

Analyze the performance of Divide and Conquer scheme for Wireless Sensor Network

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Abstract: Wireless sensor network (WSN) is a network of small light weight wireless nodes which are highly distributed and deployed in large numbers. There are Some issues in wsn like scalability, deployment, energy consumption and many more. There are also many energy efficient techniques in wireless sensor network like LEACH, HEAP etc. Divide and conquer is also one of the efficient technique which is based upon manually deployment. In this paper , Divide and conquer scheme is explained in detail.

Keywords: LEACH, HEAP, Sensor nodes, Relay Nodes

1. Introduction

In sensor network architecture, we can possibly deployed in extremely large number of sensor nodes or devices. Sensor network consist of a sensor field, where the sensor nodes are deployed that is physical environment. Sensor nodes should have a low cost [5]. A low-cost device can thus be expected to have fairly limited computational and communication capabilities, considering the fact that sensing capabilities are also to be included in the device. Sensor nodes are deployed in many applications, where human intervention is not easy to maintain the sensor node. These type of sensor nodes where human intervention is not possible there sensor nodes are operate on limited battery power. These batteries are not easily replaced. Sensor nodes have a [7] limited power, so they have to be designed in such a way, that sensor nodes use the power in an efficient way.

For more specific applications like physical intrusion detection, sensor nodes have more advanced capabilities which are not in other nodes that are used in simple fields. Thus, sensor devices may range from millimeter-sized devices fabricated on custom silicon to more general purpose cell-phone-sized devices with advanced capabilities. Wireless sensor node is microelectronic device means it is equipped with a limited number of power source [8]. Nodes are dependent on battery for their power. Hence power conservation and power management is an important issue in wireless sensor network [9]. Due to this reason researchers are focusing on the design of power aware protocols and algorithm for sensors network. In this paper main focus is about analysis battery consumption.

2. Review of Literature

Jakob Salzmann et al. introduced [1] a large wireless sensor networks, low energy consumption is a major challenge. Hence, deployed nodes have to organize themselves as energy efficient as possible to avoid unnecessary sensor and transceiver operations. The energy conserving operations are limited by the task of the network, usually the network has to guarantee complete functionality during its lifetime. The contribution of this paper completes the functionality-aware and energy-efficient clustering algorithm family MASCLE by two innovative algorithms. As already given by the MASCLE algorithms, the proposed Hex-MASCLE algorithms combine advantages of temporal and spatial network fragmentation. In contrast to previous approaches, the shapes of the basic cells are given by regular hexagons, similar to honeycombs. In the present work, two possible versions for hexagon-based clustering with self-healing abilities are proposed and evaluated. As result, the applying sensor network achieve a significant improve of network lifetime. Additionally, the algorithms are more fault-tolerant against localization errors.

Ewa Hansen, et al. they discussed [2] that wireless sensor networks becoming very important for developing of energy efficient infrastructure. They found the minimum separation distance between cluster heads in a cluster based sensor network, prolonging network lifetime by lowering the energy consumption. They performed simulation to determine how much energy is consumed by sensor network in separating the cluster heads. They also discussed the effect of energy

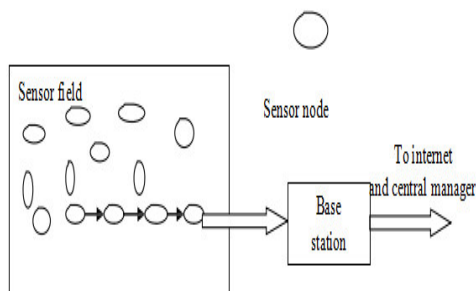


Fig. 1.1 Wireless Sensor Network

consumption for a given minimum separation distance between cluster heads. They showed that wireless sensor network could better performed when they introducing a minimum separation distance between cluster heads. It is checked by comparing the number of message was received by the base station.

Arun K. Somani, et al. discussed [3] a distributed, light weight, scalable clustering algorithm for clustering in wireless sensor networks. The environment where the sensors are deployed randomly here clustering algorithms are very suitable. There are not necessarily of the same size in terms of the number of nodes in a cluster for distributed clusters. The size is set by the radius of the radio signal range. In the cluster formation one node could join the one cluster at a time. The cluster head can communicate to other nodes direct or indirect. The cluster head can communicate to the base station through an overlay network and intermediates node in between. They analyzed that the performance of clustering algorithm by using simulation. Results show that very few nodes (less than 5%) are not able to join a cluster or remain orphan, many are isolated due to random deployment .

