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A Review on Wireless Sensor Networks: Routing

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Abstract
Wireless sensor networks (WSNs) are networks with devices that can detect, process, store, and communicate wirelessly. Each network terminal can have multiple sensing devices that can measure physical variations such as temperature, brightness, humidity, and vibration. However, developing and implementing WSNs poses many challenges. This review presents the challenges of WSN using different routing algorithms such as geographic routing, energy-aware routing, delay aware routing, QoS aware routing, secure aware routing, and hierarchical aware routing. Another goal is to find out which WSN component automates interference and behavior. What kind of application is in the WSN depends not only on his work but also on the question of the basis, functionality, and handling of his project. The study was carefully planned, and the systematic review of the literature was set up in a strong framework according to a pre-defined protocol. Finally, we evaluate the performance parameters of previous routing algorithms with diverse routine metrics that are energy consumption, delay, packet delivery ratio, throughput, false ratio, packet loss ratio, and network overhead.

Keywords Wireless sensor networks · Routing algorithms · Geographic routing · Energy aware routing · Delay aware routing · QoS aware routing · Secure aware routing and hierarchical aware routing

1 Introduction

Wireless sensor networks (WSNs) characteristically limit memory, computing, and communication resources to hundreds or thousands of low-cost, low-power-sensitive devices. These networks offer low-cost solutions to problems in military and civilian programs, including war surveillance, target monitoring, environmental and health monitoring, fire detection, and traffic control. Due to the low cost of deploying wireless touch networks, touch nodes have simple hardware and strict source control. Sensory technologies are very important today when collecting information close to the environment, and the use of WSNs is becoming more popular daily. Some networks are characterized by multiple sensor nodes used to monitor certain events. Lack of

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battery power at the sensor terminals can cause serious physical problems with energy efficiency. The study of wireless touch networks has become a rapidly growing field of research that provides insights into the integration of new software technologies with distributed computing. This is how sensor network nodes are deployed to achieve maximum network coverage in situations where a certain quality of service (QOS) is provided. Can monitor and understand whether network coverage measures whether there is a blindness to communication; By understanding the level of wireless sensor network coverage in the monitor area you can expand sensor node distribution or guidance when adding sensor nodes to future development activities.

On the other hand, it will improve network-related transmission, management, storage, and computer costs. Therefore, the WSN Coverage Control Performance Evaluation Criteria are required to analyze the availability and performance of the coverage control strategy and algorithm. Without researching this domain, small global effects and measurement features are mainly associated with networks, despite the physical distance between nodes. There is another type of network called the spatial network. A specific pattern of a node or edge in spatial networks is predetermined. A geographical spatial network is one meter of Euclidean distance between nodes. Such networks are widespread around the world, including wireless sensor networks (WSNs), multi-agent networks, transportation networks, airline networks, urban road networks, and epidemiological networks. However, these networks are different and common: the distance between nodes strongly influences the location and mobility of networks. Take WSN for example, the distance between the sensors affects the connection of the networks, because the sensors have only low transmission beams. Surprisingly, this is ubiquitous, but these types of networks are no better known than connected networks. WSNs contain small devices that communicate wirelessly without the use of standard network infrastructure. A Low-level exchange between two common nodes to communicate with collaborative projects. Of course, the reason and duration of the trip consultation do both at the same time. The connection between any two nodes is based on filling the entire network. However, the suitability of such wireless networks requires low power devices in power storage, and Power wireless communications are always hungry, and Malius asks for all the more reasons for casting. ACTA is the first mode-based wireless networks access path after the routing instruction. In other words, their results are based on a network of information that delights their guests about current nodes. Although these routes have never been used, early plans were based on an effective route strategy that kept track of all available routes. Effective routing is not accurately calculated according to changing network topology, so there are more studied response methods that retain only the paths currently in use. Creating this situation in an automated learning process focuses on the forum section. First, the questions are set in the form of a discussion, and then a discussion section is set up for everyone to discuss the structure of the printed text tree, which requires students to express their own opinions and discuss problem-solving.. The authors can present alphabetical printed maps, a statistical chart of physical education subjects, dividing the leap years, and the best examples and cases of the double cycle of chickens and rabbits in a single cage. Through these examples, students will understand the similarities and differences between the cases so that they can better study the double cycle. In the meantime, it will help students to solve the problem of the wood structure of printed letters and complete their independent study.

1.1 Overview

This Review paper contains the following section which is discussing the detailed analysis of this presentation. This may be helpful to the reader to understand the paper Sect. 2 discloses how this review has been streamlined and also explains the way you have read the paperwork starting from planning the paper, searching methodology, sources used and data extraction for this work is elaborated. Brief introduction and explanation about the various theme on routing methodologies discussed in chapter 3 specifically themes like Geographic Routing, Energy-Aware Routing, Delay Aware Routing, QoS aware Routing, Secure aware Routing, and Hierarchical Aware Routing is detailed. Section 4 of this paper deals with the detailed comparative analysis of various routing methodologies is discussed. Chapter 5 summarizes the literature review on the following topics from Research questions1 to research question 5 followed with conclusions chapter.

2 Literature Review

In this study, we designed a literature review based on wireless touch networks (WSNs) and their routing algorithms. This rigorous method aims to avoid relying too much on the process and to give scientific importance to the results obtained, thus distinguishing formal training from simple and traditional literary reviews. This study evaluates and explains relevant research that is available for specific research questions, topic areas, or interesting events, and therefore aims to provide a reasonable assessment of the research topic. In general, the study of literature consists of three stages: planning, passion, and analysis, for this purpose a detailed analysis is considered [1–88] to present a clear visualization to the reader of this paper.

Planning Define a search strategy and answer research questions.
Conduction Identify and select primary studies and evaluate the performance.
Analysis Explore research questions and answers using information from relevant research.

Literary reviews have recently been considered as the best way to interact with research sources that help systematically identify, select, analyze, and integrate knowledge about a particular research topic. In addition, they are used to integrate existing literary works in a comprehensive and biased manner and to identify research challenges and opportunities in the arts.

2.1 Planning of Literature Reviews

This section identifies the need and purpose of the literary review. This goal includes a predefined program that sets out selection criteria, data collection, and compilation methods that describe the research objectives and search strategy.

2.1.1 Research Questions

Initially, in our literary review work, we translate our review objectives into research questions. We found a preliminary study in WSN to understand and summarize the sources of routing problems and sources of routing protocols. Here, the following research questions (RQ) were framed.

Table 1 Source of search

Source	Type	Link (URL)
IEEE Xplore	Digital library	http://ieeexplore.ieee.org/Xplore/home.jsp
ScienceDirect	Digital library	http://www.sciencedirect.com
SpringerLink	Digital library	http://link.springer.com/
ACM Digital Library	Digital library	http://dl.acm.org/dl.cfm
TabdF	Digital library	https://www.tandfonline.com/
Hindawi	Digital library	http://www.hindawi.com/
Google Scholar	Digital library	http://scholar.google.com

Table 2 Searching criteria

Criteria	Group 1	Group 2	Group 3
1			WSNs
2		Issues	WSNs
3		Routing algorithm	WSNs
4	Issues	Routing algorithm	WSNs
5	Geographic	Routing algorithm	WSNs
6	Energy	Routing algorithm	WSNs
7	Delay	Routing algorithm	WSNs
8	QoS	Routing algorithm	WSNs
9	Security	Routing algorithm	WSNs
10	Hierarchical	Routing algorithm	WSNs

1. What is the need for routing algorithms in WSN?
2. What are the routing algorithm types used to enhance the performance of WSN?
3. Why QoS is the most important parameter to keep should be a better one in WSN?
4. What are the parameters that need concentrated to enhance security problems in WSN?

2.1.2 Searching Plan

To obtain relevant literature to answer specific research questions, we conduct an online search of digital libraries using the results guide. To achieve this, we have decided on how to find these sources, citing sources that may provide recent research on the review. We evaluated all the online digital libraries listed in Table 1 and selected libraries suitable for critical WSN publications. After completing the list of resources, we have defined the search terms and how to search for entries in the online digital library. To fashion a investigate string, we select some keywords from the pre-defined search phrases and created three exploration languages as shown in Table 2. Each group contains investigated conditions that have the same or similar meaning to the word. Groups 1 and 2 contain the terms "root algorithm" and "WSN", respectively. Group 3 contains terms used to modify the search, search preliminary research, and improve WSN automation capabilities at the design/configuration level. The majority of online digital libraries offer advanced search options that permit the user to access logical investigate strings. We have taken full advantage of this feature to create a search string that can be used to search all digital libraries. In this review, we have defined a search string to investigate for research questions linked to your investigate topic. Groups 1, 2, and 3 are related to the terms.

2.1.3 Criteria of Inclusion and Exclusion

This phase intends to gradually reduce the number of articles in the exploration phase and to edit the compilation of high-quality articles relevant to answering scientific questions. To absolute this charge, remove captions that do not fit the purpose of this white paper. Selection and Quality Screening Criteria One of the selection criteria is listed in this section. If the article meets important entry criteria, the application shows further processing of the article. In other words, you need to consider paper automation features in the background of wireless touch networks. Papers with little in sequence will be temporarily released for later processing. The quality of the document is not considered at this time.

2.1.4 Data Extraction

The purpose of the data compilation procedure is to collect data and provide reliable answers, taking into account the quality of the data you need. To guarantee data quality, set the subsequent conditions:

1. Scientific papers are available in the most influential journals, conferences, and computer science journals.
2. The speech of the publication should be English.
3. Documents published in 2010–2021.

When, the higher than the procedure is complete, the extract data are processed to identify key topics as part of the review design phase. The data obtained from every learnings are described in Table 3.

2.2 Conduction

During this period, a preliminary investigation was discovered, selected, evaluated, and a series of sub-investigations were conducted following pre-established protocols. The search process performs an automatic primary search on the selected electronic database to find all basic searches that match the search string obtained. As shown in Fig. 1, the

Table 3 Extracted data's and their descriptions

Data	Details
Title	The title of the study
Year	The year when the study was published
Reference no	The study referred in this literature review
Routing algorithm	Which routing algorithm the selected study proposed
Design and methodology	Which methodology the selected study proposed
Parameter discussed	What are the parameters are analyzed in this study
Limitations	Limitations of the proposed solution

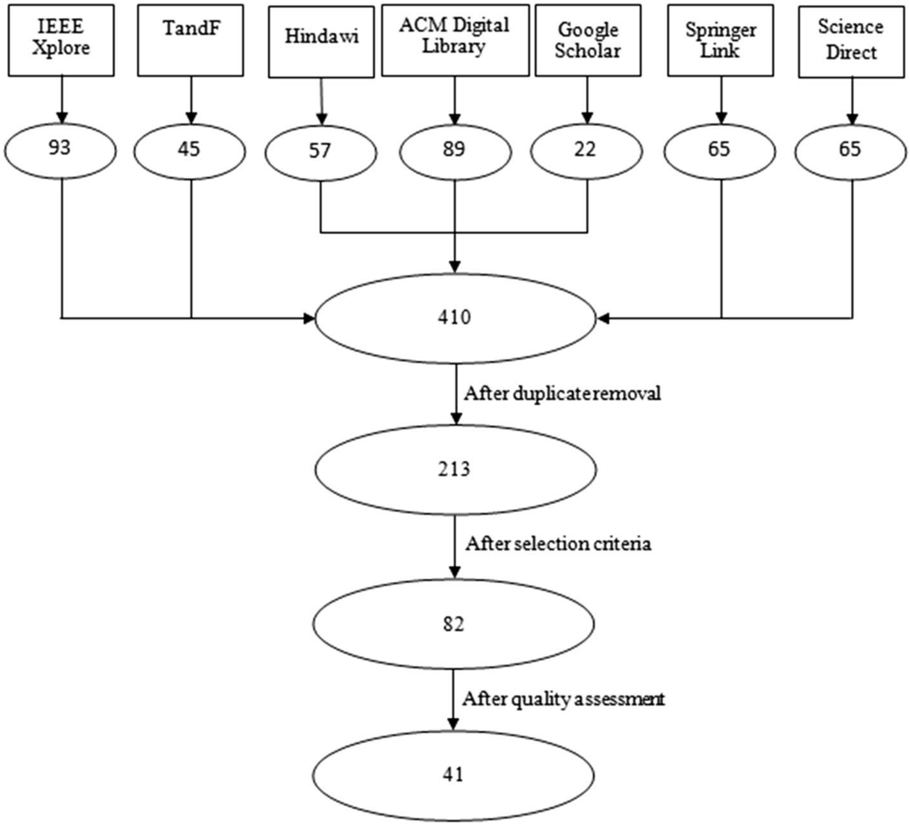

Fig. 1 process of pertinent studies selection

survey was taken from an electronic database, 251 of which were originally selected based on title, application, and keywords. From the first set of 251 studies, collection criteria were used through study, and 87 preliminary studies were obtained. The remaining articles were subjected to quality screening and identified 41 studies that did not meet the standard. Therefore, 32 preliminary studies were considered compatible with this SLR and elected for data mining.

