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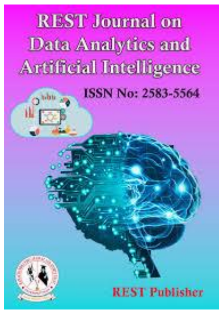

Advanced Routing Protocols for Wireless Sensor Network: Review

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Abstract: Sentiment analysis of text plays a crucial role in various fields, particularly in marketing and customer service industries, where understanding subjective informa- tion from text data is essential. While existing sentiment analysis tools often focus on binary classifications of positive or negative sentiment, this study delves into the possibility of representing emotions using multiple dimensions. By exploring Ekman's six basic emotions and the Valence- Arousal-Dominance (VAD) structure, this research aims to investigate whether using more than one dimension to classify emotions is useful. Two datasets, Bag-of-Words and EmoBank, are analyzed, with EmoBank providing VAD values for 10,000 English sentences. Research questions focus on optimizing textual sentiment prediction and evalu- ating the utility of multi-dimensional emotion classification. Experimental investigations involve data pre-processing, model selection, and sampling tests to address dataset limitations and dependencies between variables. Findings suggest the potential for building more nuanced senti- ment prediction models, with implications for improving sentiment analysis accuracy and understanding human emotions in text data.

1. INTRODUCTION

Next-generation technology is used in the creation of homes, workshops, dwellings, shipment, and moving automation in smart settings. The real-world sensory details are used by the intelligent settings. Sensor networks including numerous wireless sensors were utilized to gather this sensory data in faraway regions. Wireless sensors, often known as nodes, are tiny electronic devices that may connect with other Wi-Fi devices or with one another [1]. WSN nodes are equipped with a small operating system (OS) designed specifically for hardware and required software [2].

A WSN is a unique kind of ad hoc network, consisting of a large number of small nodes grouped geographically to monitor physical or environmental variables like humidity, pressure, temperature, etc. A sensor node's controller, memory, transceiver, sensor, and power are its constituent parts. Sensing, processing, and transmission are a sensor node's three primary functions. Because expanding sensor coverage and communication across the WSN consumes more energy, every node in the network has limited communication range and restricted sensor coverage. To send the observed event to the sink node, each node has a limited communication range [3] [4].

In many aspects, a wireless sensor network is distinct from other types of networks. It starts with tiny physical network nodes that detect, analyze, and send radio waves. Second, every node is configured by the same network protocol, enabling a collection of nodes to form an automatically configured network. Third, sensor nodes have limited energy because they are constructed without maintenance for years [2]. The lifespan and efficiency of the network have a significant impact on the battery capability of the sensors [5][6]. Power is therefore crucial for networked sensors to collect data on reduced energy consumption.

Wireless sensor networks must consider many issues, including the entire lifetime of the network, coverage, energy consumption, and protection [7–10]. The main purpose of the technology is to improve the lifespan of CH and sensor nodes and provide efficient and secure communication. The following points should be taken into account when designing an energy-saving clustering algorithm. The first one is to broadcast the routing process because this is good for mass wireless communication [11]. Additionally, the board needs to be evenly distributed throughout the network to ensure that heads are equally visible on all links for contact [12]. In addition, since the interaction between the main unit and the BS consumes all the energy, the communication between the BS and the main unit may decrease [13]. Finally, the routing table does not work well in most hierarchical routing systems.

The number of members in the cluster determines how much energy is used to collect data from sensor nodes. Just as there are differences between member nodes and cluster heads, there are also differences in energy use across cluster members. All of the above mentioned factors should be taken into account while developing the routing protocol with the aim of maximizing energy effectiveness in addition to the objective of optimum network analysis and data presentation.

2. RELATED WORK

Dubey et al. [15] proposed a routing policy for high-power, multi-hop, static link networks and found an application in agriculture. Provides power standards to determine how much power is used. Energy consumption, packet loss, and network lifetime measurements are used to evaluate the proposed static multi-hop (ESM) energy efficiency relative to the current configuration. Simulation results show the performance and support life of the network of the proposed system.

Mehta & Saxena et al. The work [16] includes the classification of hierarchical routing protocol and the investigation of an intelligent hierarchical routing protocol that can use limited search algorithm and sleep algorithm to complete the intelligent routing job. procedures.

The MEGA revised GA was proposed by Hampiholi et al. [17]. By taking into account the constraints on connectivity and the energy usage of the sensors for communication, it optimized the wireless network. In order to achieve energy-efficient routing performance, the authors compare the MEGA protocol against a number of existing routing techniques. In order to improve energy efficiency and routing dependability, ad hoc network protocols are implemented and their performance is analyzed for a variety of WSN network situations using simulation approaches and device evaluation.

The LEACH-C algorithm, a unified centralized method, was created as the foundation for the LEACH algorithm. Every node will transmit its position and energy level to the BS at the initiation of every LEACH-C algorithm cycle. Following data receipt, the central station determines the average power of each node, selects less than the average energy nodes compared to rivals, and uses the network's ordinary power value as the CH starting point. By using this method, the amount of power needed for communication during card selection can be decreased, freeing up more power for data transmission [9].

3. ROUTING PROTOCOLS

LEACH process, nodes in the network is divided into several groups and a group leader is selected from each group. All collected data to be shared at remote sink after combine & Compressed. The head selection process has several steps. In each cycle, the group leader is selected to complete forwarding, merging, data storage and compression, and other related tasks.

