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ENERGY EFFICIENT TOPOLOGY CONTROL AND ROUTING IN WIRELESS SENSOR NETWORK

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ABSTRACT

A two tiered Wireless Sensor Network is regard, in this nodes are alienated into clusters and each cluster having cluster head, these cluster heads to the fore data to base stations. To make best use of the network existence, look into two energy proficient approaches. We initially suggest an approach that is; in the network base stations are turn up optimally hence the remoteness between close proximity base station and every cluster head is decreased. In the Wireless sensor network energy consumption is a main apprehension. After that, a routing method is developed to organize the communication among cluster heads in the direction of the base stations so as to sure that the collected information successfully and professionally attain the application. A mobile collector must pass through the transmission range of every sensor in the field, in order to collect the information from each sensor node directly without any delay to save energy of sensor nodes, as a result of life time of a sensor network. On the whole active structure of above two techniques is represented and appraised. The experimental routine assessment demonstrates the effectiveness of topology control as a very important process to increases the network life span of WSNs.

Keywords: Wireless Sensor Network, Cluster, Base Station, Mobile data collector, Routing protocol; Mobile data Gathering.

I.INTRODUCTION

Wireless sensor networks are attractive more and more trendy in these days owing to the important advantages them current in moving out monitoring tasks in definite application areas. These areas are different one to each other for example military area and target tracking to healthcare and environmental monitoring. These areas vary from military and target tracking to healthcare and environmental monitoring. But, there be present particular aspects that require to be addressed for the period of deployment in organizes to attain the best probable functionality and reduce to a great extent problems that are intrinsic in wireless sensors network and wireless sensor network. Latest technical improvements in the networks made the concept of wireless sensor network.

Wireless sensor network consists of sensor nodes which are spatially dispersed to observe physical or environmental situations, such as temperature, sound, pressure, etc. These sensor nodes are very small, cheap and dispersed devices. These sensor nodes are proficient of wireless communication and local processing. Every sensor node having limited energy. Each sensor node having tiny batteries. . Each sensor node is accomplished of only a limited amount of dispensation. Sensor nodes monitor the physical and environmental conditions great detail not only in small area networks but also in large area networks through the coordination of sensor nodes. The sensor nodes in the sensor network coordinate with each other to perform actions. In traditional networks doesn't depend on dense employment of sensor nodes in the network. But in the wireless sensor network sensor nodes are deployed densely and sensor nodes are coordinate with each other in order to complete the tasks.

In traditional networks, sensor nodes are connected like star topology technique that means using small number of sensor nodes with the intention of connected to a central unit. On the other hand, currently, the center of attention is further on wireless, distributed, sensing nodes. And also concentrates on why distributing wireless sensor network and how sensor network sensing in wireless mode? To know the exact position of a particular occurrence distributed sensor network senses that particular occurrence using as much less nodes or single node is enough. In many cases multiple sensor nodes are needed to conquer environmental obstacles. The environment does not having any infrastructure so it has to be monitored using wireless sensor network. In wireless sensor network sensor nodes having limited energy through tiny batteries, through this energy only sensor nodes communicates in the network.

The most significant mean issue in a wireless sensor network is energy utilization. Energy utilization is the main significant issue to decide the life of a sensor network for the reason that generally sensor nodes are obsessed on battery and comprise extremely small energy possessions. Due to having low energy the energy optimization is other difficulty in sensor networks. In wireless sensor network energy consumption reduction is important and also extends the life of the network to a large extent as possible as. To achieve these issues, concentrates on each and every phase of design and process in wireless sensor network. Energy Awareness is included not only for individual nodes but also for a group of sensor nodes and complete network. The network lifetime is straightly affected by energy conservation.

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The construction of wireless sensor network must be energy aware oriented design. Through this energy aware design can reduce the energy consumption by developing design techniques and architecture. The lifetime of sensor network increases through energy aware designing of operating system, application layer, and network protocols. In the process of the system radio communication are also plays an important role in energy consumption because radio communication consumes high amount of energy. So the energy management of radio communication is also necessary. Sensor nodes having one more ability that it acts as a router. If a sensor node acts as router then it forwards bulk amount of the packets when sensor node receives it. The radio communication helps to identify the packets and also redirects the packet which has to be forwarded. It forwards the packet because intermediate nodes do not hold the packets longer time and also reduces the operating cost.