2.3 Study Analysis

The routing protocol is the method of selecting the correct path to move data from one cause to another. Depending on the network type, channel characteristics, and performance rate, there are some issues with the process when selecting a route. In a wireless sensor network (WSN), data received by one sensor terminal is usually sent to a base position that connects the sensor network to another network (such as the Internet), where data is collected, analyzed, and referenced accordingly. Steps will be taken. Due to the proximity of the base station and the motion (sensor nodes), tiny feeler networks that can communicate directly with each other instead of monochromatic communications require thousands of nodes due to the very large coverage area has been used and this situation requires multi-hop communication..

This is because most feeler nodes are so far absent from the sink that they cannot converse openly with the base place. Due to the technical limitations of the sensor node, sudden node failure may occur. Such interruptions should not affect the routing process. This should work effectively in the event of a pocket loss. In general, when talking about a network of wireless sensors, the sensors are placed approximately. In addition, in some situations, network topography is constantly changing. The routing algorithm can handle this situation. The routing algorithm is another important issue that needs to be handled with care. Figure 2 represents the categories of routing algorithms of WSN. Steering is a very imperative task in WSN and it should be done carefully. Routing technology is required to establish infrastructure among the sensor node and the base station to send data. Various path mechanisms have been developed to reduce power consumption and extend phase life. Routing protocols can be categorized based on node participation, cluster protocol, operating mode, and network configuration. The various challenges of this route include power consumption, terminal layout, scaling, connectivity, safety, and security. There are WSN routing mechanisms that enable reliable data distribution, but there are some issues that need to be addressed. The QoS protocol provides quality at the expense of power, which is a very powerful resource in networks of wireless sensors.

Quality of service (QOS) refers to a specific characteristic of a data connection, which is found between the end points of the connection. QOS parameters not negotiated when

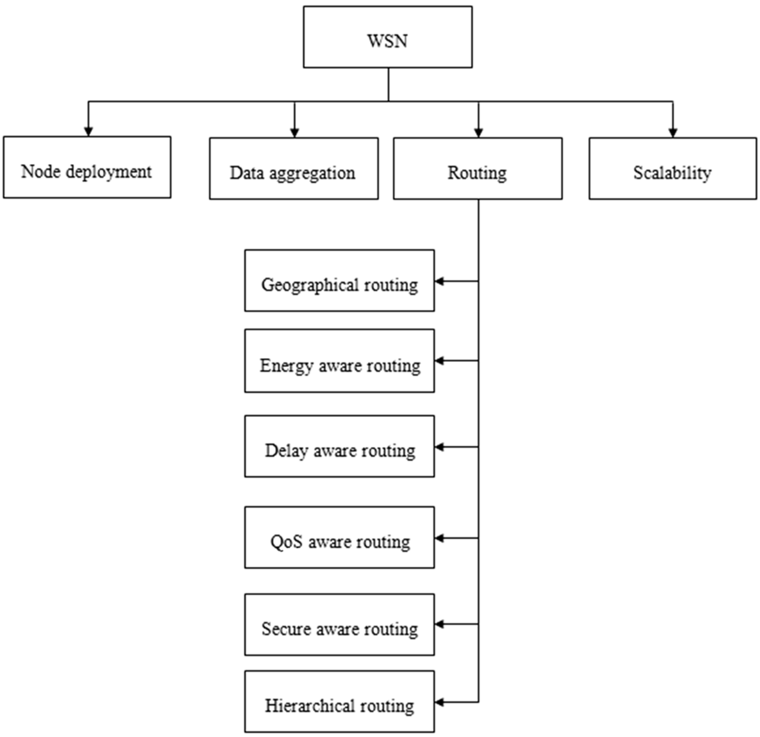

Fig. 2 Categories of routing algorithm of WSN

connecting. QoS allows a company to prioritize transportation and resources to ensure the promised presentation of a particular request or service.

3 Brief Discussion

3.1 Geographic Routing for WSN

Shu et al. [31] have proposed an efficient two phase geographic greed sharing (TPGF) routing algorithm for WMSNs. The TPGF provide real-time multimedia transmission requirements and real-world WMSN features. It can be re-enabled to find a short (very short) path leading to performance and a short (short close) node synchronous route path as needed. The TPGF supports three features: (1) bypassing the whole, (2) short-track transmission, and (3) multiple paths simultaneously. No facial routing is used, e.g. DPGF is a pure geographic sharing route algorithm that does not use left / right hand rules and scheduling algorithms, e.g. GG or RNG. This allow additional relations to explore further route paths for the TPGF, and also allows the TPGF to differ from many existing geo-route algorithms. Lyu et al. [32] have proposed the new and holistic approach, which has taken Signal Strength (SGOR) a safe and measurable opportunistic pathway, meets the security and scale requirements of the WSNS. Unlike preceding protected protocols that relied on communications such as anchor nodes, a dispersed confirmation algorithm was adopted to use signal strength against a location fraud attack. As one of the opportunistic geographical routes, SGOR is authorized to use the broadcast character of wireless channels and measurements derived from the geographical route. In addition, an environmentally friendly trust model was proposed in SGOR to protect against more types of aggressors. Imaginary consequences are presented to exhibit the effectiveness and strength of SGOR for surviving the most severe attacks. In the detailed simulations they compared SGOR with four more courier algorithms. The outcome shows that SGOR achieve twice the rate of pocket distribution, especially for large and highly hostile networks, with acceptable overhead costs. Hong et al. [33] have planned A novel routing protocol called Hybrid Beaconless Geographic Routing (HBGR) that provide dissimilar algorithms for dissimilar packet. They divided WSN packets into delay sensitivity packages and usually packages, taking into account the need for delayed use. Disruptive Methods for Delayed Sensitivity Packages and Conventional Packages HBGR offers two types of request sending / deleting, with different channel reception advantages. Given a simple analysis, this confirms that delay sensitivity packets have fewer delays than conventional delays and have a higher channel reception priority.

Niroumand et al. [34] have planned a new system of geographic cross-layering is called Geographic Cross-Layer Routing, which is compatible with Disaster operations. The GCRAD integrate Mac and routing with a relay sampling mechanism and consider the number of possible relay nodes as criterion for terminal location, synchronization distance, and relay selection. GCRAD eliminates useless transactions and at the same time reduces the handshake system (simultaneously) by impacting these standards, reducing the risk of collisions. Compared to sophisticated methods of the geographic cross-layer route, they demonstrated GCRAD end-latency, low power consumption, and acceptable delivery speeds, especially at high transmissions, through NS2-based simulations, which is the chief character of the disaster. Huang et al. [35] have addressed WSNS challenge; it recommends the Energy Efficient Multicast Geographic Route

Protocol (EMGR). EMGR uses a pre-generated Energy-Aware Multicast Tree, a combination of targets, and a source node to send a multicast message and then pre-select the nodes neighboring to the optimal energy relay location. The analysis and simulation results show that their specific protocol works better compared to existing protocols with low power spending, control overhead, computational complexity, and higher pocket distribution speeds. Hong et al. [36] have proposed novel Route Protocol, Circular / Sector Perspective Division, Adaptive Redirect Area Selection (FADS), which eliminates unique inconsistencies, reduces the risk of a single incision collision, and determines dynamic load balancing. 1) The redirect area section ensures that each node can focus on each other with the same shipping saber, thus avoiding the incompatibility of unique slots. 2) Choosing a forward from the bar reduces the number of opponents (candidates), thus reducing the chances of fighting with one slot. 3) Selection of an adaptive sharing area movement through dynamic channels in the direction of each dynamic load balance. The results of the fat simulation stand out well, especially in frequent networks and busy networks, when compared to the corresponding protocols for pocket distribution speed, end-of-delay suspension and power consumption package, regardless of 2D and 3D conditions.

Liu et al. [37] have proposed the opportunistic approach of the new geographic routing, known as Easy-Go, solves the steering quandary, i.e. reduces the program triumph rate over complex networks. In particular, by exploring the transmission direction, they proposed a new aspirant assortment algorithm that introduce layered cutting and virtual deepening ideas to get better the broadcast achievement rate in strip WSNs. hypothetical psychoanalysis and detailed simulation exemplify the elevated performance and broadcast efficiency of the planned Easy-Go strategy of the WSN network. In addition, they carried Easy-Go Z-stack TM nodes in the test bed. Compared to traditional methods, their easy transmission improves the success rate by 10%, reducing the speed of communication and power consumption by 11.8% and 5% respectively. Hadi et al. [38] have proposed the direction distribution indicated in the geo-route is used, where the sensor node can send unwanted data messages. Therefore, the node can perform automatic aggregation without selecting a leader and associated overhead. In this case, for one target event, two sensor nodes can run data collection. Ghaderi et al. [39] have proposed GF-based routing protocol base on CDG technology and labeled as Blurred GAF-based CDG (FGAF-CDG). In this, they first divided the area of the sensors into virtual hexagonal grid cells and place the cells according to their geographical positions. In each sample round, the cluster head (CH) sensor is selected for each phase cell base on an algorithm based on fuzzy logic. CH measurements are sent to the pool via multi-hop, which is base on a vaguely based routing algorithm in CDG format. The imitation consequences show that the planned system gives better consequences than other competing GAF methods. For example, depending on the area of the sensors, the power consumption of a particular model is 50% less than the FTGAF-Hex method. Hameed et al. [40] have proposed energy efficient geographic (EEG) routing procedure is planned that focus on network operation and sensor node expenditure. The specific protocol sensor uses the mean quadratic error algorithm to solve the localization difficulty. Additionally, overhead routing is condensed by control nodes to preserve neighborhood and unified in sequence. The specific protocols reduce force holes in the complex by effectively opposite the energy spending at the sensor nodes. Detailed simulation exemplify how the planned project manage the energy spending and pocket allocation coefficient (PDR) compared to the modern geo-route protocol. Table 4 represents the summary work of geographical routing algorithm for WSN.

Table 4 Summary of research work (All Parameters estimated per Second Unit)

Ref. no	Routing algorithm	Methodology	Parameters	Remarks
[31]	TPGF	Cluster based	Delay	Facilitate multimedia streaming through WMSNs
[32]	SGOR	AOMDV	Packet delivery ratio, end to end delay	An environmentally sensitive confidence model alleviates the vicious nature of abandoned pockets, such as black hole attacks
[33]	HBGR	RTS/CTS	Delay, packet delivery ratio	Improve the sharing choices that are guaranteed for candidate pioneers
[34]	RIDSR	Clustering	Delay, energy consumption, packet delivery ratio	The risk of a collision is reduced during the hand touch mechanism
[35]	EMGR	Multicast tree	PDR, energy expenditure	Profound effect on energy reduction
[36]	FADS	Collision based	Packet freedom ratio, End-to-End latency, and energy expenditure	Evaluate the effect of field-based distribution region and test the pseudo vacuum solution
[37]	Easy-go	New candidate selection algorithm SLS,	Energy consumption	Improves the level of success in the transfer
[38]	SPIN	Clustering Hierarchy	DAR, energy consumption	Nodes can compile messages into a single message and send them to their destination
[39]	GAF	FGAF-CDG	Energy consumption	To improve grid consumption, power consumption and load balance
[40]	EEG	ECMSE based, Energy efficient distributed clustering algorithm	Energy consumption, packet delivery ratio	Reduce power holes by choosing the front tip

3.2 Energy Aware Routing for WSN

Mottola et al. [41] have MUSTER provided a routing protocol that was clearly designed for multiple communications. First, they calculated the optimal solution for a multiple sink problem, developed an analytical model, and simultaneously deviated from multiple sources in a centralized way. Next, they described the approximate calculations of the optimal solution of the distributed system and how they are implemented in MUSTER. To enlarge arrangement life, MUSTER reduces the numeral of nodes concerned in multiple routes and balances their overall load. They appreciated the MUSTER emulation and the original WSN bed. The results indicate that their protocol creates optimal route paths, doubles the length of the WSN, and provides the user with 2.5 times more data from the total source. In addition, MUSTER is essentially compatible with network integration, helping to increase life by up to 180 percent and quadruple data output. Zhang et al. [42] have presented an energy-balanced routing system base on the Forward-Awareness component (FAF-EBRM). At FAF-EBRM, the following hop node is elected based on alertness of connection load and energy concentration. In addition, the local topography is designed without a one-way reconstruction algorithm. The FAFEBRM tests are comparable to the LEACH and EEUC and the test results are better than the FAF-EBRM LEACH and EEUC, which promotes a balance of consumption and energy consumption, ensuring a high QoS of the WSN.

