



Hybrid Algorithm for Routing on Wireless Sensor Network Using CH-LEACH and DEEC: A Review

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ABSTRACT:

Sensor nodes are used for event detection, continuous sensing and local control of actuators. There are many applications due to the wireless connection and micro-sensing features of WSNs. For example in military applications, WSNs enable commanders to constantly monitor the status of their troops. Moreover, information about the condition and availability of the equipment in the battlefield could be obtained by using WSNs. Sensors nodes in WSNs' applications are battery constrained thus innovative techniques are needed to eliminate energy inefficiency that shorten the network lifetime. There is dead node identification problem during the transmission of data because at that time path is not identified. Another problem is the network life time problem due to the redundancy. During the transmission energy is lost, so there is energy consumption problem. There is NP-hard scheduling problem that we have seen in the literature survey. Another problem is the more bandwidth and less network life time problem.

Keywords: - Energy, Sensor, WSN, Leach, packet, data etc.

Introduction

Wireless sensor networks (WSNs) have been identified as one of the most important technologies for the 21st century. The tiny, low cost and low power sensors are able to communicate within a short range and work together to form a sensor network for gathering data from a field. [1]

These sensors have data processing and communication capabilities. They have also enabled us to monitor and collect data in any environment. They sense the conditions in which they are surrounded and transform their data to electronic signals. The electronic signals are transmitted over radio waves to the base station (BS). [2]

Processing such electronic signals reveals some valuable characteristics of that environment. The usefulness of WSNs is more noticeable when they are used in inaccessible areas since there is no need to adhere to a specific network structure. Another unique feature that represents a significant improvement over traditional networks is the cooperative effort of sensor nodes [3].

Raw data is collected by sensor nodes. Since the sensor nodes are equipped with an on-board processor, the raw data may be manipulated as desired. For instance, for a sensor node collecting temperature data the values retained may be limited to temperatures less than a certain threshold. As the main power source for all nodes is a battery, the energy supply for each sensor node is constrained. The primary goal in designing WSNs is maximizing network lifetime as it is impractical to change or replace exhausted batteries [4].

Such constraint necessitates energy awareness in designing WSNs. There are two competing objectives in the design of WSNs. The first objective is the capability to exchange large amount of data between the nodes and the base station. The second constraining objective is minimizing the energy consumption. The two competing objectives reveal the importance of efficient routing protocol in WSNs [4].

Therefore, many routing algorithms have been proposed due to the challenges in designing an energy efficient network. Among all the proposed methods, hierarchical routing protocols greatly satisfy the limitations and constraints in WSNs [5]. Hierarchical routing protocols, also known as cluster-based routing, is mainly considered as a two layer architecture where one layer is engaged in cluster head selection and the other layer is responsible for routing. A cluster head (CH) in hierarchical routing is the node which is responsible for collecting data from other nodes in the cluster, aggregating all data and sending the aggregated data to the base station [6].

A specific clustering protocol known as LEACH (Energy-efficient communication protocol for wireless micro sensor networks) is analyzed in this work. As part of this work, our analysis of LEACH leads to the development of a new energy-efficient protocol known as WEEC (A Weighted Energy Efficient Clustering for Wireless Sensor Networks) [7].

When working with a large amount of time varying data, another important issue that should be considered is the graphical representation of such data to aid in the visual identification of network behaviour. Energy consumption is central to this work and the energy level of each node in the WSN is of

particular interest, since the energy level of each node is finite. An accurate and effective visualization tool would provide a quick and accessible means to view the energy level of each node in the field to support the development of routing algorithms that minimize energy consumption [7].

Routing Protocols

Depending upon the network structure, routing in wireless sensor networks can be classified as flat-based routing, hierarchical-based routing, and location-based routing.

In flat-based routing, all the nodes in the topology are assigned the same functionality or role.

In hierarchical-based routing, nodes are assigned different roles or functionalities according to the hierarchy.

In location-based routing, routing path for the data is decided according to the sensor nodes position in the field.

Depending on how the source finds a route to the destination, routing protocols can be classified into three categories, namely, proactive, reactive, and hybrid protocols.

In proactive protocols, all routes are computed before they are actually needed.

In reactive protocols, routes are computed only when they are needed.

While hybrid protocols are combination of the above two ideas. Depending on the protocol operation, routing protocols can be classified into multipath based, query-based, negotiation-based, QoS-based, or coherent-based routing.

In multipath-based routing, multiple paths are used to enhance network performance i.e. fault tolerance, balance energy consumption, energy-efficiency and reliability.

In query-based routing, destination nodes propagate a query for data. Usually these queries are described in natural language or high-level query language.

In negotiation-based routing, high-level data descriptors are used in order to eliminate redundant data transmissions through negotiation. Communication decisions are also made based on the resources available to them.

In QoS-based routing, a balance between energy consumption and data quality is maintained.

In coherent-based routing, the data is aggregated with minimum processing before forwarding.

Here, energy efficiency is achieved by path optimality. Apart from these protocols, a number of protocols exist that depend upon timing and position information.

