarrow C_i \cup u$
7: end while
8: while any C_i do
9: Select a node u from C_i as new head such that

$$\arg_u \min\left\{\sum_{v=1,v\neq u}^{|C_i|} d^{\lambda}_{u,v} \mid \forall u \in C_i\right\}$$

10: $N \leftarrow N \cup u$
11: end while
12: if $N \neq M$ then
13: $M \leftarrow N$
14: $N \leftarrow \emptyset$
15: go to step 4
16: end if

VI. Performance Evaluation

The following graphs are compared to the existing method which are based on Expectation-Maximization technique (EM-METHOD) to the K-medoids technique. The graphs are showed better performance in energy, delay and data delivery efficiency.

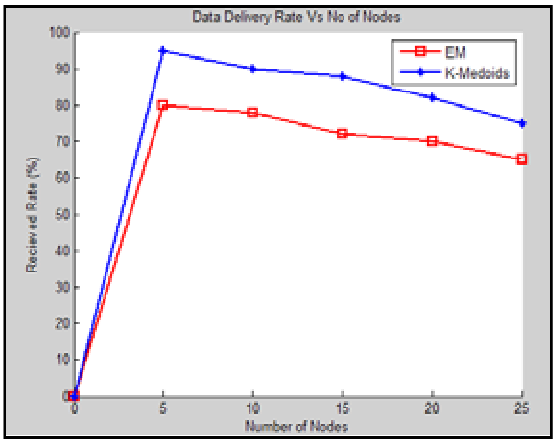

Fig. 3: Data Delivery Performance

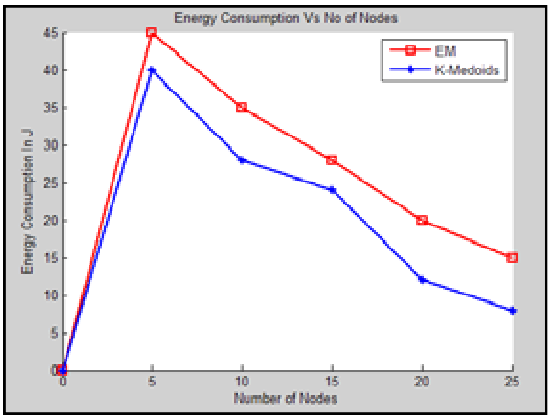

Fig. 4: Energy Level Performance

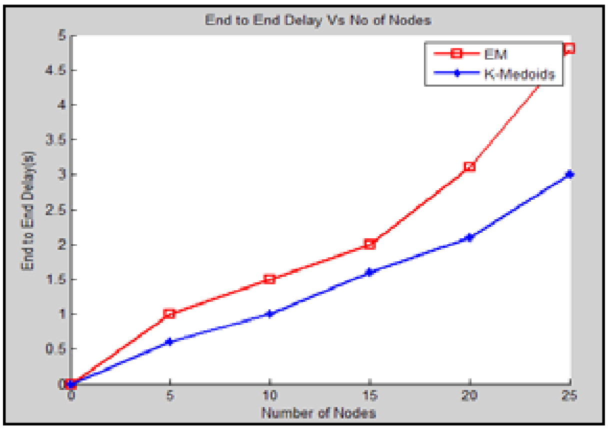

Fig. 5: End to End Delay Performance

VII. Conclusion

The system gathers big-data energy efficiently using this proposed scheme for large-scale wireless sensor networks. This system suggests that energy efficient big data gathering in such networks is, indeed, necessary. We use optimal routing algorithm for communicating between sink node and cluster head. Once the cluster head gathers information from each node within a cluster, then that information should be passed to sink node in single-hop path. If the communication range is far than normal then multi-hop path is taken for gathering data. By using optimal routing mechanism we can gather big-data energy efficiently and also by using novel approaches it is possible to secure the data effectively from eavesdroppers..

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