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Optimization of the WSN Network Based on the EAMMH and OLIN Algorithm

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***Abstract*- Wireless Sensor Network (WSN) is a network type that consists of several sensor nodes used for particular functions in a specific area. These nodes forward the data to their nearest base station (BS). For the transmission of data, nodes with restricted energy can be used. A big challenge in WSN is the high quantity of energy needed for the little volume of data. Monitored processes that provide time-stamped data may alter significantly over time in real-world sensor networks. The OLIN (online information network), an online data mining approach, automatically accommodates the drift rate of the idea in a non-stationary data stream by continually generating a classification model from each sliding training example window. This paper presents a new IOLIN (incremental online information network) data mining algorithm in real-time, which saves a substantial amount of calculation effort by updating an existing model as long as no major idea drift is observed. The suggested technique relies on the overlooked "Information Network" (IN) decision-tree classification model and provides three different sorts of model updates. No statistically significant distinction between precision of the incremental algorithm (IOLIN) vs. renewable algorithm (OLIN) was discovered in studies with multi- year streams of traffic sensor data.**

***Keywords*- OLIN, IOLIN, Energy Efficient Protocol in WSN.**

I. INTRODUCTION

In recent years, the research community and business have drawn substantial attention to Wireless Sensor Networks (WSN). Its possible application in a number of scenarios, including military operations, environmental monitoring, surveillance systems and health care, and environmental monitoring and public security, is crucial to recent research and rapid progress. A huge number of sensors, generally utilized randomly in every geographical area, are applied in these applications. These sensor nodes monitor the environment, connect with other nodes and under many conditions perform minimal data processing.

Sophisticated and highly efficient routing protocols are necessary to implement existing and planned uses for WSNs. Nevertheless, the inherent features of the single sensor nodes provide significant issues with energy use and communication methods. The characteristics include restricted power and a small range of drives. As such, it is a challenging process, for a WSN-specific application, to pick or propose a new routing protocol. Some of these issues can be dealt with by WSN clustering.

For each cluster, smaller clusters are organized and a CH for network node clustering is selected. Each cluster sensor Node will send data from its respective CH and CH to a central baseline (BS). Only CH transmits information from the cluster because nodes in other clusters do not share the communication can prevent collisions between sensors within the group. The objective is to locate a collection of nodes that can serve as cluster heads between a group of sensors. The perfect selection of CH nodes is difficult to obtain for a particular network configuration. A non-deterministic NP (polynomial) hard optimization problem has been shown to be the perfect CH package.

The link between the nodes might be either intra-cluster or inter-cluster after WSN has partitions into clusters. Data interchange between nodes of members and their respective CH included in the communication inside the cluster. The interconnection between the clusters includes data transfer between CHs and BS. An important and crucial part of WSNs is effective data transfer between CHs and BS, inter-cluster communication. A hop-based strategy is a straightforward way to execute the direct data exchange task for each CH with the BS. Another approach is to allow intermediate nodes to be involved between CH and BS in data packet delivery.

II. LITERATURE REVIEW

Fathima Shemim KS et. all (2020) This article explored energy efficient clustering strategies for WSNs in LEACH, EAMMH and EEAHP. The main focus was the analysis of these procedures' performance and energy efficiency. The preceding data have demonstrated that EEAHP has done well in terms of put-in and total network life, compared to LEACH and EAMMH. EEAHP uses an effective sleep and wake schedule to solve the energy hole problem and hence increase its stability. [1]

Amin Shahraki et. all (2020) Clustering was employed in WSNs as a frequent way to topology management. Clustering can handle additional challenges, such as load balancing, QuoS, safety management and mobility, though is generally known as energy consumption. This research analyzed the goals of WSN cluster technology for more than 20 years after the first important technique to clustering has been introduced, to explore the current path of classification technology. [2]

Vaibhav Godbole et. all (2012) Wireless sensor networks (WSNs) are divided into clusters to collect information more efficiently. The location of the base station is not considered by most suggested clustering methods. In multi-hop WSNs this leads to hot spot difficulties. In this research, the purpose of the analysis is to prolong the lifetime of WSN's a fluid clustering method (FCA). In view of the residual power and distance of sensor nodes, this algorithm modifies cluster head radius. Based on these tests, we have concluded that FCA is a stable clustering algorithm for WSNs which is energy efficient. [3]

Surender Kumar et. all (2014) Energy savings to extend the life of the network is a significant problem in design while building a new wireless network sensor routing protocol. Clustering is an essential technology and contributes to maximize the life and scalability of the network. Most of WSN's protocols for routing and dissemination of data assumes a standard network architecture where the battery power, communications, sensing, storage and processing capacity of every sensor is equal. EACP for two level heterogeneous sensor networks was suggested in this paper (Energy Aware Clustering Protocol). [4]

