

Review of Energy Consumption and Cluster Head for Wireless Sensor Network

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Abstract: A wireless sensor network (WSN) in its simplest form can be defined as a network of (possibly low-size and less complex) devices which are denoted as nodes that can sense the environment and communicate the information gathered from the monitored field through wireless channel or link. In the data is forwarded, possibly via multiple hops relaying, in sink network that can use it locally, or connected to other networks. The idea of development of wireless sensor networks was initially motivated by military applications. Wireless sensor network provides a reliable, low power method for making measurements in applications where cabled sensors are impractical or otherwise undesirable, low maintenance. In the nodes are connected in sensor, wireless sensor network (WSN) is a large network of resource-constrained sensor nodes with multiple preset functions used, sensing and processing, to fulfill different applications. In this paper we study of introduced wireless sensor network, Sensor Network, Energy Consumption, Cluster Head, and literature review.

I. INTRODUCTION

The wireless sensor networks are interesting network to study due to the fact that large number of applications are being developed using these networks system. A wireless sensor network of the type investigated here refers to a collection of sensors, and nodes that are linked by a medium which is wireless in nature system [1]. Network to a main location or sink where the data can be observed and analyzed. One can be retrieve required information from the network by injecting queries and gathering results from the sink. The sensor nodes can communicate among themselves using radio signals. For typically a wireless sensor network contains hundreds of thousands of sensor nodes. It have individual nodes in a wireless sensor network (WSN) are inherently resource constrained: they have limited processing speed, communication bandwidth and storage capacity. After the sensor nodes are responsible for self-organizing an appropriate network infrastructure often with multi-hop communication. Wireless sensor devices in

respond to queries sent from a “control site” to perform specific instructions or provide sensing [2]. The working mode of the sensor nodes may be either continuous or event driven. Wireless sensor devices can be equipped with actuators to “act” upon certain conditions. It is wireless network sometimes more specifically referred as Wireless Sensor and Actuator Networks as described in a Wireless sensor networks (WSNs) enable new applications and require non-conventional paradigms for protocol design due to several constraints. Wireless sensor network are using Global Positioning System (GPS) and local positioning algorithms can be used to positioning information and obtain location. The requirement for low device complexity together with low energy consumption, a proper balance between communication and signal/data processing capabilities must be found. This is motivates a huge effort in research activities, industrial investments and standardization process on this field since the last decade. At present time, most of the research on WSNs has concentrated on the design of energy- and computationally efficient algorithms and protocols; the application domain has been restricted to simple data-oriented monitoring and reporting applications [3]. That authors in propose a Cable Mode Transition algorithm, in which determines the minimal number of active sensors to maintain K-coverage of a terrain as well as K-connectivity of the network. Specifically, it is allocates periods of inactivity for cable sensors without affecting the coverage and connectivity requirements of the network based only on local information schemes. In a delay-aware data collection network structure for wireless sensor networks is proposed in the objective of the proposed network structure is to minimize delays in the data collection processes of wireless sensor networks which extends the lifetime of the network. The network geometric deficiencies and used Particle Swarm Optimization (PSO) based algorithms to locate the optimal sink location with respect to those relay nodes to overcome the lifetime challenge Sensor-actuator networks can provide the ability to continuously monitor the integrity of structures in real-time, and detect damage at an early stage, and provide robustness in case of catastrophic failures [4].

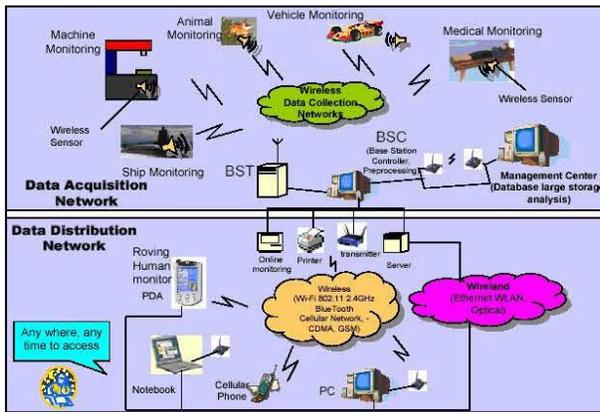


Fig.1: Wireless Sensor Networks (WSN)

