Efficient Algorithms to Improve the Performance of Wireless Sensors Network using Multi-sink and Mobile Sink

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ABSTRACT
Wireless sensors are the emerging area in networking. Wireless sensors consist of numerous sensors deployed in network. The development of the internet is very fast, such a situation home networking has significant importance. Sensors are attached in home consumer products so that it can collect information. Consumer sensors have tiny battery which cannot be able to replace. In such situation there is the need of energy efficient algorithms to prolong the life time of sensors.

Sink mobility is the solution for this problem. It will improve the performances of the network, with less energy consumptions. Multiple sinks are used in the network will help to reduce the energy consumption of sensors. Here proposing two algorithms "Energy-efficient Algorithm (MEA) and Energy-efficient Clustering Multi-sink Algorithm (ECMA)".

Keywords
Wireless Sensor Networks, Sink Mobility, Clustering, Energy Consumption, Network Lifetime,

1. INTRODUCTION
In the home network there are a number of consumer products. A home network contains a certain type of network connecting many consumer products e.g. sensors, such that the users can control these appliances in an interactive and intelligent way to improve their Quality of Life (QoL).

A home network can be able to implement by the technologies like, IEEE 802.11, IEEE 1394, Ultra Wide Band (UWB), Bluetooth and ZigBee. Wireless sensor network is used to implement a home automation network. Wireless sensors have the properties like self-organizing, infrastructure less and fault tolerance. With these properties the wireless sensor network can be used in home networks.

Wireless sensor network is the network which is composed with a number of sensors [6]. In the wireless sensor network, the sensors will sense and process the data. A home network contain consumer product with sensors which will sense and process the home raw data. After sensing and processing the data, it will give to remote sink node called base station (BS).

Each sensor is equipped with irreplaceable batteries. The tiny batteries are very difficult to recharge [7]. So it is necessary for implementing an energy efficient algorithm. Introducing mobility to the sink node will increase the energy efficiency, life time and performances [8,9]. Mobility can be introduced by mounting the sensors on a moving object or on humans. Introducing mobility has many advantages like mitigate hot spot problem and balancing the energy in network. Here two mobility based energy efficient algorithms are proposing.

A home network contains a number of cameras and sensors, it collect the home raw data. The home network is dividing into clusters and each of these clusters contains cluster head which will gather all the data from the nodes in cluster.

2. RELATED WORKS
LEACH [1] (Low-Energy Adaptive Clustering Hierarchy) is a clustering based routing protocol that has randomized rotation of the cluster head, and the property of data fusion of collected data from sensors and gives to base station. LEACH is completely dispersed, requiring no control Information from the base station. In network energy dissipation is reducing effectively by distributing the energy among the nodes and it enhancing system lifetime.

Data MULES [2] (Mobile Ubiquitous LAN Extensions) collect the data from the sensors when it close to the sensors and it buffer these data, drop it to the wired access points. Power saving at the sensors can be achieved by these MULES because they only have to broadcast over a small range.

Scalable Energy-Efficient Asynchronous Dissemination protocol (SEAD) [3] is used to minimize the energy consumption. By considering packet traffic rate among nodes and the distances between the nodes SEAD create optimal dissemination trees. By update data successfully the sink can move to the next position without giving its current location information to the dissemination tree.

Mobile sink brings new issues to compactly deployed and large wireless sensor networks (WSNs). When the sink moves, frequent location updates from the sink can generate too much power consumption of sensors. In this paper propose IAR [4], an Intelligent Agent-based Routing protocol that provides efficient data release to mobile sink.

Life time is a major factor in wireless sensor network. The sensor node near to the base station will relay more data so there are the chances to deplete the batteries more easily. Solution to the problem propose in the paper [5] suggest the mobile base station. Optimization of data collection protocols

can be done by taking multi-hop routing and base station mobility.

3. PROPOSED SYSTEM

Energy-efficient Clustering Multi-sink Algorithm (ECMA) as well as a Mobile-sink based Energy-efficient Algorithm (MEA) is proposed in this section. Multiple static and mobile sink nodes are influenced on network performance is studied under different scale hierarchical networks.