Hamdy.H El-Sayed et. all (2018) The WSNs pose challenges for different transmitters and receivers, and efficient protocols. Until recently many strategies for addressing these challenges have been offered. One of them is the clustering approach, which aims to assess the efficacy of several clustering systems and to compare them. To that end, authors first make the transmitter and recipient energy constant by growing network nodes with regard to maximizing network size. We chose protocols for the EAMMH, LEACH, SEP and TEEN clustering to examine the viability of various clustering strategies. [5]

Santosh V. Purkar et. all (2018) In the design of an application for real-life, a heterogeneous wireless network of sensors meets the criteria of researchers to tackle unattended challenges. However, researchers' key constraint is the energy source with sensor nodes. In addition, energy-efficient operating systems need to be designed to extend the lifetime of sensor nodes and hence of HWSN. The clustering technique, which improves the performance of WSN, is one of the most suited approaches to energy efficiency improvement. A unique way to improve the performance characteristics of an energy efficient clustering technique for HWSN via EECPEP-HWSN is proposed for this study. [6]

Mohamed Saad AZIZI et. all (2019) The sensors in the wireless sensor network are usually a restricted source of energy and are employed in hard to access regions. The energy consumed by the transit of data from sensors to destinations poses a major difficulty in developing a power-efficient routing strategy for homogeneous and heterogeneous wireless sensing networks. Various techniques of reducing energy usage and improving the lifetime of the sensor network were given using clustering algorithms. In this research authors describe a technique for routing the energy-efficient wireless sensor network. [7]

Muhammad K. Khan et. all (2021) However, the most significant resource in every resource, as the life of the network depends on sensor nodes and nodes are still alive based on energy. WSNs do not have a finite resource. Detailed literature study shows that during the communication process most power has been taken advantage of. The most significant role in optimizing energy usage in the communication process is an effective routing protocol.

The study report also describes a well-known hierarchical LEACH routing protocol in its extended forms. In addition to significant energy consumption improvements by LEACH as compared with other non-hierarchic routing protocols, the routing protocol also offers several possibilities for improving energy efficiency. [8]

Ikram Daanoune et. all (2020) Currently, energy-efficient design is the key problem for the routing protocol in the WSN. To tackle this challenge, the sensor node must work with minimal energy usage for a long time. The data sent and received generally represent the largest energy use in the network. Several protocols have been developed to address this difficulty.

This research suggested a new strategy in WSN to hierarchical clustering with the hierarchical and clustering method of energy-saving. The primary aim of the improved protocol is to balance the energy use of nodes.

Secondly, extending network life and improving stability: (1) taking into account current CH selection energy, (2) evaluate the current energy and the distance from the plumbing system to collect the CH leader who transfers summer data to the plumbing after all data gathered are received. The proposed performance of the protocol in this study was evaluated against the original LEACH algorithm. [9]

Fang Zhu et. all (2019) With their wide-ranging use, the wireless sensor networks have received huge attention from every industry. Major difficulties in wireless sensor networks include the maximization of network life. This article provides a protocol of energy efficient routing which uses an uneven clustering technology to solve the problem of hot spots and proposes a double cluster head method to reduce cluster head node energy consumption. Sensor nodes have limited power and can hardly be replaced. This paper therefore presents a UDCH energy efficient to improve the energy efficiency of WSNs. This protocol seeks to resolve energy consumption concerns and unequal power challenges. To overcome the problem of hot spots, UDCH employs unequal clustering technology which improves CH selection technique and cluster size calculation method. [10]

III. METHODOLOGY

1. IOLIN Algorithm:

The IN method, the IN or the information network has an overlookable tree-like classification model to minimize the overall quantity of predictive features. The methodology based in IN is based on the notion that the MI between entry and target attributes should be evaluated by a multi-layered network. Each hidden layer is linked to a certain input property, representing the interaction between that input attribute and the previous levels. The IN algorithm uses a pre-taping strategy: a node is separated if this method statistically reduces the entropy of the objective attribute (equivalent to mutual information).

In the absence of any of the remaining input qualities, the structure of the network will halt. This algorithm is produced by a network that can be utilized as a decision tree to predict the value of the target attribute. A sampling network structure appears in the following figure. The network consists of two covered layers, which in this instance represent two input properties. The first tier of the input attribute consists of three values of Nodes 1 through 2 and 3. Nodes 1 and 3 are separated by the network construction process. The second (end) hidden layer includes 4 nodes, consisting of the combination of the two values of the second attribute with the first nodes divided into two layers. The target layer indicates the target property with three values (classification) (class labels).