Sensor Network

A Sensor is a device that responds and detects some type of input from both the physical or environmental conditions, such as heat, light, pressure etc. The output of the sensor is generally an electrical signal that is transmitted to a controller for further processing. A wireless sensor network consists of autonomous sensors scattered in an environment where they monitor conditions such as temperature, sound, and pressure. Because of the huge size of this forest, changes in the forest affect not only the local environment but also global climate by altering wind and ocean current patterns [5].

WSN projects include wireless sensor networks applications such as wireless, Zigbee, home automation, SCADA transformer health monitoring system and so on [1].

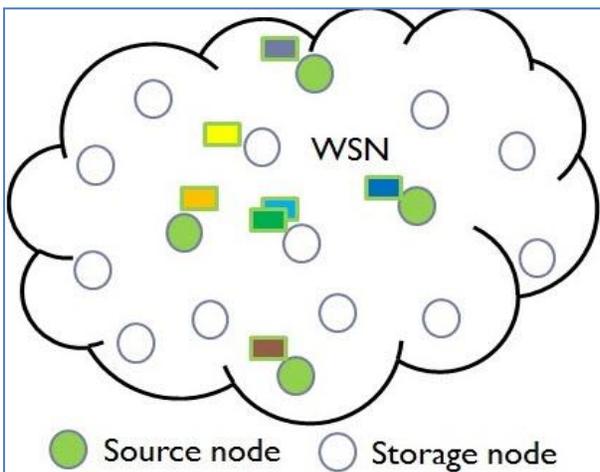


Fig. 2: Sensor Network (Source and Storage Node)

In the localization for outdoor wireless sensor networks (WSNs) is a fundamental middle-ware service for many wireless sensor networks applications. For example, in military surveillance location information of each node is

essential to determine a target's position. The Sensor networks are shown in figure 2.

Types of WSNs (Wireless Sensor Networks)

Depending on the environment, the types of networks are decided so that those can be deployed underwater, underground, on land, and so on. Different types of WSNs include. Terrestrial WSNs, Underground WSNs, Underwater WSNs, Multimedia WSNs and Mobile WSNs.

Requirements for a Wireless Sensor Network

Initial research into wireless network sensors was mainly motivated by military applications, with the Defiance Advanced Research Projects Agency (DARPA), continuing to fund a number of prominent research projects (e.g., Smart Dust, Network of Embedded systems (NEST)). The type of applications considered by these projects led to a de facto definition of a wireless sensor network as a large-scale (thousands of nodes, covering large geographical areas), wireless, ad-hoc, multi-hop, un-partitioned network of homogenous, tiny (hardly noticeable), mostly immobile (once deployed), sensor nodes that would be randomly deployed in the area of interest, (Kay Romer et al. 2004). Further applications and projects do not always fit these requirements, but these are the basic constraints assumed by most developers. To summarize the aims that a node and a network of this nature have to achieve, these are ideally the main characteristics: Low power consumption, Low cost nodes that use cheap and commonly available batteries, Small physical size to facilitate deployment, Compliance to standards and regulations, Single design for international markets, Ability to maintain time synchronization with other nodes and hopping messages to destination, Operate over wide temperature ranges especially for military applications or high temperature scenarios (i.e. a desert zones) and Fault tolerant [7].

II. LITERATURE REVIEW

Shiv Prasad Kori et al. "Performance Comparison in Terms of Communication Overhead for Wireless Sensor Network Based on Clustering Technique" International Journal of Electronics Communication and Computer Engineering, Volume 4. The present work, the comparative evaluation of communication overhead for the wireless sensor network based of on clustering technique is carried out. It has been be observed that overhead in cluster-based protocol is not much dependent upon update time. Simulation a result indicates that cluster based protocol has low communication overheads compared with the BBM based protocol when sink mobility is high.