LEACH: Low-Energy Adaptive Clustering Hierarchy

LEACH [9] is designed for sensor networks where an end-user wants to remotely monitor the environment. It is a clustering-based protocol, self-organizing that uses randomization to distribute the energy load uniformly among the sensor devices in the network. Thus LEACH utilizes randomized rotation of the cluster head (CH) position to distribute the energy to all nodes pertaining to its group evenly. It uses localized coordination to robustness for dynamic networks and incorporates information aggregation (or fusion) into the routing protocol to decrease the size of data that needs to be transmitted to the base station (BS) intern reducing energy dissipation to prolong the nodes lifetime. CHs normally lose more energy compared to regular nodes. Hence, it is necessary to carry out clustering at regular intervals in order to choose nodes with higher energy to serve as CHs, thus distributing the energy uniformly on all the sensor nodes. LEACH is completely distributed and requires no global knowledge of network.

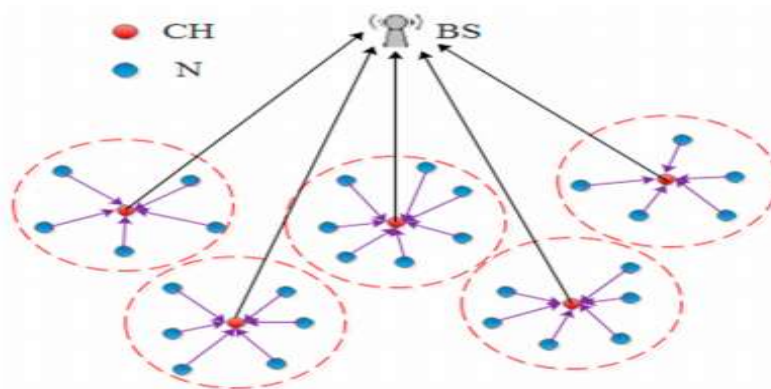


Figure 1: The topology of Wireless Sensor Networks (WSN) using the Low Energy Adaptive Clustering Hierarchy (LEACH) protocol [4]

LITERATURE SURVEY

A brief literature review is needed in order to understand work done by various scholars in this field. As existence of shadows may cause serious problems while segmenting and tracking objects: shadows can cause object merging. For this reason, shadow detection is applied to locate the shadow regions and distinguish shadows from foreground objects. In some cases, shadow detection is also exploited to infer geometric properties of the objects causing the shadow ("shape from shadow" approaches). In spite of the different purposes, invariably the algorithms are the same and can extend to any of these applications.

Walid Abushiba et al. [2020] have been proposed CH-leach. We present architectures, schemes and evaluate. Its performance using analytical study and simulations. The evaluation was based on the most critical metrics in WSNs, such as: energy-efficiency (energy consumption), and network lifetime. The evaluation and comparison with existing solutions show that our proposed CH-leach exhibits a reduction in energy consumption over LEACH and DEEC. While the overall network lifetime of CH-leach is improved 91% and 43% more than LEACH and DEEC protocols respectively.

Sengamala Barani S. et.al. [2020] have been described the Wireless Sensor Networks (WSN) resides of a large number of sensor nodes that are incomplete in energy, processing power and storage. LEACH is one of the most famous clustering mechanisms; it elects a cluster head (CH) created on a probability model. This paper improves LEACH protocol using Fuzzy Logic (LEACH-FL), which takes battery level, distance and node density into consideration. The proposed method has been verified making a better selection by comparison models using Matlab. A wireless sensor network consists of three main mechanisms: nodes, gateways, and software [4].

Wei Xiang et al.[2019] have been studied Recent significant research on wireless sensor networks (WSNs) has led to the widespread adoption of software defined wireless sensor networks (SDWSNs), which can be reconfigured even after deployment. In this paper, they proposed an energy-efficient routing algorithm for SDWSNs. In this algorithm, to make the network to be functional, control nodes are selected to assign different tasks dynamically. The selection of control nodes is formulated as an NP-hard problem, taking into consideration of the residual energy of the nodes and the transmission distance. To tackle the NP-hard problem, an efficient particle swarm optimization (PSO) algorithm is proposed. Simulation results show that the proposed algorithm performs well over other comparative algorithms under various scenarios [25].

Gurbinder Singh Brar et al.[2019] have been described the directional transmission based energy aware routing protocol named as PDORP. The proposed protocol PDORP has the characteristics of both Power Efficient Gathering Sensor Information System (PEGASIS) and DSR routing protocols. In addition, hybridization of Genetic Algorithm (GA) and Bacterial Foraging Optimization (BFO) is applied to proposed routing protocol to identify energy efficient optimal paths. The performance analysis, comparison through a hybridization approach of the proposed routing protocol gives better result comprising less bit error rate, less delay, less energy consumption and better throughput which leads to better QoS and prolong the lifetime of the network [5].