Brar et al. [27] have planned an energy awareness route protocol based on the broadcast of a specific direction is called a PDORP. The proposed protocol includes PDORP Power Sensor Information System (PEGASIS) and DSR routing protocols. In calculation, genetic algorithm hybridization and bacterial falsification optimization (BFO) are used for specific route protocols to determine energy efficient optimal pathways. Compared to the hybrid advance of the anticipated routing protocol, it gives improved results, including performance analysis, small bit error rate, latency, power reduction, and better efficiency, resulting in better QoS and longer network performance. In addition, a computational model is obtained to appraise and contrast the presentation of two route algorithms using advanced computational techniques. Akila et al. [43] have proposed to overcome this problem, a vague cluster framework is recommended for cooperative communication in WSN. In this, the cluster head (CH) is elected based on the residual energy, confidence, signal interference — plus noise ratio and load. It then performs cluster routing using a network code-based probability route diagram. The Uncertain Clustering Protocol helps to determine the Coefficient Node (CN) that joins the cluster. Finally, particle mass optimization is used to determine the best path of data transfer among each CN and CH. The imitation outcome show that the planned technology improves grid life and energy efficiency.

Shafieirad et al. [44] have proposed a novel with a large-scale EHWSN that requires multi-hop communication, energy awareness, and an opportunistic routing protocol. When choosing the best sharing partner, the program takes into account the energy in the sensor nodes, the FC distance and the amount of data. Their protocol does not require prior knowledge of network topography. They proposed a mathematical analysis of the routing protocol to confirm the digital results obtained. As the results show, some protocols significantly improve data distribution compare to advanced technologies. We have also introduced an EH sensor system to disassemble the sensors in the environment. In other words, the transfer load is the same at all nodes regardless of location, which significantly speeds up data distribution. Sharma et al. [45] have proposed the energy efficiency of the routing algorithm is critical to civilizing the performance of battery-controlled wireless sensor networks (WSNs). It is important to consider the diversity of nodes in routing in order to achieve optimal resource utilization. It provides an indication of the energy model and offers the Traffic and Energy Information (TEAR) project to get better the constancy period for the project. The imitation results point to that the TEAR under display is superior to other cluster routing algorithms.

Pandey et al. [46] have utilized developments in social media, known as small social features, are a new way of transmitting non-standard to the WSN. The smaller global WSN (SW-WSN) common path length is shorter and the common clustering coefficient is higher. Cognitive SW-WSN is created by totaling a new link between the node and the zinc of the selected location. Improving connection costs for new data routing systems is recommended. This method provides consistent power consumption and high data transfer speeds. Perform the test at the bottom of the WSN test using node simulation and real-time configuration. A thorough analysis of network performance, residual power, and data latency on the WSN evaluates the presentation of the planned system. Experimental outcome show that small cognitive small world model achieves energy balance, prolongs phase life, improves energy efficiency and compares data obtained using different sophisticated approaches. It indicates that the delay will decrease. The results provide sufficient impetus to use the large method in large and medium-sized network applications. Haseeb et al. [47] have presented an ESMR protocol using confidential sharing program that enhances work efficiency by protecting versatile data from malicious activity. The proposed protocol has three main characteristics. First, the network field is divided into internal and external areas based on the location of the terminal. In addition, in each zone several clusters are formed based on the location closest to the node. Data protection is protected from each cluster header at each synchronization node using a specific effective privacy sharing scheme. Finally, the data connection size evaluates a specific solution to reduce the analysis path completion. IoT-based control wireless sensor networks (WSNs) offer a lightweight solution with secure data routes with a multi-hop approach. Energy-specific energy information and secure multi-routing protocols account for 38% of network life efficiency, 34% of network efficiency, 28% of power consumption, and 36% of overhead routing.

El-Fouly et al. [48] have introduced a reliable routing algorithm based on the effective integration of environmental awareness known as E3AF. This algorithm takes into account various parameters such as environmental measurements, sensor terminal power consumption balance, and network and data reliability. The routing algorithm serves the environment to avoid dangerous places. The optimization problem creates a paper problem designed as complete linear programming to help understand and achieve the optimal solution. Haseeb et al. [49] have proposed WSN Protocol on Safe and Energetic Energy to prevent and prevent compromises on data efficiency data. First, synthetic intelligence-based chorister analysis is used to implement a reliable and intelligent training program for a specific protocol. Second, it protects exchanges from enemy groups in order to gain resistance with minimal obstacles. In addition, route maintenance strategies are implemented through traffic testing to disconnect and reduce network connections. Table 5 represents the summary work of energy aware routing algorithms for WSN.

3.3 Delay Aware Routing WSN

Yao et al. [50] proposed EDAL, which stands for Energy-efficient Delay-aware Lifetime-balancing data compilation. The development of the EDAL algorithm from the

Table 5 Summary of research gap

Ref. no	Routing algorithm	Methodology	Parameters	Remarks
[41]	MUSTER PROTOCOL	Clustering	Delay, PDR	This increases the quality of network data collection and provides the user with four times the data
[42]	FAF-EBRM	Cluster based	PRR	Energy balances energy consumption, prolongs working life,
[27]	PDORP Routing	CH	End to End Transmission Delay, Bit Error Rate, Energy Consumption, Throughput	Get a fast and undamaged trail with low transmission delays
[43]	CHCTEEM	Clustering, fuzzy based CH selection, PSO based inter clustering	Average packet drop, Control overhead	Consumption effectively manages the energy consumption in the proposed project, which significantly increases the life of the sensor networks
[44]	MAX-SNR	SNRC based	Data delivery ratio,	The sensor node is the best sharing partner for a broadcast node in its range
[45]	TEAR	Cluster head	Energy consumption, Number of alive nodes	Helps to create a highly efficient routing algorithm with versatile sensitivity requirements
[46]	SW-WSN	Hop	Data latency, delay	Cognitive small world links are proposed using an introductory probability model
[47]	SEHR	Fuzzy logic-based clustering		Meter mode encryption provides data protection based on light weight, simplicity and randomness
[48]	RRDLA	E3AF based	Packet delivery ratio, Network lifetime, Average end-to-end delay, processing time	Sensor data is generally unreliable and can be serious or have multiple repetitions
[49]	SEHR	Fuzzy logic-based clustering		Meter mode encryption provides data protection based on light weight, simplicity and randomness

OVR will result in a decision to prove that the NP is a complex number based on the problem creation. Consequently, we propose both central heuristics to reduce computational overhead and decentralized heuristics in order to make the algorithm scalable for large-scale network operation. We are also developing a tightly integrated EDAL for abstract detection. This is a growing technique that significantly reduces the total cost of transport to collect sensor indicators with low inertia. Finally, evaluate EDAL systematically and compare it with the protocols involved in both EDAL performance simulation and technical testing. Bhuvan et al. [51] have proposed a delayed awareness routing protocol to send information about a critical time event in the WSN Basin. NS2 simulations evaluate the performance of a specific protocol according to different circumstances.

Huynh et al. [52] discussed two objectives of WSN design, examining trade transactions between reducing energy consumption and minimizing final delays. First, they proposed a new approach to distributed clustering to conclude the best volume for each module, captivating into account both energy consumption and final and final latency requirements. Next, they proposed a new power consumption function and a final delay function for the new end to use in the inter cluster path algorithm. It provides a multi-hop path algorithm used to transmit sensory data from cluster head to sink, with final and final delay limits and minimum energy values. Wu et al. [53] proposed a Delay-aware Energy-optimized Flooding algorithm (DEF) tailored for a coherent duty cycle WSN that can improve the plan of most flooded trees. DEF enhances energy efficiency by regulating flood facilities and controlling delays worldwide. For this purpose, from a mathematical point of view, we first adapted the flood problem to a new context. Next, we present a routing metric that makes full use of the characteristics of the coherent duty cycle WSNs for energy upgrade and develop an effective approach to tree adaptation. Comprehensive evaluation results show that DEF can save significant energy, while flood protection remains unchanged or slightly reduced. In addition, a modified Mini-Men-Mental State Examination (MMSD) was proposed to represent the lower limit of the rated energy. Compared to MMST, DEF offers comparable energy efficiency and better latency performance.

Lai et al. [54] Consumption in wireless sensor networks studied the problem of power consumption. The wireless sensor nodes are in a harsh environment where the situation changes significantly, with rapid changes in connection quality and node position. The node completion delay of each sensor depends on the quality of the connection and the oscillation of the node position. On the other hand, activating sensor nodes and extending network life is a major concern. To address these issues, this paper provides Predictive Delivery (BRT), a new and easier routing that combines parameters such as residual power, connection quality, end-to-end delay and distance to improve network performance to provide. BRT assigns weights to individual connections and final first-to-last delays to reflect node position during long-term network operation. Simulation results show larger scales than the widely used EDX metric and the two most recently used power consumption measurements and the expiration delay at the pocket-to-pack ratio. As shown. Maurya et al. [55] proposed knowledge of effective data transmission interference in a multicellular sensor environment introduced us to energy-efficient routing technologies (e.g. DA-EERR). The specific scheme defines the specific location of the search, which ensures timely delivery of delay-sensitive data. Additionally, an algorithm is developed in a specific search area to select a single path of delay energy delay between source and sink, which allows data to be quickly transferred to energy-efficient hop. The specific DA-EERR scheme improves the percentage of successfully retrieved data packets embedded in a large, dense network using the optimal balance of data aggregation and network load.

Anees et al. [56] proposed delay aware and energy-efficient opportunistic node assortment in restricted routing (DA-EEORR) protocol, appropriate for delay-sensitive applications. Based on the asynchronous work cycle of the sensing nodes, the planned project uses the thought of opportunistic link random maps to select the next hop of the ring path in the search space blocked by optimal link and path links. imitation results show that the planned scheme improves the mobile mandatory radiator path map based on existing identification: control package overhead, network lifetime, power consumption and package distribution factor. Jain et al. [57] proposed virtual infrastructure based Delay-aware Green Routing Protocol (DGRP) that create manifold rings in the sensor ground and restrict mobile sync location updates only to ring-owned nodes. Simulation results show that DGRP performs better routing algorithms based on power consumption and performance. In addition, DGRP improves data delivery interruptions by up to 26%, approximately 39% and 35%, respectively, compared to modern levels of sensor node size, sink speed, and network size. Vishnupriya et al. [58] proposed Energy and data Communication delay aware Routing (ECDR) in WSN. It is a compatible function based on both energy efficiency (EE) and the optimal choice of CH to extend the life of the terminal. This strategy uses distance, power and sensor tip delay exercise functions to decide on the best CH in the network. Vijayabaskar et al. [59] proposed the Link dependability and Delay Aware routing (LRDA) in WSN. RSS method estimate the distance between intermediate nodes which prove the reliability of connection. The node with the maximum signal strength is defined as the minimum interference node. Data is transmit from the sender to the earpiece using the shortest latency terminal in the shortest path. This improve the performance of the track. reproduction results show that the LRDA approach improves the quality of connected nodes, improves performance and reduces path load and delay compared to the basic approach. Table 6 represents the summary work of delay aware routing WSN.

3.4 QoS Aware Routing WSN

Liu et al. [60] proposed a QoS based routing algorithm with the help of a new WSN agent. The WSN Synthetic QS Bulk Particle Optimization Algorithm was chosen as the WSN Adaptive Value to improve the overall performance of the network, using the specific method. Intelligent software agents are used to monitor changes in network topology, network communication currents, and changes in the condition of each node path. These agents may be involved in network routing and network maintenance. Test results show that the proposed algorithm will help to provide better quality service over wireless touch networks compared to traditional algorithms.