Anshul Shrotriya et al. “**Energy Efficient Modeling of Wireless Sensor Networks Based on Different Modulation Schemes Using QualNet**” International Journal of Scientific Engineering and Technology, Volume No.1, I have study in the paper that it accounts for the analysis of energy consumption in existing energy models of Wireless Sensor Network (WSN) based upon different modulation. There are two main energy models preferred in Wireless Sensor Network, MOTES and MICAZ [1].

Amrinder Kaur et al. “**Simulation of Low Energy Adaptive Clustering Hierarchy Protocol for Wireless Sensor Network**” International Journal of Scientific Engineering Volume 3, , Recent advances in wireless sensor networks have settled into an important part of one’s everyday life and gained attention from both the research community and actual users. In wireless sensor networks energy alertness is an essential consideration & it explored to many new protocols specifically designed for sensor networks. Most of rank, given to hierarchical routing protocols based on clustering because of scalability .In this paper analyze the routing challenges & design issues involved in the wireless sensor networks and present the overall working of LEACH protocol and its SIMULATION [2].

Arivanantham Thangavelu et al. “**Clustering Techniques to Analyze Communication Overhead in Wireless Sensor Network**” International Journal of Computational Engineering Research, Vol. 04. The major problem with wireless sensor network is their limited source of energy, the courage constraint and high traffic load. In this paper we introduce various clustering techniques which are to be used to reduce communication overhead and increase network’s lifetime [16].

Labisha R.V et al. “**Energy Efficient Clustering Algorithms in Wireless Sensor Networks-An Analytical View**” International journal Volume9, Wireless sensor network refers to a group of spatially distributed and dedicated sensors for monitoring and recording the physical conditions of environment like temperature, humidity, sound, pollution levels, and wind speed with direction and pressure. Sensors are self powered nodes which also possess limited processing capabilities and the nodes communicate wirelessly through a gateway. In these applications a large number of sensors are expected and requiring careful architecture and management of the network. Significant attention has been paid to clustering strategies and algorithms yielding a large number of publications. In this paper, we demonstrated that cluster based protocol leads to less communication overheads [6].

Sandeep Gupta et al. (2015). “**Comparison of Energy Consumption in Wireless Sensor Networks with Different Clustering Technique**” International Journal Of Engineering Science & Management, 5(4). The wireless sensor network consists of the sensor nodes. The idea of development of wireless sensor networks was initially motivated by military applications. A WSN provides a reliable, low maintenance, low power method for making measurements in applications where cabled sensors are impractical or otherwise undesirable. In this paper Comparison of Communication overhead for 50 nodes and 100 nodes of three clustering technique SOM, K-Means and Fuzzy clustering and result analysis in between Communication overhead versus velocity in m/s [17].

Vineet Mishra et al. (2015). “**Performance Analysis Of Cluster Formation In Wireless Sensor Networks**”, Global Journal of Advance Engineering Technologies and Sciences, 2(11). The energy consumption is the principal concern in WSN. It system is built on an IEEE 802.15.4 wireless mesh network. Wireless Sensor Networking is a network of wireless sensor nodes deployed in an area. The wireless sensor network consists of the sensor nodes. The idea of development of wireless sensor networks was initially motivated by military applications [18].

III. TYPES OF CLUSTERING TECHNIQUES

Two well-known clustering algorithms are used in association with a visualization interface to simulate the possible cluster network with optimized energy Consumption. Clustering algorithms Subtractive clustering assumes each node as a potential cluster head and calculate the measure of the likelihood that each node defines the cluster head, based on the density of surrounding nodes.

1. The algorithm has the following features: Selects the node with the highest potential to be the first cluster head.
2. Removes all nodes near to the first cluster head, in order to determine the next node cluster and its head location.

Fuzzy C-mean (FCM) algorithm was introduced by Bezdek. The FCM based algorithm is a data clustering technique wherein each data point belongs to a cluster to some degree that is specified by a membership grade. K- Means: - Clustering K-means was first used by Mac-Queen in 1967 is one of the simplest clustering method comes under unsupervised learning algorithms used to solve the well-known clustering problem.