With the possible ideas of drift in a non-stationary data stream the OLIN on-line classification algorithm simply builds a new model for every sliding window. However, this renewable technique ensures accurate and relevant models throughout time, hence enhancing classification accuracy. The fundamental weakness of OLIN's, on the other hand, is the high expense of calculating new models. We present a new (incremental OLIN or IOLIN) algorithm in this research, an expansion of the regenerative OLIN method. As seen in the evaluation section, the incremental method is almost as accurate and occasionally higher than the regeneration algorithm and much lower as no new example needs to be produced.

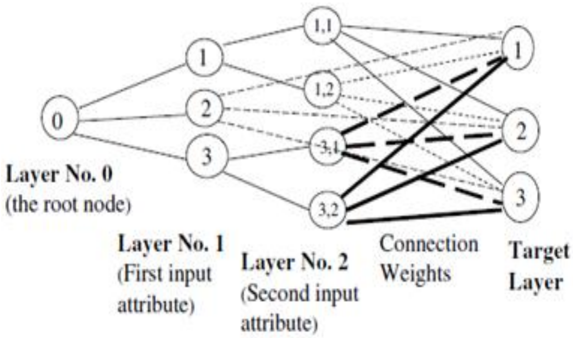

Fig 1. Diagrammatic Representation of IOLIN Algorithm.

The basic insight behind the incremental approach is to update the current classification model with the current training window concept, so long as a statistically significant drop in predictive precision does not take place as a key concept drift and when a major concept drift occurs a new model is built. In fact, the regenerative strategy is a particular example of the gradual approach.

Whenever new data comes in, the progressive technique is the same as the recuperative approach when a substantial concept drift is found. The progressive technique is only helpful if the concept remains stable among at least one pair of adjacent windows. This threshold requirement can be easily satisfied in most data streams, especially when the size of the training window is quite small. Many occurrences have been seen in the sectors of transport, manufacture and stocks through the deployment of OLIN regeneration into numerous datasets.

- If there is no concept drift between 2 adjacent training windows (characterized as a significant accuracy loss) the differences between a new and a former model are modest (about 80 percent of the network structure remains the same). This means that the present model can be modified in considerably less time and effort instead of re-building a new model (in case of no idea drift).
- If there is no considerable design drift between two consecutive windows, the main change in the latter hidden layer of the data network is between the new and the existing model.
- The new model is virtually wholly different from the current one when the big concept drift between two neighbouring Windows is found (in 90 percent of the cases the differences propagate up to the root node). The occurrences above indicate that as long as the last layer of the existing model cannot be updated by a large drift, the discovery of the substantial drift of the concept means that the construction of a new model is preferred.

IV. RESULTS

1. Energy Graphs:

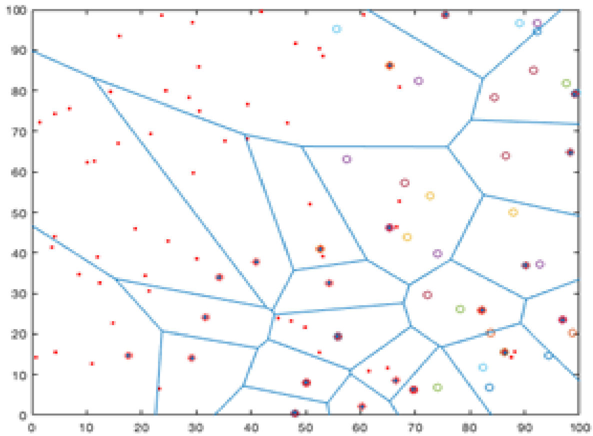

Fig 2. Energy Graph.

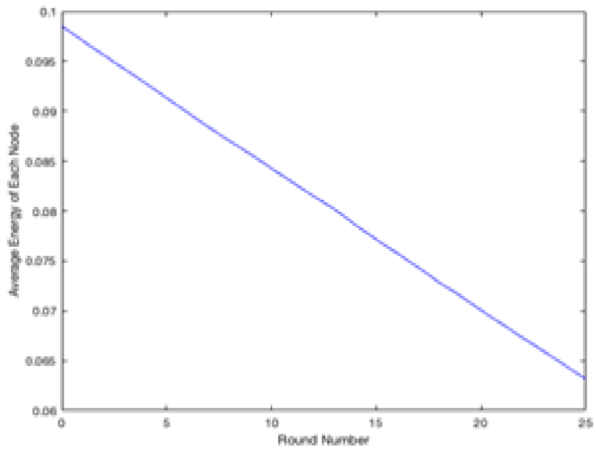

Fig 3. Graph Plot between Average Energy of Each node and Round Number.