Malik et al. [61] presented a diversified WSN (EAQHSeN) advanced ant-based QoS-aware routing protocol. It is a service-oriented QoS routing protocol for multimedia and multicourse wireless touch networks. I used bio-inspired routing. The main feature of the protocol is the ability to meet different QoS requirements for the diversified traffic generated in a single step. Routing decisions are made specifically to control traffic control, traffic and multimedia traffic, and to increase network performance and usability. Simulation results show that the proposed EAQHSeN protocol works better than the (AODV) trial protocol and the energy-efficient anti-routing (EEABR).

Faheem et al. [62] proposed a EQRP is our routing protocol for Innovative Dynamic Cluster Energy Efficiency and Quality Services (QS), which is inspired by the actual behavior of bird mating optimization (BMO). The specific distribution system significantly improves network reliability and reduces redundant packages WSN-based SG applications.

Table 6 Summary of delay aware routing WSN

Ref.	Routing protocol	Methodology	Parameters	Remarks
[50]	EDAL	Heuristic Algorithm based Revised Push Forward Insertion	Delay/Second	By integrating the compressed sense with EDAL, achieve additional lifetime results
[51]	DAR	Localization techniques	PDR	Comparative simulation analysis of the proposed protocol with future operation protocols
[52]	DCEM	Inter-cluster routing algorithm	Energy consumption/Node	They have provided a multi-hop routing algorithm for sinking from cluster heads, resulting in a low power cost
[53]	DEF	MMST	Delay/Second	To modify and extend the DEF algorithm to solve the problem of efficient multicast routing on a synchronous duty cycle network model
[54]	EELDR	PDR	Energy consumption/Node	The proposed PRT metric would be the best and most efficient solution for selecting suitable route routes for wsns used in harsh environments.
[55]	DA-EERR	Lossy and lossless data aggregation technique	Delay/Second	The proposed route plan is suitable for large high-density networks
[56]	DA-EEORR	Optimal link & path connectivity	PDR	DA-EEORR includes several mobile radiator nozzles for realistic delay-sensing applications in future potential jobs
[57]	DGRP	NS-2	Throughput/Second	DGRP can be further enhanced to solve problems caused by multiple mobile immersions while maintaining mutual understanding between communication overhead and desirable program interruptions
[58]	ECDR	Fitness function	Delay	The simulation outcomes are illustrates that the ECDR scheme enhances the packet received rate and diminishes both the delay and energy utilization in the network
[59]	LRDA	RSS	Throughput	The planned method increase network performance and reduces network pocket drop rates

Performance results show that the proposed protocol successfully reduces the final and final delay and improves pocket allocation speed, memory usage, residual energy and performance.

Faheem et al. [63] presented MQRP is a new multi-mobile synchronization-based QoS-aware collection protocol for WSN-based SG applications to switch to SGI 4.0. Extensive simulation research is carried out using the network simulation tool Estate 9.0. Experimental evidence has shown that the proposed program improves QoS performance rates such as pocket delivery speed, memory usage, control message overhead, residual power, network life and performance, and reduces pocket error rates.

Jaiswal et al. [64] presented an energy-efficient routing protocol for WSN based IoT application having unfairness in the network with high traffic load. The proposed protocol takes into account three factors in selecting the best route: the lifespan of the hop tip, reliability and traffic strength. It performed a rigorous simulation using NS-2. Furthermore, the performance of the proposed protocol is comparable to other modern protocols. The results show that the proposed protocol performs better in terms of energy saving, pocket distribution, end-to-end delay and network lifetime compared to other protocols.

Ganesh et al. [65] proposed a highly robust and flexible QoS-centric malfunction routing protocol for mobile-WSN LLN (Q-FRPML). Unlike classical routing approaches such as the 6LowPAN-based LLN (RPL) routing protocol, our specific Q-FRPML protocol adopts Signal Strength Index (RSSI) which helps with many innovations, including mobile node compatibility. The best parent node is selected based on the objective functions, and the connection layer adopts a false-flexible alternative path to QoS-centric communication on mobile-WSNS. The Q-FRPML protocol is implemented parallel to the connecting layer of the traditional RPL IEEE 802.15.4 protocol layer, so that once the link is found, the parent node is optimally selected and the alternate path is formed. In the process, Q-FRPML avoids continuous network exposure, which significantly reduces overhead signals and power consumption. Q-FRPML protocol is the latest RPL or S based on the results of Contiki-Cooja -based simulations with high pocket allocation rates, low pocket loss rates, and ultimately barriers between different networks. -RPL protocol indicates that it is high. Or load level. It uses the Q-FRPML protocol in parallel with the natural RPL, but can be used live on mobile (WoS-based QoS central communication) for backward compatibility. Kalidoss et al. [66] proposed a new routing protocol called Secured QoS aware Energy Efcient Routing Protocol designed in terms of reliability and energy modelling, this paper enhances WSN security and improves energy use. In this proposed work, trust modeling uses authentication techniques. Its main method is to guarantee the confidence score. Sujanthi et al. [67] proposed a novel Secure Deep Learning (SecDL) approach for dynamic cluster-based WSN-IoT networks. To improve energy efficiency, the network is designed using two concentric hexagons and mobile synchronization technology. The dynamic cluster is created on the Pi-hex network to select the best cluster head for the Quality Prediction Event (QP2). This ensures QoS and energy efficiency. Data collection is enabled in each cluster and the reduction program is executed after deleting data in both directions. Deepa et al. [68] proposed the optimal QoS-based clustering scheme using the Versatile routing protocol for WSN (OQoS-CMRP) is a cluster clustering algorithm based on a particle cluster optimization (PSO) based clustering algorithm which is used to reduce energy consumption. The single sink-all-target algorithm is used to determine the finest multi-hop contact path for select the next hop node from the sink to the sensor. The round robin path selection algorithm is used to transfer the data to the pond. Dinakaran et al. [69] presented an efficient QoS adaptive image mining technique. This method focused on improving image recovery capability and achieving QoS on WSNs. The film is processed using a Copper filter to remove noise. From the noise-removed image, a local double system is created for each part of the image, which creates a provincial local binary system (RLBP). The generated RLBP attribute is sent to the data node, anywhere the system evaluates RLBPS (RLBP resemblance). Image subgroups were selected and transferred to the source node according to the RLBP similarity value. This method improves the image extraction performance on the WSN and reduces the problem. Table 7 represents the summary work of QoS aware routing WSN.

3.5 Secure Aware Routing WSN

Rathee et al. [70] have proposed the control power of the sensor nodes forces the network to switch between QoS and safety. To speak to these issues, this article recommends optimizing the QoS Awareness Energy Balance Secure Routing (QEBSR) based agent colony on the WSNS. It is recommended to calculate the delay for the completion of the additional heuristic transmission and the node confidence factor along the route. The proposed algorithm compares the two existing algorithms: the combined path of energy distributed according to energy efficiency and the compromise resistance of the node. The imitation results show that the planned QEBSR algorithm works better than the added two algorithms. Hatzivasilis, et al. [71] have new developments have introduced a trustworthy system for secure navigation of temporary networks that enhances the intelligence of network companies. Resource consumption per single node provides an energy meter, establishes similar collaboration, and extends phase life. Knows the position of topographic metric nodes and improve load balance. Channel-Health Metric tolerates periodic activity due to poor channel environment and protect against network attacks. The assessment meter assesses each participant's participation in a specific network activity, detects specific attacks, assesses the overall compatibility of the basement counter, and protects against integrated attacks. Uluagac et al. [72] have proposed the node uses its local time standards as a single dynamic key to encrypt each meaning. In this way, Sofas supply an effective dynamic encryption filtering system that filters out malicious data from the network. Through that they can achieved their main goal of synchronizing events in the sink as quickly, correctly and indirectly as achievable. Through baggy integration, condense the number of control letters required by the WSN, provided that significant profit such as abridged power expenditure, listening to harmful nodes, and network detection prevention.

Haseeb et al. [47] have proposed raise energy awareness using a underground sharing program to enlarge energy efficiency by protecting various data from harmful activities, energy awareness and safe multi-route routing protocols. The planned protocol has three main distinctiveness. First, the network field is alienated into internal and outside zones according to the position of the node. In addition, several clusters are formed in each zone based on the areas surrounding the node. Second, data transfer from cluster chapters to each synchronous node in each region is protected by a specific efficient secret sharing scheme. Finally, the data resolution analysis evaluates the specific solution to reduce the complexity of the routing. IoT-based WSN offers a frivolous explanation with secure data movement with a multi-hop move toward. Kumaran et al. [73] have proposed shared keys are used to protect authentication. The two-way authentication technique here allows the dispatcher and receiver to share a public key matrix as the authentication key. Select a random sound matrix for sender and receiver and check by weight. To improve verification and honesty, a hybrid offline, online individuality cryptographic technology is proposed, a

Table 7 Summary of QoS aware routing WSN

Ref.	Routing protocol	Methodology	Parameters	Remarks
[60]	Agent-assisted qos-based routing	Particle Swarm Optimization algorithm	Delay/Second	Qos-PSO algorithm underscores the improvement in the quality of WSN services such as delays, pocket loss, and synthetic qos
[61]	Ant-based qos-aware routing	Bio-inspired routing heuristics	PDR	They experiment with the proposed methods using other ACO-based solutions
[62]	EQRP	Bird mating optimization (BMO)	Throughput/Second	Introduces new mass intelligence based hierarchical communication framework with parallel computer capabilities to ensure powerful data distribution for WSN-based smart grid applications
[63]	MQRP	Estinet9.0	PDR	Cross-layer communication protocols with parallel computing capabilities will ensure further communication delays and leave the development of such protocols for future protocols
[64]	EOMR	Data-centric technique	Energy consumption	Continue to work with evolutionary mechanisms to improve the QoS parameters
[65]	Qos-Centric Fault-Resilient	Confdence Region (CR) based mobility control	Delay/Second	The results of the research provided will be shown to be optimal for the breakdown of resilience
[66]	Qos aware Energy Efcient	Trust based cluster	Throughput/Second	Modify cluster formation on real nodes to improve malicious node detection accuracy, eliminate malicious nodes, and improve routing speed
[67]	Dynamic Cluster-Based Routing	Co-fitdnn	PDR	Extend this work with multiple nozzles to reduce energy consumption
[68]	Oqos-CMRP	Modified Particle Swarm Optimization(PSO)-based clustering algorithm	Delay/Second	This protocol is primarily connected to energy efficiency and can extend the routing protocols to improve the energy efficiency
[69]	TBL routing	Image retrieval algorithm	Throughput/Second	Qos-based routing TBL was introduced to solve network problems

cryptographic system that performs digital signature and public key encryption in a logical one-step process.

Ganesh et al. [74] have proposed the required distance vector deviation was changed base on the signal-to-noise ratio (SNR) combination of the dynamic cluster. An efficient and specific scheme of wireless sensor networks can be alienated into clusters and cluster heads (CH) nodes using the SNR-based Dynamic Clustering (ESRPSDC) method, etc. SNR values are specified in CH. Zin et al. [75] has proposed security supplies and ordinary attacks on wireless touch networks. They offered a variety of secure routing protocol classifications based on a nature protected from WSN attacks. By classification, they reviewed a variety of secure routing protocols, analyzing their strengths, limitations, and performance in the WSN domain. The relative learn of the recommended categorization is base on the various hardware, additional sanctuary communications, security necessities, related attack, and safe and secure trail route in wireless sensor networks. Stavrou et al. [76] have proposed the security features of routing protocols have not been properly considered because most routing protocols in WSNS are not considered to meet defense supplies. However, when WSN applications support important infrastructure (e.g., military, health, environmental, etc.), the issue of security may become relevant. Different routing is one of the additional features to ensure a particularly secure, flexible and trustworthy environment, depending on the availability of this infrastructural resource. The need for security in WSN applications has prompted researchers to develop secure multidisciplinary protocols or to create security extensions for existing protocols.

Thahniyath et al. [77] have proposed Scheme of secure, load symmetric route (SLBR) of various cluster networks. Therefore, better safety, pocket transfer and energy efficiency help to achieve performance. Zin et al. [78] have proposed art for protected WSN routing protocols that address environmental design issues and challenge. Additionally, the final classification of basic mean issue for WSN routing protocols. They also defined the classification of design elements related to safe routing: basic, essential, and optional. The similarity and difference between safe design approaches are summarize in terms of key design features, defense objectives, and attack resistance. Lastly, they reflected on prospect trend in safe trail design research at WSN. Table 8 represents the summary work of secure aware routing WSN.