Numerous studies have been projected before now as probable solutions to reduction of energy consumption problem. The topology control method introduced the concept of special function nodes they are called as relay nodes. The topology control method not only uses the relay node concept but also uses the technique called clustering. These two techniques are applied in the wireless sensor network to reduce sensor node communication cost. a number of techniques have been projected in the literature that intends to avoid swift battery drainage as a result can be the reason in the network connectivity breakdown or sensing area. Wireless sensor network using method called single-hop operation, in this concept relay nodes sends the data to base stations after sensing the field. The wireless sensor network consists of only one relay node in single hope transmission. These relay node gather data from cluster heads which gathers data from the cluster members, after that relay node sends the data to the base station.

As earlier stated that using of cluster scheme, using this scheme in the sensor networks to improve the network lifetime and reduce the energy consumption of sensor nodes. The most important variation through other comparable approaches is that the relay nodes are not taken as immobile nodes probable to function at the positions that were primarily arranged but with mobility potentiality that let them to travel to new positions selected by best possible energy utilization management techniques. In exact we make longer the work accessible in so that the relay nodes can travel to new positions, a quality that in concurrence with re-clustering be able to go ahead to energy utilization minimum.

We consider a problem of, finding the shortest visit of each sensor node in sensor network using M-Collector within the transmission of each sensor in the network. Here using the concept of polling points these polling points are nothing but data collectors from sensor nodes. For the intension of cleanness, we imagine that M-collectors travel at a fixed speed and pay no attention to the time for creation turns and data transmission, in that way we can approximately guess the time of a data-gathering visit by the go round by the go round length. obviously, by moving all the way through the undeviating visit, data can be collected in the little amount of time in that way the users will have the a large amount up-to-date data. We pass on to this as the single-hop data-gathering problem (SHDGP).In this method the M collector moves around the network within the transmission range of every sensor node, to collect the data one at a time. Here M-collectors are moves around the network then the nearest sensor nodes are upload the data to M-collector so the transmission power can be reduced and automatically lifetime of a network can be increased.

II.NETWORK ARCHITECHTURE

We consider here, a huge number of motionless and various sensor nodes wrapper a given area of concern. The organization of nodes and topology of a network is organizes as a two-tiered Wireless Sensor Network as depicted in Figure 2. It contains a number of clusters, multiple mobile base stations. Each cluster is collection of some of Sensing Nodes and in this one sensor node elected as Cluster Head. Sensing Nodes are very small, cheap. So the sensor nodes are heavily deployed in each cluster. These sensor nodes are sense the data from environment and then upload the data to related Cluster Head.

1. Clustering:

Sensor nodes divided in implicit group according to some convention. Every Sensor node group having a particular function. These group of nodes or cluster members elected one sensor node as cluster head. These cluster members communicate with cluster head directly to forward the data. The cluster head then forwards the cumulative data to the base station.

1.(A).Cluster Formation:

In cluster, cluster members' elect' one sensor node as Cluster head, the election of cluster head is based on the energy. Cluster-head selection in the beginning each sensor node broadcasts a detection message which holds its node ID, its Cluster ID, and expected lifetime. Sensor nodes who have highest life time among all sensor nodes in the cluster then it select itself as a prospective cluster-head. After cluster head selection the cluster head broadcast these message with its lifetime to all corresponding nodes.

1.(B).Cluster-head Selection:

If a probable cluster-head collects the information from all sensor nodes in the cluster then it elects as a cluster head if it has highest life and broadcasts this message to all its neighbors which locate their cluster Id to that of the cluster-head and a cluster is created.

It is an effective topology control approach. In cluster based WSN, the entire network is divided into clusters, with each cluster having a Cluster Head with extra privileges and cluster members. Cluster head aggregates data from cluster members and sends it to the sink. We can form cluster dynamically and periodically.

This technique proposed various protocols for cluster head selection, cluster formation and data gathering applications.

We can use the cluster head rotation protocol for balancing energy utilization. This rotation protocol for energy usage among the nodes within the cluster. To avoid re-clustering . cluster formation takes place only once in network lifetime. A

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distributed low complexity clustering algorithm is more suitable for WSN. By this approach we reduce energy consumption.