In this figure we can see Graph Plot between Average Energy of Each node and Round Number.

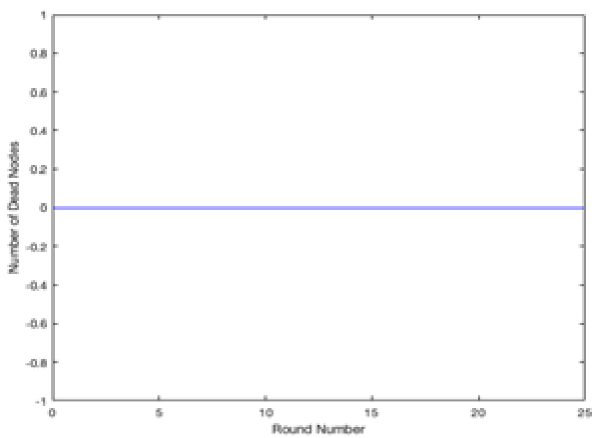

Fig 4. Plot Between Number of Dead Nodes and Round Number.

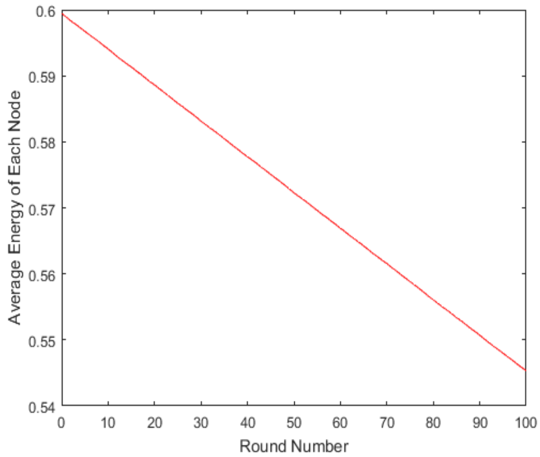

Fig 5. Graph Plot Between Average Energy of Each Node and Round Number.

2. WSN Shortest Path:

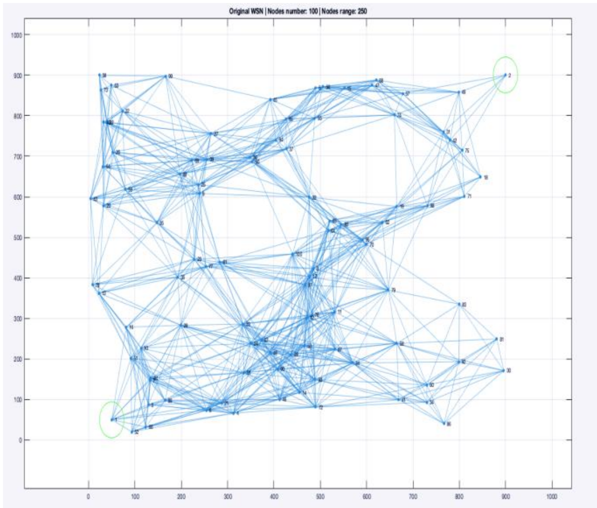

Fig 6. Shortest Path Node1-Node2.

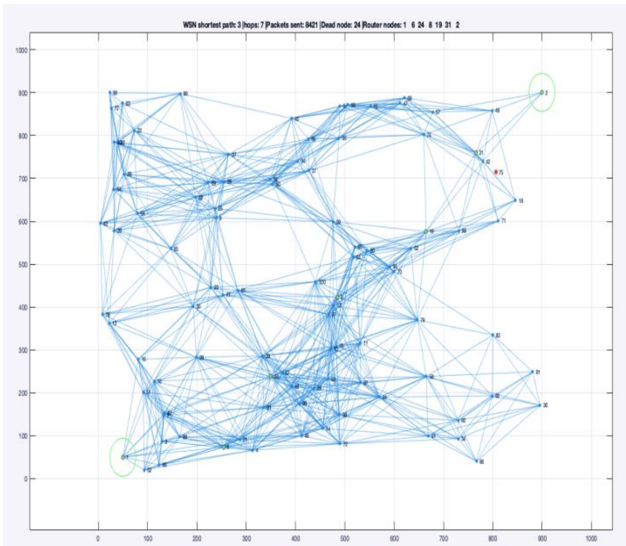

Fig 7. Shortest Path Node1-Node2. (2)