3.6 Hierarchical Aware Routing WSN

Alippi et al. [79] proposed self-regulatory mechanisms that provide spatial adaptation to the energy environment at the grid level. Among them, hierarchical algorithms are best suited for their size, energy efficiency, extended network duration, and internal adaptation capabilities. This article proposes an H-step addition of the low-energy local clustering (LLC) algorithm. It takes into report the residual energy of the tip, the amount of accumulation, the standardized reporting level of the monitor area, and the long life of network nodes. The usefulness of the planned answer has been demonstrated by ad hoc simulators and investigational studies. Manap et al. [80] discussed how topology organization and network submission influence the presentation of cluster-based and chain-based hierarchical networks. They will review key features of sensor connectivity issues such as power control, sleep / passive coupling in the topology configuration, and data transfer control used in the five general HRPs and their bang on protocol presentation. These related maps show how network applications or reactive or efficient ones are managed, and spatial management or centralized or distributed determine the behavior of the network. Lastly, insurance

Table 8 Summary of research gap

Ref.	Routing algorithm	Methodology	Parameters	Remarks
[70]	QEBSR	Advanced heuristics suggest calculating the final and final transmission delay and the node confidence coefficient of the routing path	Filed dimension	A detrimental tip can involve a number of ways to gain more topographic significance
[71]	SCOTRES	Integrates rated performance and performance on the NS2 simulator with the SCOTRES DSR routing protocol	Power/J	Our goal is not to provide synchronization of paired nodes
[72]	SOBAS	They achieved main goal by synchronizing events as quickly, accurately and indirectly as possible	Area/mm	A sharing node may be malicious or compromised, interfering with the normal operation of the network
[47]	ESMR	Lightweight solution for IoT based limited wireless sensor networks (WSN) with secure data root with multi-hop approach	Time/Second	Encryption methods need to be used to prevent deafness
[73]	EIBAS	The mutual verification technique allows the sender and receiver to share the ordinary key matrix as verification key	Area/mm	The sensor nodes control the power supply and conductor
[74]	ESRPSDC	A system of three judges has already been demonstrated for the best performance in WSNs	Area/mm	Security in the WSN such as power limitation, computing, processing, memory, and communication capabilities
[75]	H-SPREAD	Related attacks and performance for efficient secure routing over a wireless sensor network	Time/Second	Ability to track effective secure routing on wireless touch networks
[76]	SEIF	Sible functional and reliable environment, diverse routing is one of the additional features	Power/J	Because of the diversity of WSNs, the traditional approach fails miserably
[77]	ECSO, SLBR	Standard encryption and authentication schemes cannot be used directly on WSNs due to the nature of resource control on touch devices	Area/mm	The general opinion is that only the tip of the sink is an innovative tip and is safe for safety
[78]	SPINS	Innovative Art for Safe WSN Routing Protocols that address environmental design issue and challenge	Time/Second	Identify future research trends in WSN Safe Route design

reviews show that chain-based HRP guarantees a network lifetime that is 3–5 times longer than cluster HRP. Shah et al. [81] proposed scale hierarchical power-efficient clustering with energy-aware routing (SHEAR), which offers a clustering-based scalable topology control together with an energy-aware path selection scheme. By selecting cluster heads based on the maximum local residual energy of neighboring nodes, SHEAR Topology control distributes the energy scatter evenly across all clusters. In addition, pocket flow paths are assigned to reduce total power consumption in the selected path and to avoid low power nodes. The simulation results show SHEAR's performance in obtaining a reasonably long WSN.

Ke et al. [82] proposed a novel energy-aware hierarchical cluster-based (NEAHC) routing protocol with two goals: Reduces overall energy consumption and ensures reasonable use of energy among nodes. Create the problem of selecting relay nodes as a non-linear brainwashing predicament and find the optimal solution using the accumulated functional properties. Also, at the end of this paper, they will evaluate the proposed method by simulation. Mann et al. [83] proposed BeeSwarm, an SI-based energy-efficient hierarchical routing protocol for WSNs. The protocol consists of three phases: (1) Set-up phase-BeeCluster, (2) Route discovery phase-research, and (3) Data transmission phase-BeeCarrier. The integration of clustering, data routing, and three-phase broadcast is a key feature of the proposed protocol and ultimately contributes to its robustness. Assessment of imitation results shows that Beeswarm excels in pocket distribution, power consumption, and performance, and extends network life compared to other SI-based hierarchical algorithms. Hidoussi et al. [84] proposed PEAL (Power Efficient and Adaptive Latency) which is a novel protocol for cluster-based wireless sensor networks. Simulation results show that the PEAL network can extend lifespan by 47% compared to the traditional Leach protocol (low energy adaptive cluster sequence) and introduce satisfactory transfer delays compare to energy-saving gains. Jadidoleslamy et al. [85] proposed HMR-WSN, a hierarchical multipath routing protocol for homogeneous and clustered WSNs. Finally, its performance is comparable to that of the HMR-LEACH routing protocol. Algorithm complexity and statistical simulation analysis results show HMR-WSN enhanced power consumption, average pocket delivery speed, efficiency, and accuracy. Its performance is proportionally reduced based on the average path installation time, overhead routes, and ease of calculation. Guleria et al. [86] presented hierarchical energy-efficient routing protocols based on classical and group cleverness approach. Routing algorithms in both categories can be summarized in terms of energy efficiency, data collection, location awareness, QoS, size, load balance, error tolerance, demand base, and versatile ways. A methodical study of the writing on hierarchical energy-efficient routing protocols report from 2012 to 2017 was conducted. Finally, research gaps and future aspects of the protocol were discussed.

Vahabi et al. [87] presented an addition of geographic and hierarchical technique with mobile sink to reduce the energy consumption and add to the network lifetime. This technique will increase the remaining energy and significantly extend the life of the phase. The results of the test networks clearly show that the newly planned scheme will increase by at slightest 23.68% compared to other networks. Mehta et al. [88] proposed FMCB-ER which is a hierarchical routing protocol for Fuzzy Multi-criteria Clustering and Bio-inspired Energy-efficient Routing, to extend network life and improve WSN usage. This approach uses network clustering techniques to create robust clusters. Adaptive ambiguous multi-scale result analysis (AF-MCDM) combining ambiguous AHP and TOPSIS is used to select the optimal cluster head (CH). For this purpose, this approach considers three broad parameters: energy, QoS, and node location and their six sub-parameters. After selecting CH, find the best way to transfer data from the sink to CH using Emperor Penguin

Optimization (EPO). The proposed method evaluates power consumption, lifetime, performance, deferred termination, stability, packet delivery rate, delay, and dead and direct node parameters and compares them with another existing routing approach. In particular, the planned move toward reducing energy consumption by up to 13% and increasing the lifespan of the phase by up to 8% compared to the approach. Table 9 describes the summary of the research gap for hierarchical routing in WSN.

3.7 Problems Faced by Routing Algorithms

There are many routing algorithms have been discussed so for in the paper. This section elaborates individual techniques demerit. Specifically difficulties faced by Geographic Routing, Energy Aware Routing, Delay Aware Routing, QoS aware Routing, Secure aware Routing, and Hierarchical Aware Routing is listed out here using Table 10

4 Results and Discussion: Comparative Analysis of Routing Protocols in WSNs

4.1 Comparative Analysis of Geographic Routing for WSN

Table 11 describes the performance analysis of different WSN geographic paths based on different measurements: energy consumption, delay, throughput, packet delivery ratio (DR) and network overhead. The table clearly describes the analysis of different geographic routing algorithms. In [31], the energy consumption of TPGF routing protocol is 3.2 J but the energy consumption is reduced in HBGR [32] which is 1.2% lower than the HBGR routing protocol.

The energy consumption of RIDSR routing protocol is 0.2 J which is 65%, 45% lower than the TPGF and HBGR routing protocols respectively. The energy consumption of EMGR [35] routing protocol is 0.25 J which is 45.3%, 43.2% lower than the TPGF and EEG routing protocols respectively. The energy consumption of SPIN [38] routing protocol is 1.20 J which is 19.2%, 28.52% lower than the HBGR and TPGF routing protocols respectively. From table we observe that the minimum delay consumed in TPGF routing algorithm i.e. 0.02 s which is 67%, 76.5%, 81.2% lower than the state of art GAF, EEG and Easy-go routing algorithms respectively. The maximum throughput was achieved in GAF routing algorithm as 300Bps which is 2.5%, 30.9%, 34.23%, 41.09% and 42.3% higher than the state of art SPIN, FADS, TPGF, RIDSR and SGOR routing algorithm respectively. The maximum packet delivery ratio 100% is achieved TPGF routing algorithm which is 3%, 12%, 22%, 37.5%, 71% and 75.98% higher than the state of art SGOR, HBGR, EMGR, FADS, GAF and SPIN routing algorithm respectively. Finally, the maximum and minimum routing overhead was achieved in TPGF and EEG routing algorithms respectively. Figure 3 summarizes the graphical representation of comparative analysis of different Geographic routing algorithms in WSN.

4.2 Comparative Analysis of Energy Aware Routing for WSN

Table 12 describes the performance analysis of different WSN energy knowledge paths based on different measurements: energy consumption, delay, throughput, packet

Table 9 Summary of hierarchical routing WSN

Ref.	Routing protocol	Methodology	Parameters	Remarks
[79]	HPARP	Low-energy Localized Clustering (LLC) algorithm	Probability of CH	The proposed solution is used for all degrees of aggregation, but the traditional methods provide the full aggregation
[80]	Chain-based HRP	PEGASIS	Delay/Second	Chain-based HRP guarantees network operation 3–5 times longer than cluster HRP
[81]	SHEAR	Energy aware path selection scheme	Energy consumption/J	Scaling analysis of large networks will be another area of future work
[82]	NEAHC	User-grouping algorithm	Energy consumption/J	NEAHC promotes fairness between multi-hop communication power consumption and sensor nodes
[83]	Beeswarm	A Swarm Intelligence Approach	Throughput/Second	Activate Beeswarm with real-time domain-specific sensor nodes
[84]	PEAL	LEACH	Energy consumption/J	Their main challenge is that there is an optimal mechanism between extending the lifespan of the network and achieving acceptable transmission delays
[85]	HMR-WSN	LEACH	Throughput/Second	The HMR-WSN algorithm is complex and enhanced by the results of statistical simulation analysis
[86]	HEERP	Classical and swarm intelligence approach	Delay/Second	Particular attention should be paid to developing energy efficient routing protocols for applications that require QoS services
[87]	Ioghr	First-order radio model	PDR	With multiple mobile immersions, can significantly improve IOGHR
[88]	FMCB-ER	AF-MCDM	Energy consumption/J	Future actions of the network-based routing approach include extending this algorithm to mobile nodes on touch networks to make it more appropriate for mobile WSN applications

Table 10 Problems and issues faced by routing algorithms

S. No	Methodology/Technique	Problems/Issues
1	Geographic routing	It purely relied on the geographic position of the node there is increased possibilities node attack like DOS attack on sensing node
		Most of the time sensing node locations not accurate
		In moving node which has different speed in motion and exact update of the location by nodes most of the time delayed and makes this not suitable for Mobile Wireless sensor Networks
		Scalability is not feasible
		Highly Dynamic protocol hence consume much more energy
		Life span of the node decrease when implementing this methodology
		Network may collapse due to rapid mobility of nodes
2	Energy aware routing	All the time the decision taken by just calculating the number of hops distance
		Possibilities are high when all nodes start to transmit favorable near hop nodes
		Always heavy traffic is observed since when more
		node interacts with same nearby node
		Frequently communicated nodes automatically disconnected
		Always Energy alone considered main factor QoS of the system is compromised
		Aggregation method is avoided instead clustering is formulated then the benefits of data aggregation is missed
		Tolerance level is high which affect the efficiency of the system
		Not suitable heavy 24/7 applications
3	Delay aware routing	High rate of data oscillations observed
		Frequent data connectivity issue with this protocol
		More data interference leads to increased Error rate
		Very low throughput and successful data delivery rate
		More Energy spent for data routing alone
		High On time of sensing nodes which leads to shortened overall network operation ability
		High rate of accepted data delays which leads to poor performance of the Wireless Sensor Network

