A Survey On: Energy Aware CSI For Distributed Randomized K-Covered WSN

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Abstract: In Wireless Sensor Network each sensor is powered with battery life. Energy consumption plays an important role in WSN. Network life is prolonged by enhancing the energy conservation. The geographical forwarding and k coverage is used together to analyze the energy and the battery life. The sleep awake scheduling algorithm is used where energy loss takes place, so a distributed k covered randomized algorithm is used to improve the battery life and energy. The k coverage covers the maximum area with minimum number of sensors. Example for k coverage is planet exploration, multi sensor data etc. The k coverage plays an important role by minimizing energy and determining the number of active sensor for the required k coverage field. Geographic forwarding is used for passing the data from source to destination, when forwarding the data it assumes that all sensors are active but it is unrealistic in real world application where the sensors are switched on and off. The work carried out in this paper focuses on providing a minimum energy duty cycling protocol to prolong the battery life and energy efficient geographic forwarding.

Keywords: Geographic Forwarding, Scheduling, Clustering, k-coverage, Wireless Sensor Network.

1. Introduction:

WSN is a collection of wireless nodes. These sensors have limited energy capabilities which are mobile or stationary and randomly located. The first WSN was designed and developed in 70's by the military defense industry. However there were several drawbacks like large size of sensors, energy consumption and limited network capability. Since then, WSN has developed a lot with varying characteristic and requirements. The WSN uses energy efficient routing protocol for delivering the data efficiently. The WSN are used in many areas like, monitoring in military, monitoring air pollution, monitoring forest fire detection, agriculture, and healthcare. In WSN, when the event is detected it is immediately reported to the base station that decides the action and reports the message, this is how the sensor monitor in the network. A challenging problem in WSN of the protocols is the energy consumption, due to the constrained battery power of the sensors. In this paper we are going to survey how to reduce the energy conservation and increase the battery power so that, the network lifetime is prolonged. In most of the WSN they use duty cycle where the sensors can be in awake state when they turned on and go to sleep state when they are in off. These sensors are in awake state or sleep state is determined by the sleep-awake scheduling protocol, using this the data's are forwarded. An another method used by the WSN for forwarding the data is, geographic forwarding where the sensors need not store the global information's about the network it is enough that only the information of the neighboring nodes is stored to send the data's. The main aim is to gather the information's of the data and then send them to the sink through the active sensor nodes.

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A drawback in geographic forwarding is that it assumes that the sensors are always in active state where it is unrealistic in real world. This paper focuses on coverage, forwarding and duty cycling which is defined with Cover Sense Inform (CSI) framework. The framework consists of k-covered sensors where this k-coverage is explained using minimum 3 sensors. Where we use 3 sensor so that these sensors covers the area, even if one sensor fails the other sensors, senses and collects the data's and forwards it to the sink. This k-cover is used to detect, classify and target objects. These sensors are designed using triangulation based positioning system which is to increase the position accuracy.

2. Related Work:

The previous work consists of three major challenges; the first challenge is how to determine the number of active sensor that fully covers the k-cover area and only the characterized coverage is focused. Using this intersection points between the boundaries the intersection area is noted in which it results only 1- coverage. In this paper using the minimum number of active sensors, maximum coverage is provided. The second challenge is to determine a minimum energy duty cycle ,so there should be a minimum number of active sensor to cover the field and it can deplete the energy uniformly. Though many k-covered protocols are used it does not provide good results with minimum number of active sensors. Here our goal is to prolong the network lifetime and battery power. The third challenge is determining energy efficient geographic forwarding protocol to forward the data's with minimum energy consumption using the duty cycle.

2.1 Energy Conservation in Sensor Network:

The energy conservation is based on the coverage and connectivity ,to provide this a protocol is designed which can dynamically configure a network to achieve a guaranteed degree of coverage and connectivity. This provides a geometric relationship between the coverage and connectivity. By using this protocol the network lifetime is prolonged and an efficient coverage is maintained. But the drawback is that it covers only 1-coverage and it does not deal with scheduling algorithm. [2]

2.2 Coverage in WSN:

The distributed protocols are designed for determining the level of coverage and connectivity of sensor network and even for adjusting a sensor to achieve the expected levels of coverage and connectivity. The approach used here is to put some sensors into the sleep mode and to reduce the transmission power of some sensors. By putting some sensors in sleep mode the transmission power is increased and by increasing the transmission power the network lifetime is also increased. It can also cover only 1-coverage and it does not deal with data forwarding.[1]

2.3 Coverage in heterogeneous Sensor Network:

Here a differentiated coverage algorithm is used for the heterogeneous sensor network. The sensor are placed in different areas for coverage so different sensors covers different areas so using this algorithm the degree of the coverage in different area is found. By this algorithm the time consumption is less, it improves scalability. The drawback is, it does not provide security to the network and all unwanted nodes also receives the data's.[5]

2.4 Coverage by Directional Sensors:

The sensors are placed randomly in a network and the coverage is provided by the directional sensors were these sensors had to cover a maximum area with minimum number of sensors. Here this maximum coverage with minimum sensors (MCMS) problem is solved by maximizing the target to be covered so that the number of sensors to be activated is minimized; by this method the network life time is prolonged. The problem here is, it does not provide an exact solution.[4]