The network lifetime is impacted by uneven clustering and premature node death from excessive energy consumption in certain cluster heads, as a result of the random selection process used to choose them. As a result, the existing wireless sensor network mostly suggests ways to reduce node energy usage.

A centralized directing convention for clustering is the LEACH-C calculation, which is a change over the Filter calculation. At the begin of each LEACH-C calculation cycle, all hubs transmit position info and remaining vitality levels to the BS. Taking after information gathering, the base station decides the normal vitality of each hub, employments the network's normal vitality esteem as the cluster head edge, and distinguishes hubs as potential candidates on the off chance that their vitality is break even with to or more noteworthy than the normal vitality. This approach can decrease the sum of vitality required for communication when selecting a cluster head, liberating up more vitality for information exchange [9].

3.1. SOP Protocol

It has 4 phases:
- Discovery phase: All sensor node neighbors are searched in this.
- Organizational level: At this level, groups are created and joint in a hierarchical way; where each node is assigned a position based on its position in the hierarchy. After creating a table of O (log N) size, the distribution tree is prepared.
- Maintenance level: Direction measurements and energy level messages are updated and sent from the sensor node to its neighbors. Store the broadcast tree using local Markov loops.
- Self-Reorganization Phase, group restructuring occurs in case of node or partition failure.

3.2. PEGASIS and Hierarchical PEGASIS

The chain-centered method known as Power Efficient Gathering in Sensor Information Systems [5] creates a chain of sensors in accordance with the greedy algorithm. Only one sensor node in the chain connects with the sink node, and every node in the chain sends and receives data exclusively from its neighboring nodes. Every node in the data aggregates sensed data. This protocol has the potential to outperform LEACH by a factor of 100 to 300 for varying network topologies and sizes. The primary advantage of PAGASIS is the removal of the overhead related to CH selection in LEACH.

PEGASIS's main drawback is that it significantly slows down nodes further down the chain. A bottleneck can also result from a single leader speaking with a single sink. In an attempt to address the issues with PEGASIS, Hierarchical PEGASIS attempts to reduce data transmission delays and takes the energy x delay measure into account when resolving the data gathering issue.

3.3. TEEN

The Threshold-Aware Energy-Efficient Sensor Network Protocol [6] is a helpful tool for time-sensitive applications since it is made to react to abrupt changes in objects that are sensed by measuring devices. It employs a data-centric methodology and a hierarchical network model in which nodes in close proximity to one another form clusters. Redrawn from [6], Figure 4 displays the hierarchical clustering in TEEN. Nodes notify the hardware and software initialization of attributes after a group constructs a CH.

Hard start is the minimum significance of the characteristic that reasons the sensor to send the correct characteristic to the CH, thus reducing risk by allowing the sensor to communicate only when the detection value is within the appropriate value range. After knowing that the character's value has reached the threshold or exceeded the hard threshold, the sensor will send data if the change in the character's value is equal to or greater than the threshold. This letter goes to CH and thus the number of characters decreases. TEEN is not suitable for applications that need to send data periodically as the user cannot receive data if the threshold is not reached.

3.4. APTEEN

Essentially an extension of TEEN, the APTEEN Adaptive TEEN protocol [7] seeks to address the non-manipulation limitation of periodic data collection and transmission while preserving the capacity to respond to critical events and facilitate data aggregation. TEEN is an energy-efficient threshold-sensitive sensor network. Three types of inquiries are supported by the protocol: One Time, which offers an approximate representation of the system at a specific moment in time, Permanent, which essentially removes the drawbacks of TEEN by permitting recurring monitoring of Events, and Historical, which permits evaluating the past values of the sensed properties. Although TEEN performs better than LEACH, APTEEN protocol performance is superior in terms of energy economy. The overhead involved in building multi-level clusters and providing features that rely on threshold values is a drawback shared by TEEN and this protocol.

4. COMPARATIVE ANALYSIS OF ROUTING PROTOCOLS

We compare various parameters discussed above, such as power consumption, data collection, capacity optimization, root selection, overhead of query-based and hierarchical routing methods. All these processes combine information together with further reducing data transfer and thus increasing energy effectiveness. Recently, a model of rules based on intelligent people [10] has been found, and many rules based on crowd principles have been proposed.

TABLE 1. Comparative Analysis of Various Routing Protocols

Protocol Name	Energy Efficiency	Data Aggregation	Route Selection	Overhead
LEACH	Stronger	Possible	Active	Higher
SOP	Weaker	Not Possible	Active	Higher
PEGASIS	Stronger	Possible	Hybrid	Lower
TEEN	Stronger	Possible	Active	Higher
APTEEN	Stronger	Possible	Hybrid	Higher

5. CONCLUSIONS

The newest kind of networks is wireless sensor networks, which are still in their infancy. Since the primary issue with sensors is energy consumption, this paper presented a novel energy-efficient method to boost the network's efficiency. Sensor nodes are uniformly dispersed throughout an equally distributed section of the proposed work. Two criteria are used in the CH selection process.

In the end, the simulation is run, the results are considered for living, dead, and used energy by the nodes, and the values are contrasted with those obtained using a traditional method. It was discovered in the literature that power is mostly used when data packets are being transmitted to the sink node. A power-efficient routing protocol may be able to address this problem. After reviewing a number of traditional and contemporary routing methods, it is discovered that several improvements are made over the most fundamental hierarchical routing techniques. The growing lifespan of sensor nodes has drawn the majority of research attention. Several flaws in different routing systems have also been emphasized in this paper.

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