Table 10 (continued)

S. No	Methodology/Technique	Problems/Issues
4	QoS aware routing,	Suitable for limited structured operations not suitable for long Hop networks
		High Energy utilization drains the sensing Node battery
		Important factor of Energy spent per pocket is ignored
		Combatively high delay in the network
		Not suitable for high ideal time nodes deployment
5	Secure aware routing,	Multi Layer structure not suitable for simple applications like Motion Detection etc.,
		High On time of the node shortens network life span
		Complex protocol and methodologies
		Suitable for limited applications
6	Hierarchical aware routing	High communication overhead
		More network waiting Time
		High delay Rate
		High Energy Utilization
		Less network life term
		Highly predictable nature invites more attack on the network
		Difficult to find the snooped nodes
		Less secure protocol

Table 11 Comparative analysis of geographic routing for WSN

Ref.	Routing	Parameters				
		energy (J)	Delay	Through-put (Bps)	PDR	Network overhead
[31]	TPGF	3.2	0.02	134	1	11
[32]	SGOR	X	22	x	0.95	x
[33]	HBGR	2.5	X	94	0.9	x
[34]	RIDSR	0.2	X	98	x	15
[35]	EMGR	0.25	15	x	80	15
[36]	FADS	3.0	X	150	67	x
[37]	Easy-go	X	7.9	x	x	22
[38]	SPIN	1.20	X	297	x	18.9
[39]	GAF	X	2.5	300	35	20
[40]	EEG	6.50	20	x	40	25

delivery ratio (DR), network overhead, packet delivery ratio (PRP) and bit error rate (BER). The table clearly describes the analysis of different energy routing algorithms. The energy consumption of SW-WSN is 0.79 which is 25%, 60%, 30%, 44% and 50% lower than MUSTER, PDORP, CHCTEEM, TEAR and RRDLA respectively. In [46], the delay is 0.2 for SW-WSN which is increased to 87% for MUSTER. The throughput is 134 for SEHR and 94 for MAX-SNR which is 35%, 77% and 29% lower than FAFEBRM, PDORP and SW-WSN respectively. The packet reception rate of SEHR is 170 which are 46%, 38% and 20% higher than FAFEBRM, MAX-SNR and SW-WSN respectively. The networks overhead of SEHR are 60%, 98%, 88% and 12% higher than RRDLA, SW-WSN, CHCTEEM and PDORP respectively. The packet delivery ration of CHCTEEM is 55 which is 80%, 66%, 11.9% and 10% higher than MUSTER, PDORP, TEAR and RRDLA respectively. Figure 4 summarizes proportional analysis diagram of WSN different energy recognition routing algorithms.

4.3 Comparative Analysis of Delay Aware Routing for WSN

Table 13 describes the performance analysis of different WSN delay perceived paths based on different measurements: energy consumption, delay, throughput, packet delivery ratio (DR), network overhead, packet delivery ratio (PRP), and bit error rate (BER). The table clearly describes the analysis of different delay routing algorithms. In [51], the PDR of FAFEBRM is 99.7 which is 0.3% higher than MUSTER [50]. In [55], the PDR of TEAR is 91.7 which is 0.7% higher than MAX-SNR [50]. The throughput of SEHR and SW-WSN are 170Bps respectively. The delay RRDLA is 46%, 39%, and 79% lower than MUSTER, PDORP, and MAX-SNR respectively. The energy consumption of SW-WSN is 500 but the energy consumption of SEHR is 350 which is 58% lower than the PDORP routing protocol. The energy consumption of RRDLA is 420 and MAX-SNR is 100. Figure 5 summarizes the graphical representation of proportional analysis of different delay-aware routing algorithms in WSN.

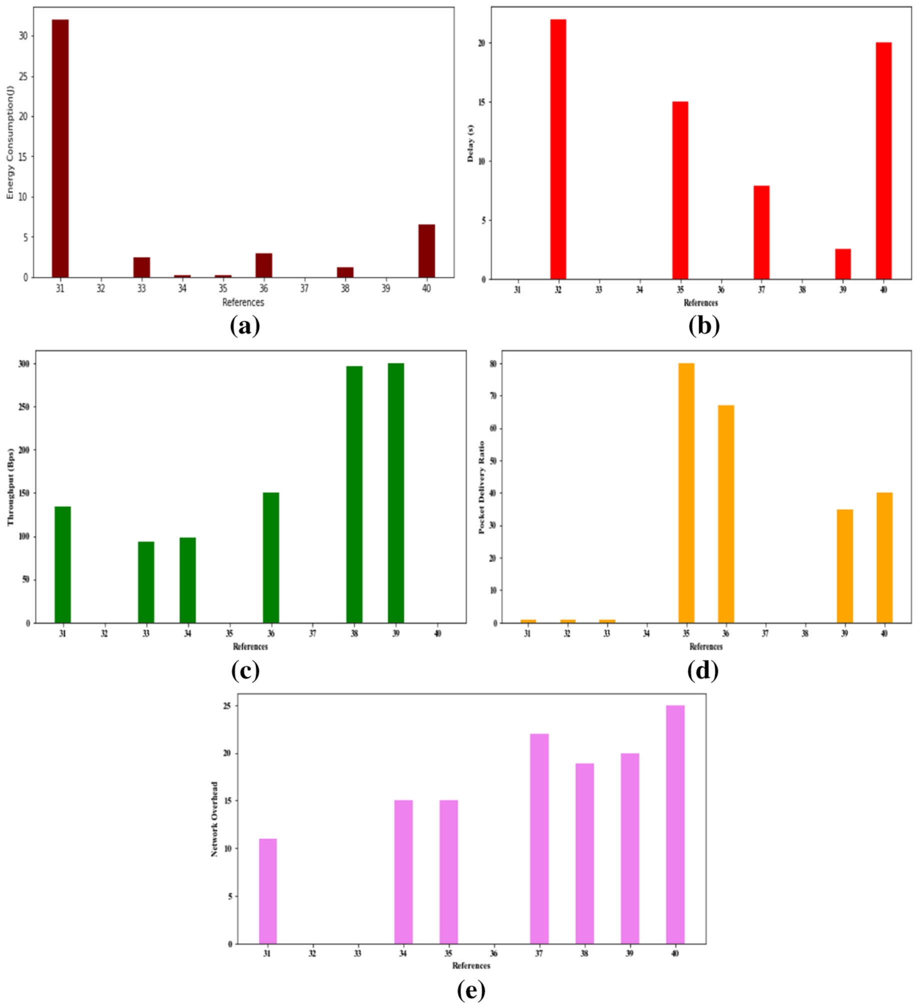

Fig. 3 Comparative analysis of geographic routing for WSN **a** Energy consumption **b** Delay **c** Throughput **d** delivery ratio **e** Network overhead

4.4 Comparative Analysis of QoS Aware Routing for WSN

Table 14 describes the performance psychiatry of dissimilar QoS aware routing for WSN in conditions of different metrics such as energy consumption, delay, throughput, packet delivery ratio (DR), network overhead, packet delivery ratio (PRP) and bit error rate (BER). The table clearly describes the analysis of different QoS routing algorithms. Table 4 provides an analysis of the performance of various WSN QoS routing algorithms based on various metrics, including: energy consumption, delay, throughput and packet delivery ratio (PDR). The table clearly describes the analysis of different geographic routing algorithms. In [62], for EQRP routing algorithm, the energy consumption is 78 J. However, for QCFR routing algorithm the energy consumption is 0.45 J only which is 78.65% lower than the EQRP routing. But, the DCR and OQCMRP have the energy consumption

Table 12 Comparative analysis of energy aware Routing for WSN

Ref.	Routing	Parameters						
		energy (J)	Delay (s)	TP (Bps)	PDR	NOH	PLR	BER
[41]	MUSTER	25	20	x	40	25	100	11.4
[42]	FAFEBRM	x	X	0.29	X	x	350	x
[27]	PDORP	6	1.92	0.7	36	0.56	x	16.85
[43]	CHCTEEM	15.20	1.32	x	55	0.2	x	x
[44]	MAX-SNR	x	X	94	X	x	253	x
[45]	TEAR	22.9	0.56	x	1.89	x	x	12.98
[46]	SW-WSN	0.79	0.2	80	X	44.7	337	x
[47]	SPIN	x	X	117.4	X	x	x	23.76
[48]	RRDLA	50	1.89	x	0.5	3.5	x	16.9
[49]	SEHR	0.7	0.3	134	X	950	170	x

as 18 J and 25 J respectively which is 45.12% and 7.8% lower than the EQRP routing algorithm. The delay of AAQR routing algorithm is 5.1 s which is 2.8%, 3.4%, 4.6% and 5.3% lower than the AQR, QEE, DCR and TBL routing algorithms respectively. The throughput of DCR routing algorithm is 65Bps which is 32.15%, 28.1%, 15.87% and 8.7% higher than the state of art MQRP, EQRP, QCFR and OQCMRP routing algorithms. From the table, we observed that the maximum delivery rate achieved in MQRP, QEE and QCFR routing algorithms. The delivery rate of those routing algorithms is 1.2%, 2.9% and 5.9% higher than the EQRP, QCFR and OQCMRP routing algorithms. Figure 6 summarizes the graphical representation of a proportional analysis of routing algorithms associated with different WSNs.

4.5 Comparative Analysis of Secure Aware Routing for WSN

Table 15 describes the performance analysis of different WSN secure paths based on different metrics: energy consumption, delay, throughput, packet delivery ratio (PDR), network overhead, packet delivery ratio (PRP) and bit error rate (BER). The table clearly describes the analysis of different secure routing algorithms. In [72], the energy consumption of SOBAS routing protocol is 77 J but the energy consumption is reduced in ESMR [47] which is 51.9% lower than the SOBAS routing protocol. The energy consumption of ECSO-SLBR routing protocol is 30 which is 23.3%, 97.7% and 95% lower than the SEIF, ESRPSDC and EIBAS routing protocols respectively. The delay of EIBAS is 2378 which is 99%, 89%, 40%, 3% and 15.8% higher than QEBSR, SCOTRES, SOBAS, ESMR and SPINS respectively. For ESMR [47], the Throughput value is 13000. The Throughput of SOBAS, ESRPSDC, HSPREAD and SEIF 99.2%, 99.2%,99.5% and 86% higher than ESMR. The packet delivery ratio of SCOTRES is 20%, 2%, 1%, 3%, 13% and 57% higher than SOBAS, ESMR, EIBAS, ESRPSDC, SEIF and SPINS respectively. The detection ratio of QEBSR is 74 which is 67%, 23%, 18%, 23% and 18% lower than SCOTRES, EIBAS, ESRPSDC, SEIF and ECSO-SLBR respectively. The latency of SCOTRES and ECSO-SLBR are 32 also, QEBSR and HSPREAD are 19. The false ratio of HSPREAD and QEBSR are 5 respectively. Figure 7 summarizes the graphical representation of comparative analysis of different secure aware routing algorithms in WSN.