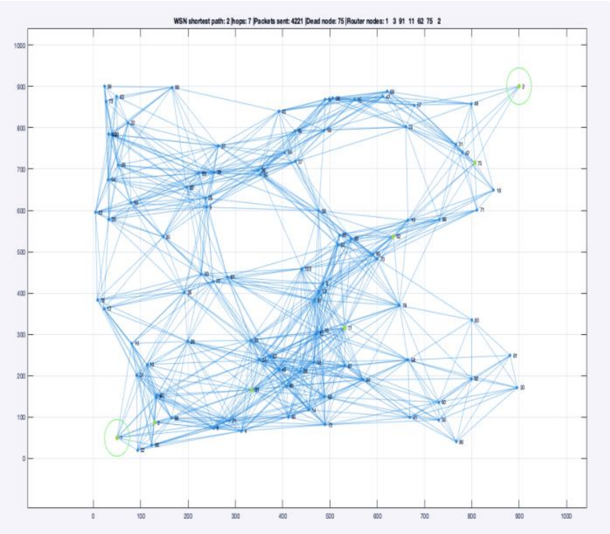

Fig 8. Shortest Path Node1-Node2. (3)

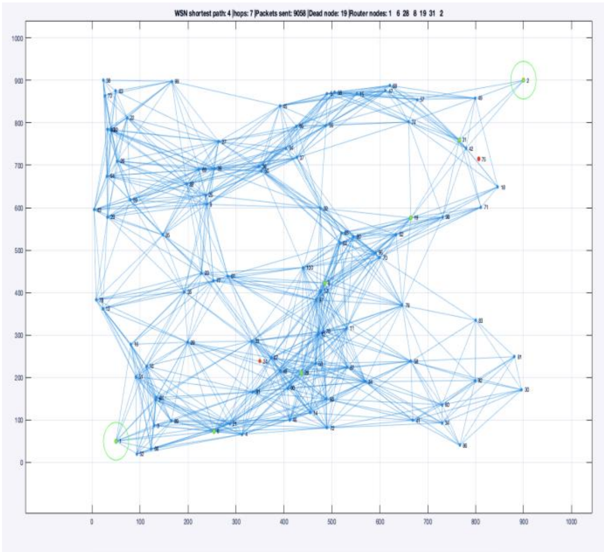

Fig 9. Shortest Path Node1-Node2. (4)

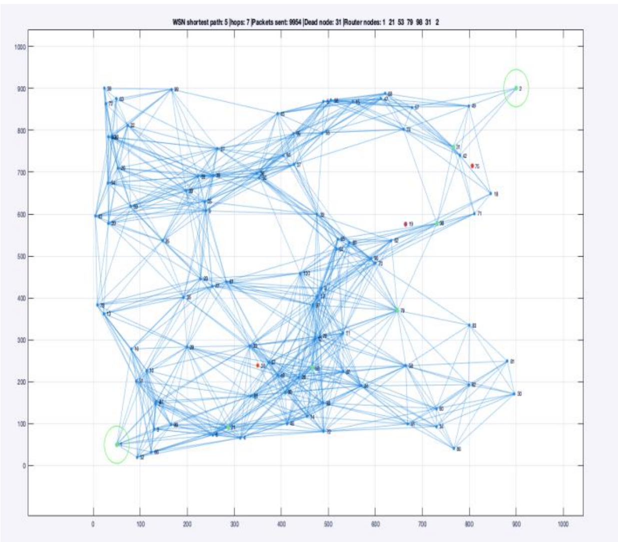

Fig 10. Shortest Path Node1-Node2. (5)

V. CONCLUSION

Self-configured Wireless Sensor Networks, infrastructure and wireless networking are less important. The network is made up of small devices with good sensors and wireless transceivers. The primary objective of WSN is to create an environmental connection data and to deliver it to the Base Station (BS), which is used to view and evaluate the data. Wireless sensor devices also respond to requests delivered to particular instructions from the base station (BS).

Energy conservation to extend the life of the network is a key concept issue in building a new wireless sensor network routing protocol, Energy-efficient techniques of WSN hierarchical clustering. The primary objective of these procedures was to investigate their performance and energy efficiency. The most important attention of wireless network researchers is an energy efficient routing strategy (WSNs). We describe in this paper efficient protocols of hierarchical routing, which thrive on conventional low energy.

VI. FUTURE SCOPE

As a result, our approach is expanded by using the software-defined wireless sensor network to assess its reliability in real world applications. In future studies, therefore, in collaboration with intelligent algorithms, the LEACH protocol should be optimized and applied in practise compared with alternative ways. As future work, it can be improved with additional costs such as consideration of uniform cluster sizes for better load balancing.

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