Therefore, each cluster inside uses directs transmissions only. Cluster members communicate with only cluster head but not with other cluster members or other sensor nodes. Cluster Heads, have so much work and responsibilities.

one of responsibility of cluster head is collect data from their cluster members and maintain their clusters. Another one is to save the energy they carry out aggregation of the data collected from cluster members to abolish redundancy and reduce the number of transmissions. The collected aggregated data at each Cluster Head correspond to a local view of its cluster. And another one is, they pass on the complex bit-stream in the direction of the nearby base station. Each base station can then produce a complete universal view of the complete network coverage by aggregating the different local view data conventional from the different Cluster Heads.

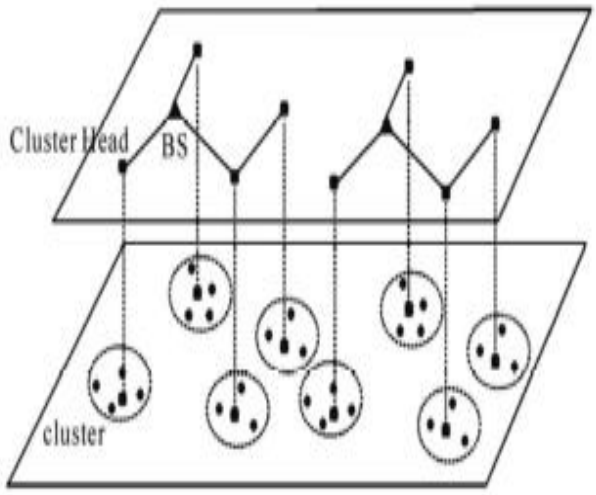

Figure1: A two tired wireless sensor network

III.PROBLEM FORMULATION

Given that, in Base Stations position scheme, we are taking into account the communication involving only in Cluster Heads and the Base Stations. Cluster Heads are disturbed by the separation scheme. We presume that cluster belongs to a particular type of network then cluster head also belongs to that particular type of network and vice versa that is a if a Cluster Head fit in to a sub-network, then its consequent Cluster fit in to this sub-network as well. Here we taken a undirected connected graph (*H,A*). Where *H* is the set of Cluster Heads, 1 *H CH i to N* and where *A* is the set of all undirected links. To achieve the graph as connected balanced sub graph to partition, let *w* be a non-negative vertex-weight function. And w in place of the corresponding criteria. Using the same process we can partition all of them. This partitioning method must be practical to a great extent as necessary according to the objective size for the sub- networks and captivating into account the number of accessible Base Stations to be located. The ultimate product must be 2 corresponding lesser linked sub-networks where n represents number of partitioning iterations. To find the spanning covering tree for each sub-region, we have proposed the algorithm called Data Gathering

IV MOBILE DATA COLLECTOR

Energy utilization fairly relies on the network topology or the position of sensor nodes. To monitor separate areas sensor network deploys sensors densely for some application. In sensor network sensors belongs to diverse areas might be disconnected. In each and every area in sensor network is heavily deployed and linked. Some cases are like that some of the sensors does not upload the data to the data sink through wireless connection. For such type of application mobile data collector is completely appropriate one. A mobile data collector moves around the network and gather all information about every community and links. And mobile data collector acts as a 'data transporter'. The major purpose of the mobile Data Gathering technique is to decrease the on the whole tour time of the mobile node. Mobile data collector also decreases the packet interruption.

A Mobile data Collector is able to stand for M-collector Mobile Data Gathering is a system that contains of one or more Mobile Collectors (MC's). To present an ascendable data-gathering system for a large-scale stationary sensor networks, we make use of mobile data collectors to collect information from sensors. A mobile data collector is outfitted with a dominant transceiver, battery, and large-memory. in particular, a mobile data collector possibly will be a mobile robot.

The mobile data collector begins a travel around from the data sink, passes through the network, and gathers sensing data from in close proximity nodes although moving, and then come back and forwards the data to the data sink. in view of the fact that the data collector is portable, it can go close to sensor nodes so energy consumption is decreased and the network lifetime can be to a great extent extended.

M-collector collects the data in small range transportation. MC travels around the sensing network to gathers the data though moving. To achieve the maximum power saving, a mobile collector ought to tour the sensor field sensor. The way travel the mobile collector in the transmission range may be arbitrary or designed. The M-collector decreases the energy utilization in the network.

M-collector gathers the data directly from the sensor node though it travels in the sensor field. To maximize the sensor network life time by decreasing the travel duration of M-collector. With the purpose of discover the shortest travel around the M-collector visits the data in the sensor field. In one-hop method of M-collector sensor nodes represented as polling points. The time utilization of the M-collector can be approximately expected by means of the travel around length with a fixed speed of M-collector roams. If the M-collector tours in the through short path, it outcome will be like the data collection in short time. in some specific applications like battlefield surveillance and environment monitoring the sensors uses a unchangeable transmission power.