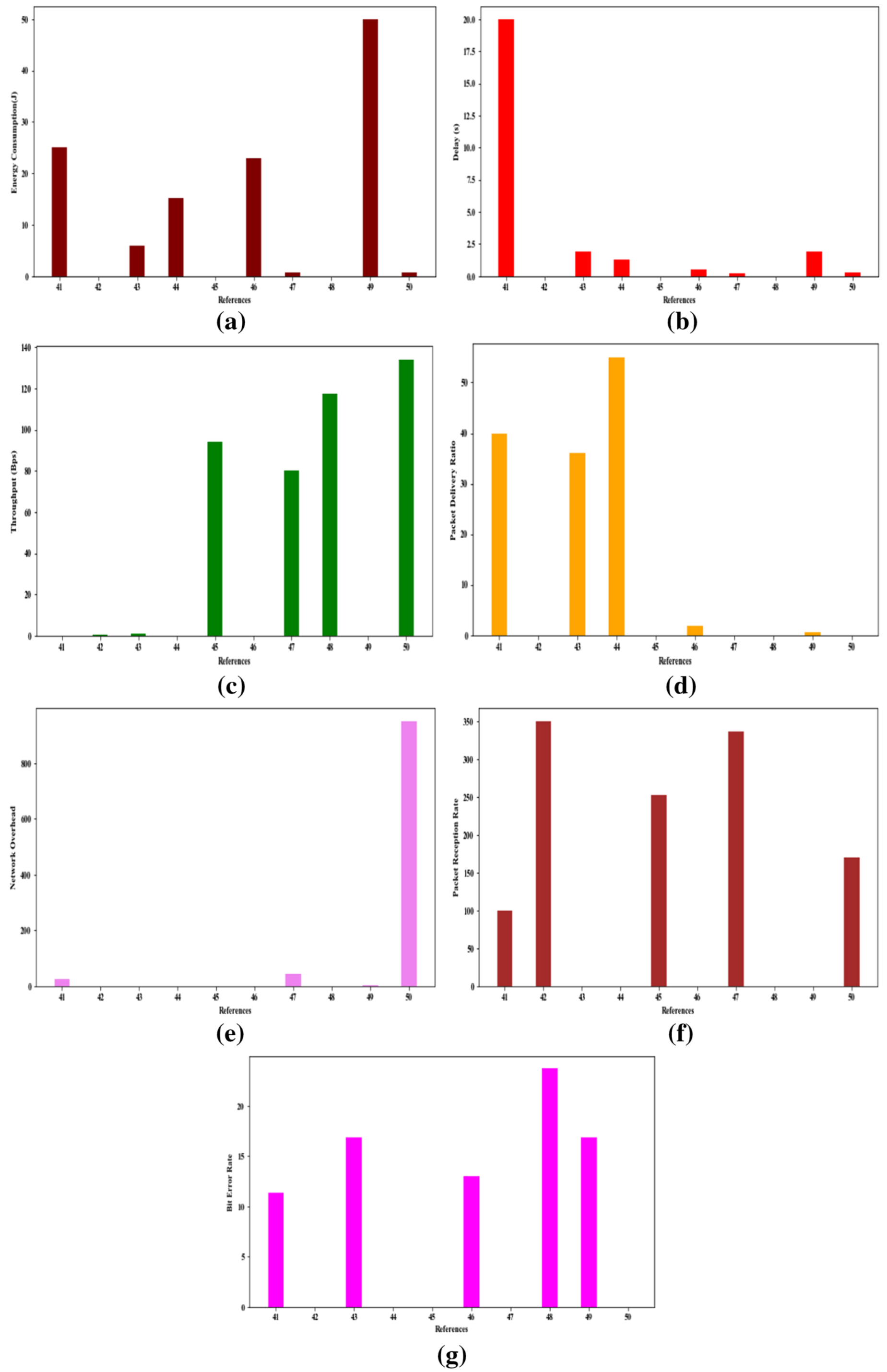

Fig. 4 Comparative Analysis of energy aware routing for WSN **a** Energy consumption **B** Delay **c** Throughput **d** Delivery ratio **e** Network overhead **f** Packet loss rate and **g** Bit error rate

Table 13 Proportional analysis of delay aware routing for WSN

Ref.	Routing	Parameters			
		Energy (J)	Delay	TP (Bps)	PDR
[50]	MUSTER	X	180	348	99
[51]	FAFEBRM	X	0.21	x	99.7
[52]	PDORP	90	95	x	x
[53]	CHCTEEM	X	1.5	237	x
[54]	MAX-SNR	100	97	x	89.3
[55]	TEAR	X	16	193	91.7
[56]	SW-WSN	500	X	170	x
[57]	SEHR	350	78	170	90
[58]	RRDLA	420	3	x	75
[59]	SEHR	X	16	1,100,000	12,000

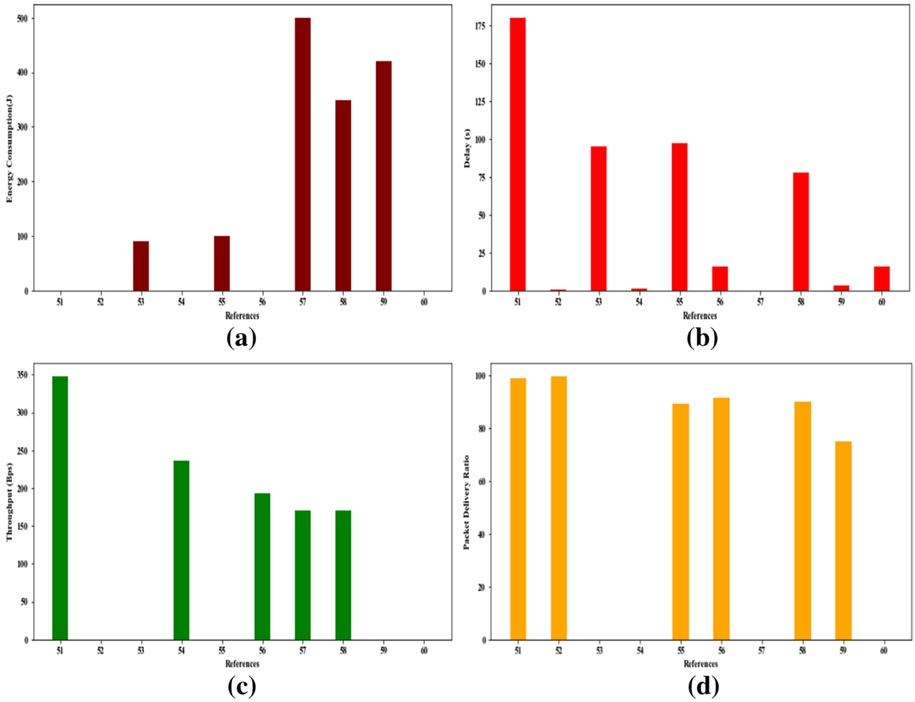

Fig. 5 proportional analysis of delay aware routing for WSN **a** Energy consumption **b** Delay **c** Throughput **d** Delivery ratio

4.6 Comparative Analysis of Hierarchical Routing for WSN

Table 16 describes the performance analysis of different WSN hierarchies based on different metrics, including energy consumption, delay, throughput (TP), packet delivery ratio (DR), network overhead, packet delivery ratio (PRP), and bit error rate (BER). The table

Table 14 Comparative analysis of QoS aware routing for WSN

Ref.	Routing	Parameters						
		energy (J)	Delay	TP (Bps)	PDR	DR	Latency	FR
[60]	AAQR	x	5.1	x	0.63	74	19	4
[61]	AQR	x	0.45	x	94	65	32	8
[62]	EQRP	78	500	94	88	x	45	5
[63]	MQRP	85	70	15,000	100	x	67	X
[64]	EOMR	1.2	2400	x	95	79	X	X
[65]	QCFR	0.45	X	98	75	81	X	3
[66]	QEE	x	0.7	98	98	x	19	2
[67]	DCR	18	0.06	65	93	90	X	X
[68]	OQCMRP	25	X	96	x	87	32	4
[69]	TBL	x	5.1	x	0.63	x	23	x

clearly describes the analysis of different hierarchical routing algorithms. Table 6 describes the performance analysis of different WSN hierarchical routing algorithms based on different metrics: energy consumption, delay, throughput, and packet delivery ratio (DR). The table clearly describes the analysis of different geographic routing algorithms. In [79], the energy consumption of HPARP routing algorithm is 0.98 J. However, the energy consumption of the Chain-based HRP routing algorithm is 0.12 J only which is 78.65% lower than the HPARP routing. But, the SHEAR and NEAHC have the energy consumption as 0.2 J and 1.92 J respectively which is 45.12% and 7.8% lower than the HPARP routing algorithm. The delay of HPARP routing algorithm is 10.1 s. Which is 2.8%, 3.4%, 4.6%, and 5.3% lower than the Bee-swarm, PEAL, HMR-WSN, HEERP, and IOGHR routing algorithms respectively? The throughput of PEAL routing algorithm is 2.18Bps which is 32.15%, 28.1%, 15.87%, and 8.7% higher than the state of art NEAHC, Bee-swarm, HMR-WSN, HEERP, and IOGHR routing algorithms. From the table, we observed the maximum delivery rate achieved in NEAHC, Bee-swarm, and HEERP routing algorithms. The delivery rate of those routing algorithms is 1.2%, 2.9%, and 5.9% higher than the SHEAR, HPARP, and HMR-WSN routing algorithms. Figure 8 summarizes the graphical representation of comparative analysis of different hierarchical routing algorithms in WSN.

The questions in this survey can be automated with a wireless sensor network. the majority of the chosen studies are involved in WSN applications, (i) adapting networks to environmental and unpredictable events, and (ii) energy-saving and extending network life.

4.6.1 Research Question 1

Selected studies [27, 34, 35, 48, 51, 57] focus on the offer solution to deal with self-structuring features. The sensor nodes are configured and modified to adapt to network and sensory behavior parameter values in response to changes in network conditions and state. In some examples of network configurations adopted in [33], the node-dependent duty cycles are minimized and the residual node energy remains at significant levels unless the tracking event changes significantly over some time. Error tolerance is a common feature of this environment. As [39] points out, the sensor nodes around the signal zone are larger than each other to maintain network connection reliability stability and sensor coverage

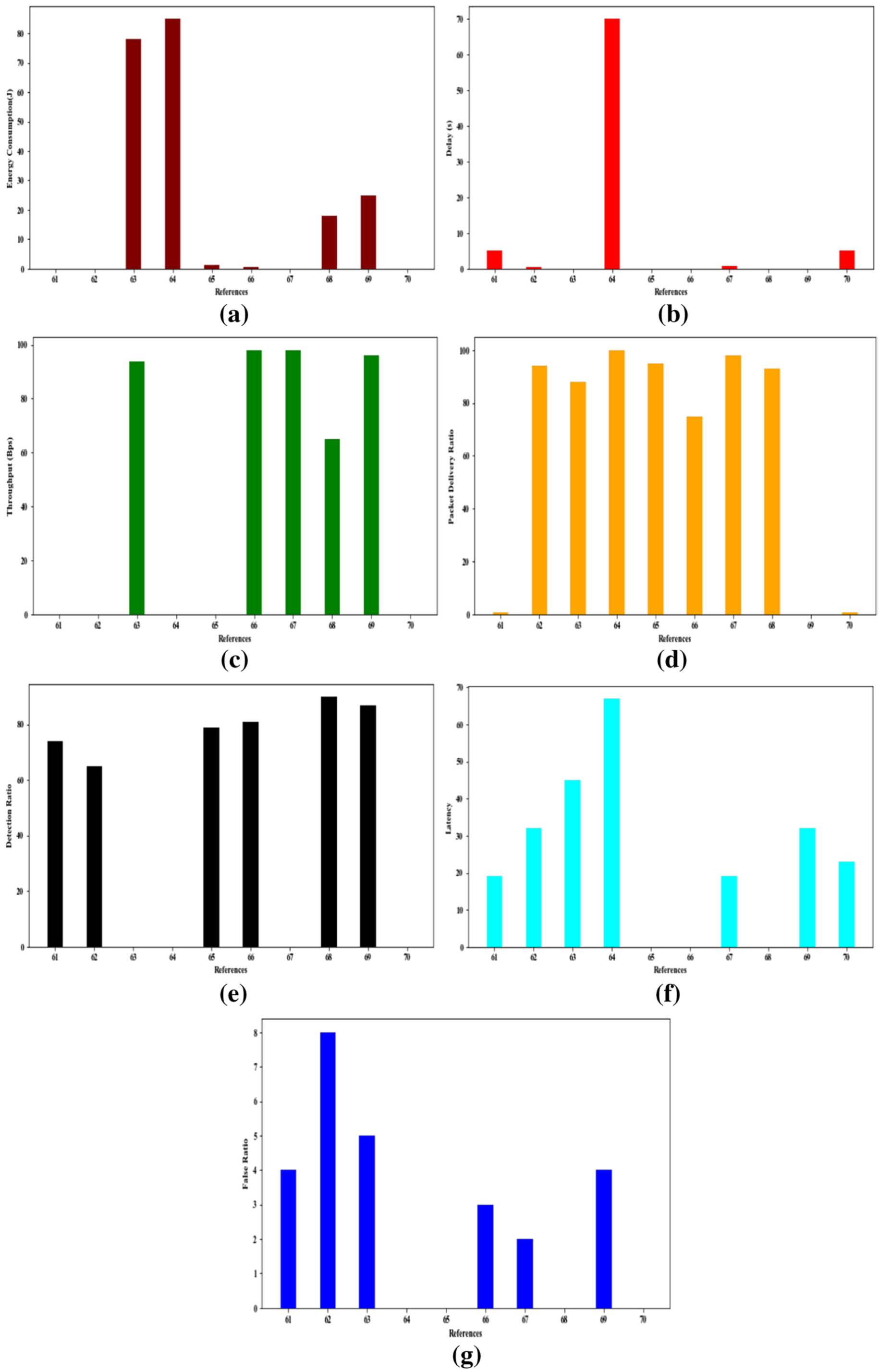

Fig. 6 Comparative analysis of QoS aware routing for WSN **a** Energy consumption **b** Delay **c** Throughput **d** Delivery ratio **e** Detection ratio **f** Latency and **g** False rate

Table 15 Comparative analysis of secure aware routing for WSN

Ref.	Routing	Parameters						
		energy (J)	Delay	TP (Bps)	PDR	DR	Latency	FR
[70]	QEBSR	x	5.5	x	0.69	74	19	5
[71]	SCOTRES	x	0.56	x	98	65	32	7
[72]	SOBAS	77	467	97	78	x	45	6
[47]	ESMR	73	70	13,000	99	x	67	X
[73]	EIBAS	1.5	2378	x	97	93	X	X
[74]	ESRPSDC	0.7	x	97	83	91	X	4
[75]	HSPREAD	X	1.2	99	97	x	19	5
[76]	SEIF	23	0.09	72	95	93	X	X
[77]	ECSO-SLBR	30	x	98	x	97	32	9
[78]	SPINS	x	5.3	x	0.73	x	23	X

to minimize the impact of the failed node. The parts are reassembled. The security mechanism relies on detecting abnormal network behaviors. This algorithm is at the BS. All cluster heads transmit data honestly to the base station. The mechanism of action is related to that of the brain. The brain receives data from all over the body and corrects strange behaviors.

