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A Review on an Approach for Base Station Control and Power Competent by Wireless Sensor Network

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Abstract: A Wireless Sensor Network is a collection of wireless sensor nodes forming a temporary network without the support of any well-known arrangement or centralized management. In WSN, energy efficiency and lifetime of sensors have a important impact on applicability and network performance. In the clustered routing architecture, a number of nodes are grouped as a cluster, and cluster head node, which is selected, based on certain parameters, collects, processes, and forwards the data from all the sensor nodes to the base station as a single hop or a multi-hop. In this research, the proposed routing protocol is with name Centralized Energy Efficient Hierarchical Routing Protocol - CEEHRP. This protocol is base station centralized i.e. this protocol utilizes a high-energy base station to set up clusters and routing paths, performing rotation of cluster heads, and carrying out other energy-intensive tasks. The algorithm demonstrates the change of states undergoing in the web and how the energy level of each node changes with time. It shows the no. of nodes dead in each round and the energy consumption of each round. The process of clustering and finding the appropriate cluster head is a major challenge and has major impact on energy consumption. The cluster head has to be a node with better level of energy and optimum location to minimize the energy consumption while hopping. All these aspects are compared for proposed method and existing routing protocols to demonstrate the efficiency of proposed method.

Keywords: Clustering, WSN, Sensor nodes

1. INTRODUCTION

Overview of wireless sensor network

A wireless sensor network (WSN) is consisting of sensor nodes that are used to monitor physical situations. All nodes consist of five components: sensor unit, analog digital converter (ADC), central processing unit (CPU), power unit, and communication unit. The sensor unit gathers material as the ADC demands, and precede the analog data it sensed. ADC (Analog digital converter) is a interpreter that informs the CPU what the sensor unit has detected, and also notifies the sensor unit what to do. It is the job of communication unit to receive command or query from, and spread the data from CPU to the outside world. Central processing unit is the most complex unit.

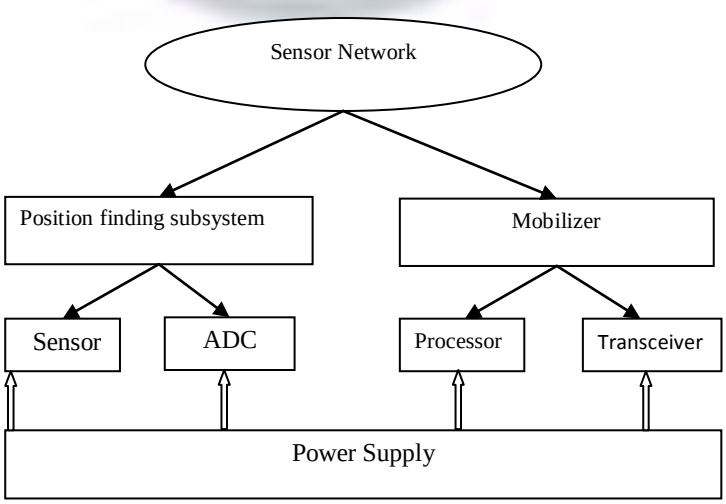

Figure: 1 Component of Sensor Node[1]

Introduction to Routing Protocols

Routing protocols are of three types, proactive, reactive and hybrid protocols. In proactive protocols, the routes are recognized before they are truly required, while in reactive protocols, routes are recognized on request. Hybrid protocols use a combination of these two techniques. Since sensor nodes lack in resources, and the number of nodes in the network could be very large, so sensor nodes should not have the storage space for "huge" routing tables. So reactive and hybrid routing protocols are appropriate in sensor networks.

According to the contributing style of nodes, routing protocols can be classified into three categories, namely, direct communication, flat, and clustering protocols. In direct communication protocols, a sensor node sends data directly to the base station. Under flat protocols, all nodes in the network are similar. When a node needs to send data, it may find a route consisting of several hops to the base station. Typically, the nodes nearby the sink, participate in the data transmission process higher than those nodes far away from the sink. So, the nodes near the base station could run out of their power sooner. In the clustered routing architecture, nodes are grouped as clusters, and a logically selected cluster head node receives then processes and finally forwards the data from all the sensor nodes within its cluster to the base station. One of the key issues in wireless sensor networks is the limited accessibility of energy on network nodes. So, making good use of energy is necessary to increase network lifetime.

1.1 Clustering in WSN

An arrangement of sensor nodes into totally different virtual teams is named clustering.