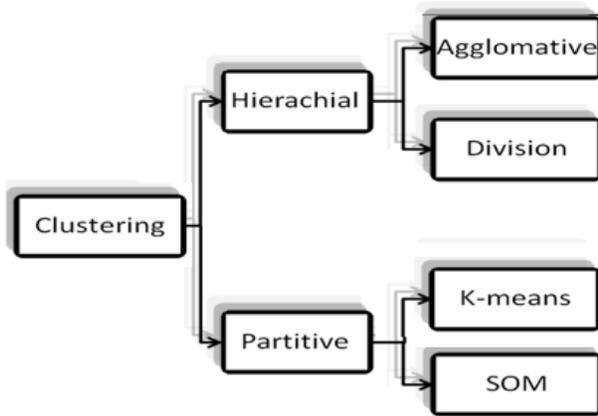


Fig. 3. Types of Clustering Techniques

It follows a simple and easy way to classify a given data set through a certain number of clusters (i.e. k clusters) fixed a priori. K- Means clustering comes under the category of partitioning method in which a partition of a database D of n objects is done into a set of k clusters. Given a k, the main task is of finding a partition of k clusters that optimizes the chosen partitioning criterion. That's why we have preferred k-means clustering for this work.

IV. ENERGY CONSUMPTION

Wireless Sensor Network (WSN) plays an extremely significant role in usual lives. Wireless Networks in provisions of constraints of their resources [14]. The energy consumption is the principal concern in Wireless Sensor Network (WSN). Therefore, a numerous researchers focused on energy efficient algorithms in WSNs for extending the life time of sensors. These differ depending on the deployment of node, the network design, the characteristics of the cluster head nodes and the network operation. Energy is proficient of save by grouping nodes as clusters. There are three types of activities that take up the majority of the power in a sensor node: sensing, computation, and radio operations such as receiving and transmitting. Of these three activities radio operations take up the majority of the power, so an energy efficient scheme should focus on reducing the amount of time spent on receiving and transmitting [4]. Nodes tend to take up more power consumption in receiving than in transmitting. Listening idly to the channel and overhearing packets consume the most of a nodes power [4].

III. CLUSTER HEAD

Clustering is used in order to advance the scalability of network performance. Clustering is useful in several sensor network applications such as inter cluster communication, node localization and so on. Clustering algorithms have extensive applications in the precedent years and common clustering algorithms have been proposed for energy

consumption in recent years in all of these algorithms, and nodes are structured as clusters, superior energy nodes are called as Cluster Head (CH) and other nodes are called as normal sensor nodes [15]. In the cluster based model, the network is divided into clusters comprising of number amount of nodes. Cluster head, which is master node, within each respective cluster is responsible for routing the information to other cluster head the figure 4 of cluster based model.

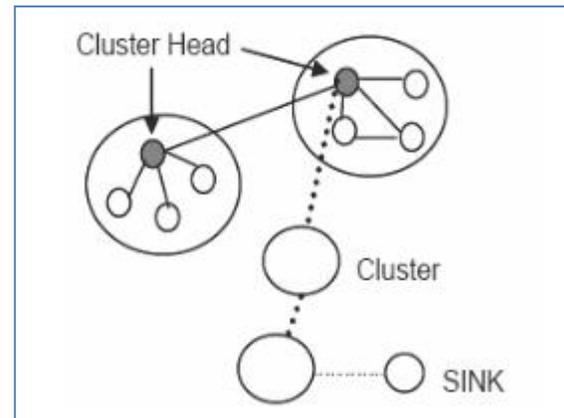


Fig. 4: Cluster based model

VI. CONCLUSION

Efforts have been made to minimize the energy consumption of wireless sensor networks and lengthen their useful lifetime at different levels and approaches. Some approaches aim to minimize the energy consumption of sensor itself at its operating level, some aim at minimizing the energy spent in the input/output operations at data transmission levels and others target the formulation of sensor networks in terms of their topology and related routing mechanisms. Advances in wireless communication technology are enabling the deployment of networks of small sensors. These sensor networks have applications in military monitoring, health, industrial control, weather monitoring, commodity tracking, home control etc.

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