4.6.2 Research Question 2

The questions in this survey can be enhanced with a wireless sensor network. Most of the select studies are paying attention to WSN applications, (i) adapting networks to environmental and unpredictable events, and (ii) energy-saving and extending network life. [41, 43, 50, 52], and [56] rely on a trial-based inference approach. As noted in S14, a common way to implement autonomous behavior in a distributed system is to use policies. Politics regulates the behavior of an organization that can express its language using natural language or numerical code. Policy-based systems use a lot of obtainable scripting language for policy definition but are not compatible with wireless touch networks due to resource constraints. Agents can switch in and out of the network, and automatically clone and relocate as the environment changes. Users pay for mobile agents that are distributed to nodes that perform program-based errands. Each agent is autonomous, allowing a manifold application to split the network.

4.6.3 Research Question 3

QoS theater a vital role in WSN. The following factor influences the parameters. (1) high data rate, (2) delay can be reduced. Studies include [61], [65,] [65, 68] the goal of network resource development using these principles is a comparatively new investigation of the topic in the WSN industry. WSN secondary software systems are more difficult to communicate with AC than traditional software systems, mainly because the computer resources required for sensor nodes are limited. However, we believe that selective research is an effective tool for resolving the autonomous behavior of WSN projects. Below are some issues and research opportunities from analyzes. Research Question 4:

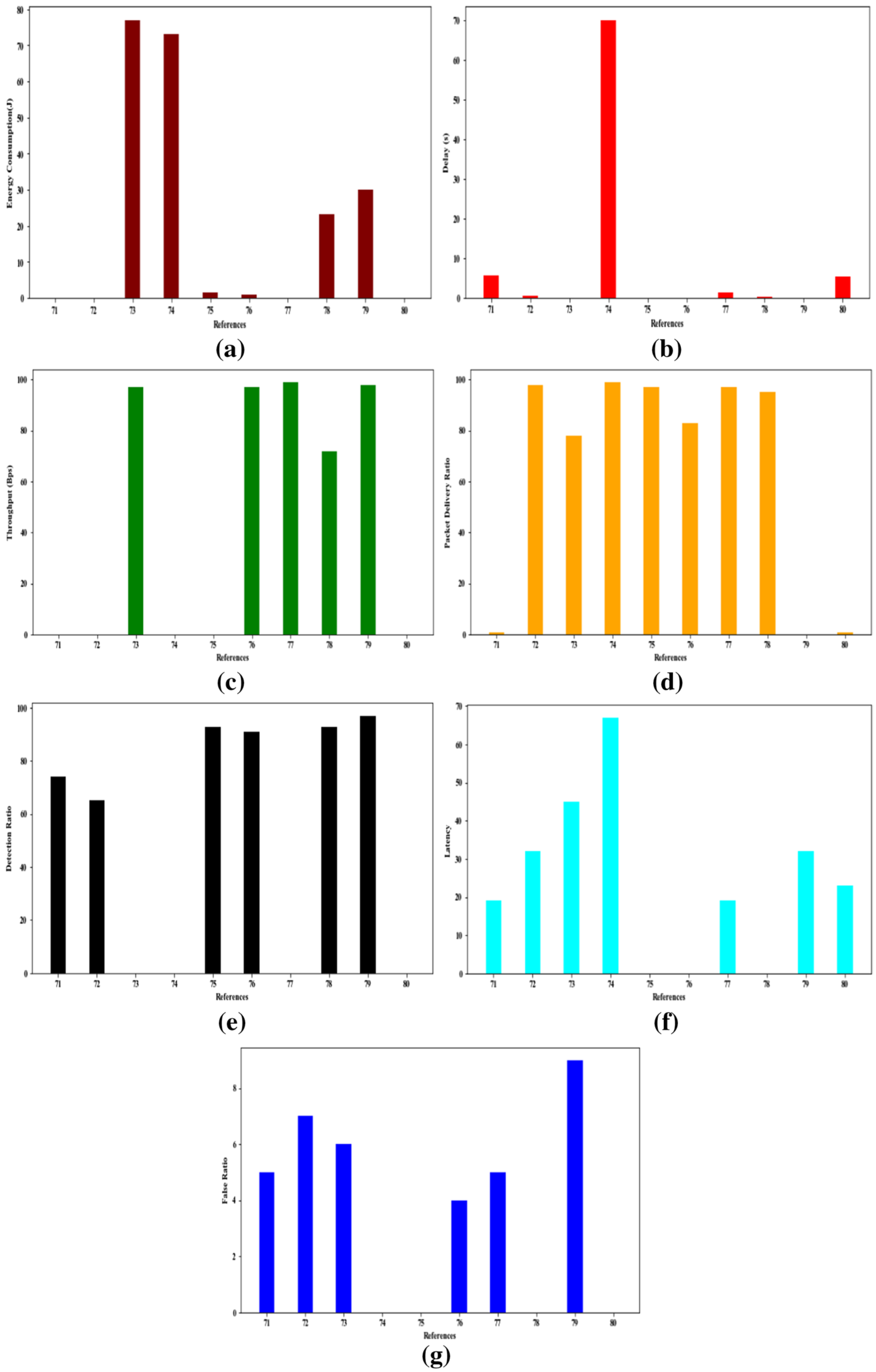

Fig. 7 proportional analysis of secure aware routing for WSN **a** energy consumption **b** Delay **c** Throughput **d** Delivery ratio **e** Detection ratio **f** Latency and **g** False rate

Table 16 Proportional analysis of hierarchical routing for WSN

Ref.	Routing	Parameters			
		energy (J)	Delay (s)	TP (Bps)	PDR (%)
[79]	HPARP	0.98	x	x	x
[80]	Chain-based HRP	0.0012	x	x	100
[81]	SHEAR	0.20	x	x	x
[82]	NEAHC	1.92	x	0.37	x
[83]	Bee-swarm	x	x	x	1900
[84]	PEAL	x	x	2.14	97
[85]	HMR-WSN	X	13	x	x
[86]	HEERP	X	14	0.98	100
[87]	Ioghr	X	x	x	x
[88]	FMCB-ER	X	x	0.37	x

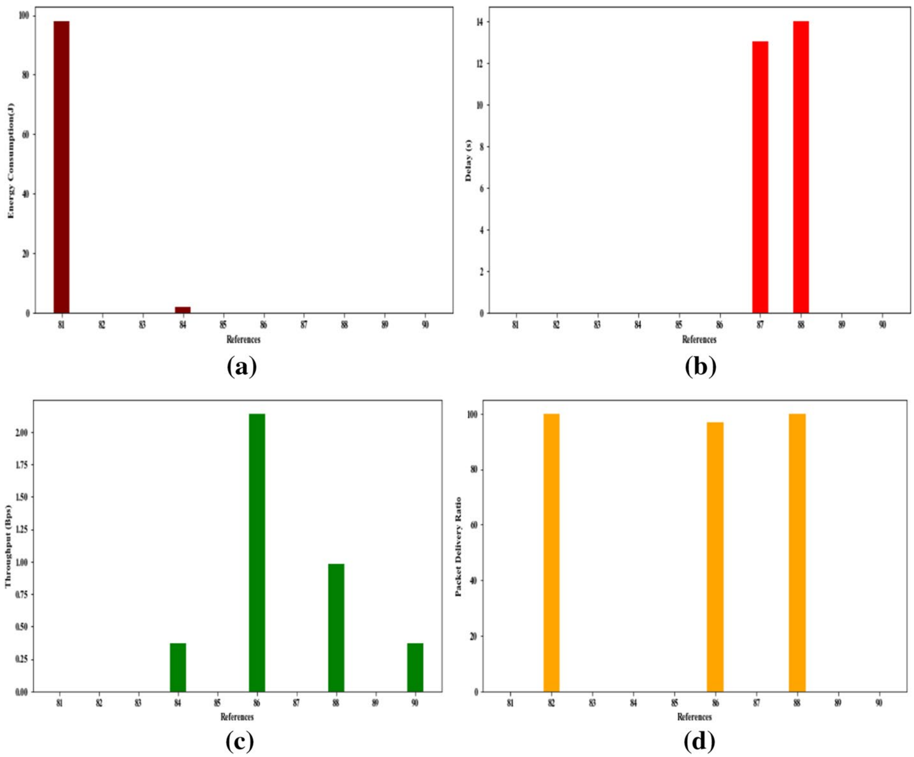

Fig. 8 proportional analysis of secure aware routing for WSN **a** Energy consumption **b** Delay **c** Throughput **d** Delivery ratio

Studies include [47, 70, 72, 75, 78] states the concentrate to enhance security problem. WSNs have been of great interest to the wireless and mobile computing research community for the past decade. The use of the WSN is numerous and growing, including internal deployment shots reaching enemy territory on tactical battlefields. However, because these networks are remote, they are vulnerable to many security threats that can negatively affect performance. This problem is exacerbated when the network is used in task-critical applications such as tactical battlefields.

5 Conclusion

The rationale of this article is to present an impression of the system literature aimed at obtaining approaches, methods, and techniques aimed at applying routing protocols for wireless sensor networks. This appraisal presented the challenges of WSN using different applications such as geographic routing, energy-aware routing, delay aware routing, QoS aware routing, secure aware routing, and hierarchical aware routing. Also found out which WSN component automates interference and behavior. This study was optimally planned as a review of the formal literature based on a strictly structured structure conducted according to a pre-defined protocol. Finally, we evaluated the performance parameters of WSN by improving energy consumption, delay, PDR, throughput, false ratio, PRR, and network overhead. The need for routing algorithms; routing algorithm types which are used to enhance the performance; QoS is the most important parameter to keep should be better one in WSN and the parameters need concentrate to enhance security problems in WSN are also discussed in this study.

6 Future and challenges

This work summarizes the routing protocols generally employed in wireless communication and specifically employed in the Wireless Sensor Network for data transfer it provides many benefits to the readers some of them are.

Its open door to the researcher to optimally select the protocol for their application.

The Detailed methodology and technical feasibilities are discussed in this paper.

Merits and demerits of the individual methodology are discussed.

Challenges.

Many more algorithms are available for discussion this paper just chooses some of the most used protocols and techniques the same way many more algorithms may be analyzed.

Based on the framework optimal usage of the protocol is difficult to deploy.

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Author's Contribution ARB is the sole author for this work all the contributions to bring out this paper is done by author.

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Data Availability Data transparency. In this paper there is no data set is used in any form.

Code Availability Software application or custom code. There coding may be available on a pre-request basis.

Declarations

Conflict of interest Include appropriate disclosures. Through this, the author of this paper declare that there is no conflict of interest in the following Either in the form of Data, In the forms of thought or materials used.

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