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The polling points pass on all the data in its communication range. M-collector later on gathers the polled data from the polling point. And then M-collector goes to the another polling point. The M-collector should pass through all the polling points in the network and lastly arrives at the static data sink. M-collector requires identifying the polling points in addition to its positions earlier than begins its data collection in travel around.

V.M-DATA COLLECTOR WITH CLUSTERING TOPOLOGY CONTROL ALGORITHM

An M-Collector begins with the data collection during travel at regular intervals from the stationary data sink, polls every sensor though travel in its communication range. A data collection algorithm where multiple mobile collectors pass through numerous shortest sub travel around simultaneously to persuade the distance condition. The mobile data collector begins a travel around from the data sink, passes through the network, gathers sensing data from in close proximity nodes although moving, and then come back and forwards the data to the data sink. Also it minimizes the delay caused by the Mobile Collector to connect with the base station.

The Algorithm is describes in below:

1.Examine the data sink particulars:

The data sink moves around the network within the transmission range of network the sensor nodes which are nearer to the data sink forwarded the data to data sink. Through minimum hops the data sink get the data then the lifetime of a network is maximizes.

2. Locate less hop count communication:

Multichip routing consumes a lot of energy because packet forwarding from one node to another is loss of energy. So must and should take less hop count then only we can save the energy and lifetime of a network. To extend the network lifetime by using less hop count communication only.

3. Statically data forwards node:

Node will fail when node uploads data incessantly then that node consumes a lot of energy so that node will loss more power. It also called as node failure.

4. Dynamically data forwards node:

The data forwarding node changes dynamically then node failure rate become less, that means with less hop count node.

5. Select a sensor node as PP(polling point):

The subset of sensors are nothing but the selected polling point, each collective the limited data from its associated sensors within a definite number of relay hops. These PP's are collects the data from sensor nodes and temporarily stores that data and then upload the data to the M-collector when it reach the transmission range of sensor nodes subnet that means polling points.

6. Gather data from PP's

Due to mobility the mobile collector to move to any position in the sensor field, it offers an chance to plan an most favorable travel around for it. Our major thought is initially to locate a group of particular nodes noted as PPs in the network and then decide the travel around of the mobile collector by visiting every PP in a definite series. When the mobile collector turn up it polls every PP to ask for data forwarding and then it forwards the data to MC. The Polling points gathers the data from all the sensors and that cumulative information is together by the Mobile collector.

7. Upload the data to BS:

In a single hop A Polling Point uploads the data packets to the mobile collector. Mobile collector start its travel around from the stationary data sink, which is positioned either inside or outside the sensing field, and gathers data packets at the PPs and then forwards the data to the data sink. Finally MC handover the data to data sink, such as BS.

VI.RESULT

Based on the improvement made with the new concept of M Collector with Cluster Topology control make network lifetime maximize as compared with other methods.

By using this concept not only we can maximize the network lifetime but also energy efficiency in routing.

In this method sensor nodes are divided into groups as clusters, for each group having a polling point, these polling point have all the information of sensor nodes in that group. Whenever a mobile collector moves around in the network then the mobile collector senses a polling point and taken all the information in that polling point and moves around the network to collect all sensor nodes information. After that it sends all the information to the Base Station in the network.

For large networks single mobile node is not enough so in that case we are using multiple mobile nodes to maximize the network life time.

In this methodology, we can maximize the network lifetime and to reduce the time delay and to avoid such interference of data occurring also. Collecting data through single hop o mobile collector reduce the consumption of energy and in multiple mobile collectors the energy consumption is not considered but gathering of data is in such a fast and reliable manner.

VIICONCLUSION

In order to cover large wireless sensor network areas we use multiple mobile base station are needed in such case we can reduce energy consumption and maximize the lifetime of network. we introduced a concept of an energy efficient usage of multiple, mobile base stations to maximize the lifetime of a two-tiered large-scale Wireless Sensor Network. The extension work what we done here is gathering data through single mobile collector or multiple mobile collector. The gathering of data from pooling point happening at regular intervals of time only, suppose a pooling point need to transfer emergency data in emergency situation how the transmission take place and how the data gathering occurring is our extension work.

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