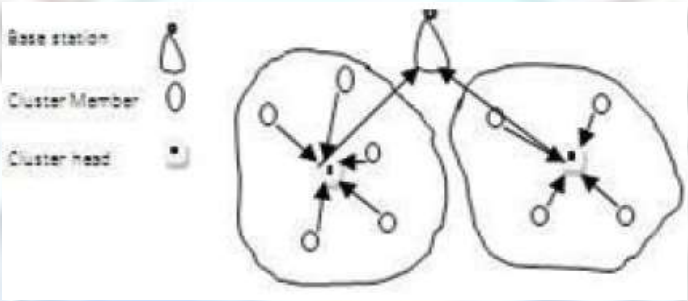

Figure 2: Clustering of WSN Nodes

Each cluster has a cluster head (CH) and its members. The CH is sort of a leader for its cluster, performing intra cluster transmission arrangement, information sending, and the reverse. [2]The cluster heads collects the information from cluster nodes and sends it to the information centre or base station (BS) as one packet, therefore reducing the overhead from packet headers. In every round of the cluster formation section, the network has to choose cluster heads and transfer the aggregative information to BS. For choosing a cluster head, the following queries are to be considered.

- Who can initialize the cluster head selection?
- What are the parameters necessary for deciding the role of a sensor node?
- Which sensing element nodes are going to be nominated as cluster heads?
- Will it require re-initiation of cluster formation process?
- Whether or not the chosen cluster heads are equally distributed?
- Which information transmission is suitable for big network, Single-hop or Multi-hop?

Challenges in Wireless Sensor Network:

Constraints in resources originate a lot of design challenges in WSN. These challenges are needed to be resolved for effective and efficient operations of WSN. Perhaps, a broad spectrum of newer applications is putting research initiatives to new challenges. Some of the challenges are given below:

Energy competent process: Sensor nodes are usually driven by the restricted energy batteries. Due to locations and huge number of distributions, it is difficult to replace those batteries at the end of their life cycle. So, it is critically important to design algorithms and protocols that consume minimal energy.

Location finding: In many applications of WSN such as in object tracking, location information of the sensor nodes is very important. This location information can be related to the object under tracking. Again, physical routing protocols

need location information to connect within the network. Therefore, location finding protocols are needed to be designed in such a way that location information can be gathered with minimum transmission among sensor nodes.

Price: It truly effects various applications of WSN. Creators are trying to keep the cost least as usual applications require a good number of sensors nodes.

Safety: Like every other new skills, WSN is likely to be geared with possible security devices. Though, security keys are quite controlled in WSN due to basic nature of sensor nodes. Inventors need to emphasis on security events such as secure routing, location confirmation, key formations, secure collections organisation and secure data collection.

2. LITERATURE SURVEY

Sumit wadhwa et. AI discussed energy saving is the crucial issue in designing the wireless sensor network. The main focus on the implementation of a wireless sensor network is energy of the node i.e battery life of the nodes. In this paper we intend to design centralized and energy saver hierarchical routing protocol and compare with BCDCP (Base station Controlled dynamic Clustering Protocol) and SHPER (Scaling Hierarchical Power Efficient Routing). To design a new protocol with named Base Station Controlled and Energy Efficient Centralized Hierarchical Routing Protocol (BECH). In BECH, initially the base station request to all nodes to send their neighbour list and residual energy. After having the information about the whole network, the base station performs computation to form the better cluster in such a way that there is less energy consumption. [1]

K. Padmanabhan et. Al proposed energy efficiency is the determinant aspect of the wireless sensor network lifetime. Various routing protocols are used to reduce the energy consumption and to improve the network lifetime. To support high scalability and better data aggregation, sensor nodes are often grouped into disjoint, non overlapping subset called clusters. This paper discussed an improved clustering protocol to minimize the energy consumption and maximize the network life-time. [2]

Tintu Devasia et. Al proposed that wireless sensor nodes with limited battery power are deployed to collect data from the environment. Initially WSN was developed for military purpose, now it is extended to wide range of applications. Gathering sensed data in an energy efficient manner is critical to operate the network for a long period of time. For different applications many protocols have been developed. This paper surveys various energy efficient hierarchical routing protocols for sensor networks and presents a classification and comparative study of the various approaches pursued. [3]

Nishi Sharma et. Al discussed wireless sensor networks are networks of large number of tiny, battery powered sensor nodes, having limited on board storage, processing and radio capabilities. Node sense and sends their report towards a processing center which is called sink. Since this transmission and reception process consumes lots of energy compared to data processing. Designing protocols and applications for such networks has to be energy aware in order to prolong the lifetime of the network. [4]

W. R. Heinzelman et. Al proposed that Energy- Efficient Communication Protocol for Wireless Micro sensor network, WSNs differ from traditional wireless communication networks in several of their characteristics. [5]