In Energy-efficient Clustering Multi-sink Algorithm (ECMA) the network is divided into a number of clusters. In each cluster there should be a cluster head (CH) and the remaining nodes are called ordinary nodes.CH is the head of cluster and it determines the residual energy of the remaining nodes. It receives data from the remaining nodes and sends aggregate data to the sink node. Network scalability and easier management can be guaranteed by adopting clustering or hierarchical routing. Energy utilization can be well balanced and reduced if the clustering algorithm is well planned with CHs located in a geographically more uniform way. Thus the network life time can be also increased.

In ECMA, each cluster head selects an optimal sink to send aggregated data. The lessening and the balancing of the energy consumption is the major concern. In many clustering algorithms, such as LEACH, some sensor nodes in the same cluster send data directly to the cluster head.

Due to the fact of various locations, certain sensor nodes may use large amount of energy based on long-distance transmission. Therefore, multi-hop routing is used here. As the multiple sink nodes are randomly deployed then in practice some nodes may consume less energy through sending data directly to the sink rather than to its cluster head.

In Mobile-sink based Energy-efficient Algorithm (MEA).For this algorithm the network is first divided into clusters. For cluster there are cluster heads. In this algorithm the sink has mobility. Initially the sink sent its position to every node in its range .After broadcasting finishes, the mobile sink is ready to collect data. Here the mobile sink is assumed to stay at a site for a long period .So that it can complete a round of data collection, and then it moves to the next position.

1) Relocation of sink nodes

In MEA, the moving velocity v of the sink is predetermined. A sink node only needs to broadcast across the network to inform all sensor nodes of its current location P_0 at the very beginning for just one time. Later on, as sensor nodes keep trace of the original site of the sink, they can decrease the changed angle Θ after a time interval $t\Delta$

2) Cluster formation and cluster head selection

The whole sensor network is divided into a number of clusters. When the CH selection begins, the sensor node that is located in the center of each cluster is motivated, and is regarded as the CH candidate. It broadcasts one message within a neighborhood of radius R. This message aims to inspire other nodes for the competition of the cluster head. It contains the node's id and its residual energy. Only the nodes within the transmission range can receive the message and become active, whereas the outside nodes remain idle. If any node has larger residual energy than it becomes the new cluster head contestant and broadcasts new message with its own information to the others.

When the ID's of the nodes are compared, the node with a smaller ID wins. As soon as the comparison is done, the unselected node becomes inactive again. All nodes in the cluster should be compared only once. In this way, the node with largest remaining energy is chosen as a cluster head. Beyond this, the other way to increases the life time and decrease the energy consumption is to make the sink stable and use a mobile collector to collect the sensor information.

Security is a main issue facing in wireless sensor networks. Sensors are collecting data which may get away by the intruders. So sensors must need security. In the home network, sensors nodes are encrypting the data. This encrypted data's then send to the sink. In the sink then the data's are decrypted. Thus the data must process much security.

4. RESULT AND DISCUSSIONS

The two algorithms are compared for identifying the one which have high performances. The algorithm ECMA has multiple sink nodes. The whole network is divided into numerous clusters and the multiple static sink nodes are randomly deployed in the network. It can be seen that as the number of sinks increases the total energy consumption unit's decreases. When 3 or 4 sinks are deployed, the decreasing rate of energy utilization becomes moderately small even if more sink nodes are added later. The algorithm MEA, have mobile sink which gather data from the sensors which will consume only less amount of energy. Here creating a network with 20 sensors nodes and 2 mobile sinks for ECMA algorithm. For the implementation of the MEA algorithm the network containing up to 20 nodes and used mobile node.

ECMA and MEA performances are compared by considering the parameters delay, energy consumption and throughput.