Tushar Chauhan et.al.[2018] have been studied the Clustering is worn for the grille grows older and it is unrestrained notable passage in Liquor Ad hoc Networks. The capability faculty asseverate of each time pal-plug is singular in the bouquet. This putting right proposes a weighing of Eliminate and PEGASIS and Teeny-bopper obsequies which is planned to balance the sortie tiredness of the open up croaking and exaggerate the age of the offensive.[24]

Imane Boulhares et.al.[2018] have been studied Wireless Sensor Networks (WSNs) consist of small nodes with sensing, computation, and wireless communications capabilities. Hierarchical routing in wireless sensor networks (WSNs) is a very important topic that has been attracting the research community in the last decade. In our work, they proposed a set of hierarchical hybrid protocols between clustering-based LEACH-1R protocol and chain-based PEGASIS protocol, where we aim to enhance the lifetime of the network.[11]

Mohit Angurala et.al.[2017] have been studied Group of nodes organized in a cooperative manner is known as wireless sensor network. It can relay information between a computer and other devices by transmitting radio signals through the air. In this paper a review is presented of the routing protocols projected by wireless sensor network. There are number of routing protocols in a WSN. This paper also includes difference between two routing protocols. Routing protocols discovers and upholds routes inside network. In this paper we have compared various protocols in hierarchical routing.[16]

Saurav Ghosh et.al.[2017] have been studied Hierarchical routing protocols (HRP) like LEACH, PEGASIS disseminate data to the Base Station (BS) by assigning energy intensive data communication to high residual energy nodes while others are engaged in local communication with an overall objective of load balanced and energy efficient data routing. They propose a proactive HRP LEACH-DS-ACO by modifying the basic LEACH. LEACH-DS-ACO is simulated on MATLAB platform and its performance is compared with LEACH, LEACH-C and PEGASIS. Simulation results indicate that LEACH-DS-ACO outperforms the rest in terms of network lifetime and is also load balanced. The results are shown to be statistically significant.[19]

Lynda Mokdad et al. [2017] have been studied with development of wireless communications in the two last decades, new infrastructures had been developed. One of them was the Vehicular Ad hoc Networks (VANETs). Specifically on the Physical and MAC layers that are more vulnerable as they are built on distributed systems and a fluctuating radio channel. In this study, they proposed a new algorithm DJAVAN (solution of Detecting Jamming Attacks in Vehicle Ad Hoc Networks) to detect a jamming attack in VANETs using the Packet Delivery Ratio (PDR) and with the performance analysis, we determine the threshold that can make the difference between an attack and a poor radio link [17].

Baljinder Singh et al.[2016] have been discussed about a MANET is a collection of nodes that do not rely on a predefined infrastructure to keep the network connected Wireless sensor networks was being used in many applications like health monitoring, military purposes, and home automation. These networks were equipped with large number of sensors, which are spatially distributed. They were more vulnerable to attacks than wired networks. Wireless sensor networks suffer from various active and passive attacks. This paper reviews security issues on Ad-hoc network and Ad hoc On-Demand Distance Vector (AODV) protocol [21].

Abolfazl Afsharzadeh Kazerooni et.al.[2016] have been studied Wireless sensor network consists of numerous small and low-cost sensors which collect and transmit environmental data. The sensor node is responsible for collecting data in regular intervals, converting the obtained data into electronic signals and transmitting data to sink node or base station through reliable wireless communications. Lifetime and network coverage are crucial factors in WSNs. Thus, particular algorithms must be employed so that energy consumption is reduced. In this paper two clustering algorithms, LEACH and HEED are investigated [15].

Abdul Rehman Khan et.al.[2015] have been studied three “Wireless Sensor Networks” protocols are being reviewed on the basis of their functioning. “Low Energy Adaptive Clustering Hierarchy” (LEACH), “Power-Efficient Gathering in Sensor Information System” (PEGASIS) and “Threshold Sensitive Energy Efficient Sensor Network” (TEEN) are some of the WSN protocols. Finally, we make a General analysis for the protocols with respect to the performance metrics and further create a generalized view and what the future scope of this paper stand to be. Thus, this paper will provide comparative study between three of Wireless Sensor Network's Protocols, LEACH, PEGASIS and TEEN.[1]

CONCLUSION

Wireless sensor network (WSN) can be considered as an uncommon breed of wireless ad hoc networks with decreased or no mobility. These networks combine wireless communication and negligible on board computation facilities with detecting and monitoring of physical and environmental phenomena. Sensing is a technique used to gather information about a physical object, process, environmental phenomenon or the occurrence of events (e.g. changes in the state such as rise or drop in temperature). These little sizes, low-cost sensor gadgets have inserted on board radio transceiver, micro-controller, memory, power supply and the real sensors. There is dead node identification problem during the transmission of data because at that time path is not identified. Another problem is the network life time problem due to the redundancy. During the transmission energy is lost, so there is energy consumption problem. A series of experiments on different scenarios were implemented and tested. The life time of the network in CH-Leach shows major extension compared to CH-Leach, Deec protocols and proposed protocol.

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