Akkaya and M. Younis et. Al, studied Survey of Routing Protocols in Wireless Sensor Networks,"The routing protocols developed for WSNs can be classified in several categories. Flat routing architecture, Hierarchical routing architecture, and Location based architecture are one of those. [6]

Nikolaos A. Pantazis et. Al, stated that Intelligent Energy efficiency is an important research topic for ad-hoc Wireless Sensor Networks (WSN). This article presents a comprehensive survey of recent energy-efficient schemes in ad-hoc wireless sensor networks, the application of which increases nodes' lifetime and thus, network connectivity and survivability. [7]

FINDINGS AND CONCLUSIONS

As discussed and studied in the survey shown just above we come to conclude that we can get important information and limit energy consumed by efficient clustering technique. Apart from that it helps in load balancing, fault tolerance and coverage. We can assume that the sensor nodes are randomly distributed and not mobile. The coordinates of base station and sensors and other dimensions of sensors are also presumed. The following parameters of a network are given some appropriate value.

- Number of Nodes
- Network size

- Initial node energy
- Minimum energy
- Network threshold
- Data transfer rate
- Location of base station
- Sensor nodes locations

3. PROPOSED WORK

3.1 Proposed Technique

The proposed algorithm is to eliminate the difficulties of the earlier algorithms and the simulation compares the already existing centralized hierarchical routing protocol with the proposed work. This algorithm extends the system lifetime of the network and reduces the energy consumption. One of the most critical issues in wireless sensor networks is represented by the limited availability of energy on network nodes. Thus, making good use of energy is essential to increase network lifetime

.

The following expectations are made about the foundation of CEEHRP.

1) A sensor network consists of various sensor nodes and the base stations.
2) Sensor nodes are organised in constant energy to all the nodes in the sensor field.
3) Sensor nodes can estimate and control the rate at which data packets are generated. All the data packets are of the different size. In our model, data aggregation is considered.
4) Sensor nodes can communicate with other sensor nodes and base stations within their radio transmission and these nodes can dynamically control their radio signal power so as to minimize the energy consumed in communication.
5) Sensor nodes can estimate the energy level of their batteries at any time and estimate the energy consumed in transmitting and receiving one unit of data.

6) Base stations are responsible for gathering topology information, implementing routing algorithm and distributing routing information to sensor nodes.

3.2 Proposed Model

Generalized Algorithm

Step 1: Initally enter the number of nodes and number of rounds in the sensor field of the network area.

Step 2: The Base station deploy the nodes in Network area with constant energy E.

Step 3: Base Station sends a REQ message to all the nodes in the sensor field, to obtain information about the every nodes.

Step 4: After receiving the “REQ” message, each node broadcasts the hello message “REP” and the nodes receiving hello message “REP” sends “REP2” message containing its ID. When a node gets reply, it will note down the ID of the node from where the reply has been acknowledged. In this way each node will have their individual neighbour list.

Step 5: After receiving the information about their neighbours the nodes, for which the base station is within their range, sends a STATUS message to the base station. This STATUS includes ID, routing table, and Energy of the node. Base station sends an acknowledge (ACK) to all sending nodes.

Step 6: After acquiring acknowledge ACK, the nodes declare itself as cluster head node and broadcast to all its neighbouring nodes.

Step 7: The node receiving the cluster head node’s message will check their status whether it is cluster node or not, if it is not a cluster node then it will become other node of the cluster, from where it has received the cluster node message first.

Step 8: Cluster nodes send the STATUS to its other cluster nodes which are near to the base station, or direct to the base station.

Step 9: The nodes which are directly sending the STATUS to Base Station, becomes the Cluster Head for the current round. Steps 6-8 are repeated until single node is active.

Step 10: For second round the nodes directly communication with Base Station and having max. Energy becomes the cluster head.

Step 11: Cluster Head will receive data from nodes that comes in its cluster area.

Step12: After collecting data, Cluster Head sends the aggregated data to the Base Station.

Steps 11-12 are repeated until system is active.

CONCLUSIONS

The main issue in WSN is energy restricted characteristic of the sensor node. So the struggle is to have the routing procedure in such the manner that it should be energy efficient in order to increase the life span of the full WSN. The base station performs calculation to form the better cluster in such a way that there is less energy consumption. In this protocol, the election of cluster heads is not randomized but is based on the residual energy of the cluster nodes and the logical structure of the whole network. So the life span of the whole network is increased. So in future applying security parameters to the base station as well as cluster head of these protocols would be easy. Finally, CEEHRP is compared with already developed routing protocols to establish the efficiency of proposed technique.

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