Vinay Kumar discussed [4] in wireless sensor networks to maximize the lifetime of the sensor network, for the data transfer the path is selected in such a way in which the energy consumption is minimized in that path. To support high scalability and better data aggregation, sensor nodes are often grouped into clusters. Clusters create hierarchical wireless sensor network, the sensor nodes utilization their limited resources in efficient way and thus extends network lifetime. They presented taxonomy of energy efficient clustering algorithms in WSNs, and also presented timeline and description of LEACH and Its descendant in WSNs.

3. Divide and Conquer Scheme

Network area is logically divided into small regions (clusters). The beauty of this technique is the formation of square and rectangular regions, which divides the network field into small regions, as a result the communication distance for intra cluster and inter cluster reduces. In first step, network is divided into n equal distant concentric squares. For simplicity, take $n = 3$ here therefore, network is divided into three equal distance concentric squares: Internal square(Is), Middle square(Ms) and Outer square(Os) [5].

BS is located in the centre of network field therefore; its coordinates are taken as reference point for formation of concentric squares. Division of network field into concentric squares can be obtained from different equations. In the second step, the area is divided [6] into two concentric squares into equal area quadrilaterals; latter is named as Corner Regions(CR) and Non-Corner Regions(NCR). To divide area between Is and Ms into four equal area quadrilaterals, top right and bottom right corners of Is are taken as reference points.

Co-ordinates of region NCR2 are taken by adding d in the x-coordinate of top right and bottom right corner of Is. Co-ordinates of region NCR3 are taken by adding d in the y-coordinate of top right and top left corner of Is.

Co-ordinates of region NCR4 are taken by subtracting factor d , in the x-coordinate of top left and bottom left corner of Is. Co-ordinates of region NCR5 are taken by subtracting factor d , in the y-coordinate of bottom right and bottom left corner of Is.

In second step Cluster heads are choose. After that In setup phase BS divides the network field into small regions, on the bases of their co-ordinates. Is nodes send data directly to BS. In each region one CH is selected per round. CHs of Os regions, select front neighboring CHs of Ms regions as their next hop CH. Nodes of CR selects, BS or neighboring CHs as their CH, based on minimum distance. If a tie occurs, for a node of CR, in selection of CH from its neighboring regions than, it is resolved by selecting the CH with greater residual energy. In steady state phase each node send its data to CH in its allocated time slot. Primary level CHs send aggregated data to their respective secondary level CHs. Secondary level CHs then, aggregate all collected data and forward it to BS.

4. Problem Formulation

Clustering technique in routing protocols plays a key role to prolong the stability period and lifetime of the network. One of the energy efficient routing protocols for wireless sensor network is Divide and Rule scheme.

In Divide and Rule scheme [10], Cluster Head in Outer Square (Os) regions send data to Cluster Head of exactly one level above adjacent region's Cluster Head. These Cluster Heads are also known as secondary level Cluster Heads, secondary level Cluster Heads aggregate their own cluster nodes data and, data of the primary level Cluster Head then, transmit data to Base Station this will lead to more energy consumption of Cluster Head nodes present in the Middle Square (Ms) and nodes present in the Inner Square (Is) regions which may lead to energy hole and may cause data routing problems. So there is need to improve this scheme to increase the life of nodes in Middle Square (Ms) and Inner Square (Is) regions. In existing technique, suppose we had corner node which wants to communicate with sink through intermediate nodes. First of all it sends request to its cluster head of nearest cluster. Then this cluster head further sends data to its nearest available region. The nodes which are deployed near sink are main nodes which participate to communicate with

sink and intermediate nodes. The problem arises when battery of the nodes near sink goes down communication stop. Because sink node can communicate only with the help of region nearby node not directly. The main reason is that nearest sensor nodes are out of range of sink. So battery degrades and communicate stops. To overcome this problem relay nodes will be used instead of sensor nodes.

5. Conclusion

It is concluded from this paper that there are many energy consumption technique in wireless sensor network. Divide and Conquer is one of them which is based upon manually deployment. There are some limitations in this scheme. In future we will be proposed a technique to improve energy efficiency of the divide and conquer using relay nodes.

6. References

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