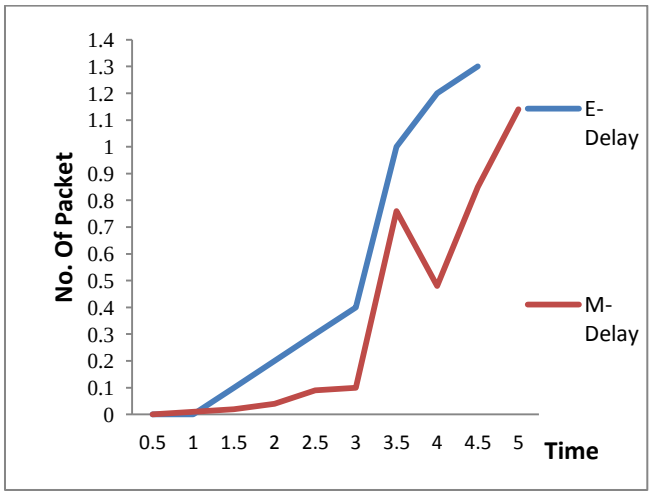

Fig 1: Comparison based on delay

It can be seen that from the Fig 1 ECMA algorithm have more delay than the MEA algorithm. For some point the delay for multiple sink is low. The delay for ECMA increased after particular time.

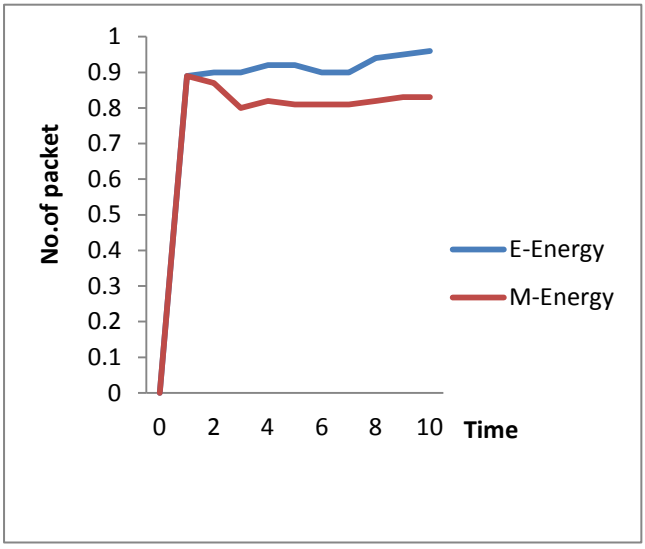

Fig 2: Comparison based on energy consumption

Form the Fig 2 it can be seen that for this network setup, the energy consumption is higher for ECMA than MEA.As the number of the sink increases the energy consumption can be decreases.

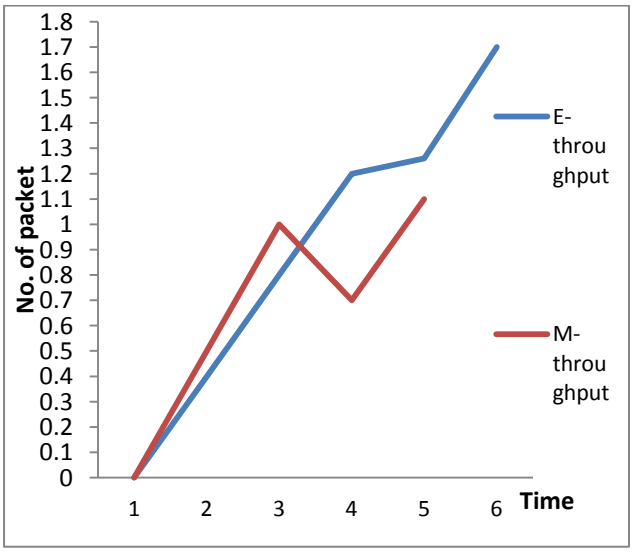

Fig 3: Comparison based on throughput

In the Fig 3 the X Graph is measured in terms of time and Number of packets .The result of the graph shows that ECMA throughput is higher than the MEA. Throughput is the number of packet received in a particular time. As the time increased, throughput of ECMA also increases.

5. CONCLUSION

In the smart home network sink mobility have very significant impact. Here proposing algorithms that use multi sink and mobile sink which will increases the life time and decreases the energy consumption. Secure data must be needed for the efficiency of the network. For the security the data is encrypted in sensors node. From the simulation result it shows that the two algorithms are effective when it apply on the consumer home network.

The smart home network can be extended by giving more security for the sensors, so that the sink node gets more protection from intruders. Sensors are capturing valuable information. So it is very important to give security. Data in the sensors should be encrypted so that it can be protected.

6. REFERENCES

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