2.5 Energy efficiency in sensor network:

To improve the energy efficiency a Span technique is used, the Span is a distributed coordination technique. This technique is used in the wireless network to reduce the energy consumption without decreasing the capacity and connectivity of the network. It also increases the communication latency and capacity. But this is a complex process and the network life time becomes less.[3]

2.6 Data aggregation in WSN:

The data aggregation method is used to prevent the traffic analysis in the network. This data aggregation uses the decoy sink protocol this protects the location of the sink in tracking the target sensor application by forwarding the data to decoy sink for aggregation before the aggregated data is forwarded to the real sink from decoy sink. By this, the traffic near the sink is reduced. But it consumes more memory to store these data's.[6]

3. System Architecture:

The sensor nodes are given as the inputs were the data's from the sensor are send to the framework where it consists of (GEFIB) k-coverage and geographic forwarding protocol. Here the data's are aggregated using different methods and they are used to send the data's to the destination. By using this protocol we are going to prolong the network lifetime and reduce the battery consumption. The framework consists of forwarding with data aggregation, local aggregated data forwarding, global aggregated data forwarding, and data aggregation with tree condition. After the aggregation the data's are compared with the CCP Coverage control protocol. The forwarding with data aggregation is performed by clustering all the data's in the cluster. These data's are collected by the cluster and data's are sent to the cluster head. The cluster head aggregates the data and it selects the best slice from the data. Once the best slice is selected, the cluster sends it to the sink. The local aggregated data forwarding gathers the data from the cluster and sends to the cluster head locally. For each round the data's are being send to the cluster head then the cluster head sends the data to the next cluster head. The global aggregated data forwarding gathers all the data's send by the local cluster head and they are aggregated by the global cluster head. Where all the data's of the local cluster head are aggregated to a single global cluster head and they are being send to the destination.

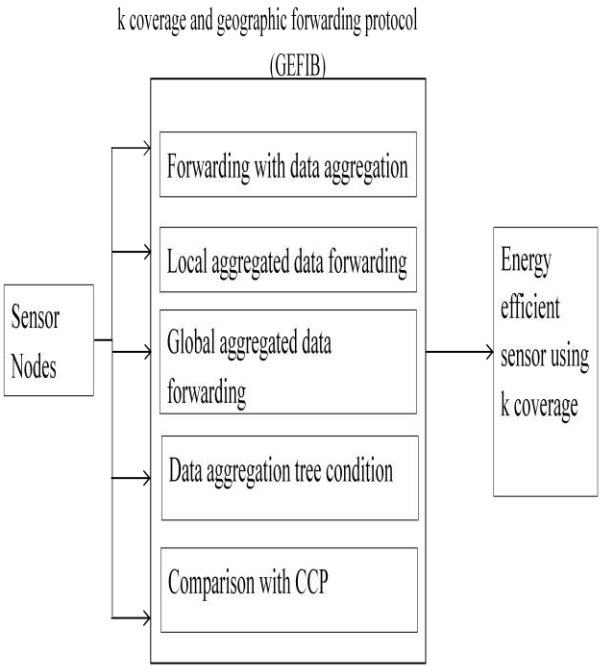

Fig1. System architecture

The data aggregation tree condition consists of rings, in which there are three cluster heads, two of the cluster heads are called aggregation initiator and the third is ring aggregator. Each ring consists of ring id and identification number which are used by the cluster head to forward the data to the corresponding ring aggregator. Each cluster head belongs to one ring. The ring aggregates the and it compares with the CCP and selects the best slice and sends to the sink. Therefore the sensed data's are forwarded to the sink using the k-coverage and geographical forwarding protocol.

3.1 Forwarding with Data Aggregation:

All data's originated from the sensor in the cluster are received by their corresponding cluster head. The cluster head aggregates the data's received from the sensor. From these, the data's average is found by the cluster head and best slice is selected. This best slice is send to the sink without further aggregation.

3.2 Local Aggregate Data Forwarding:

The aggregation occurs only within the cluster and all the data's are aggregated by the cluster head. The cluster head sends the data to the next cluster head without any aggregation. Here the aggregation of the data's takes place between the clusters. Thus the next cluster head receives data packet in each round from the cluster head.

3.3 Global Aggregated Data Forwarding:

All the data's send by the cluster head are aggregated by a single cluster head. At the end of each round the sink receives only one aggregated data from all the cluster heads. This cluster head is called as the global cluster head. The global cluster head aggregates all the data's and sends the data to the destination.

3.4 Data aggregation with Tree Condition:

The data aggregation consists of rings, the sink randomly selects three cluster heads, where two are called aggregation initiators and the third is ring aggregator, each cluster head belongs to one ring only. The ring is defined by the ring id and identification number. By this the data's are aggregated in the ring by adding values. Finally the average is calculated using the ring and the best slice is found and the best slice is send to the destination.

4. Conclusion:

The data efficient selection and their delivery play is an important role in wireless sensor networks. The important issue is energy efficiency which is characterized with limited battery capabilities. In this paper, we describe an energy efficient protocol which covers a maximum area with minimum number of sensors. They use a triangulation based positioning method, in order to calculate the distance among the nodes, thus minimizing the energy consumption and increasing the network lifetime.

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