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*Research Article*

# Aggregation Technique Using Dynamic Cross-Propagation Clustering Algorithm in Wireless Body Sensor Networks

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Wireless body sensor networks (WBSNs) are characterized by a large number of battery-powered wireless sensor nodes, and the most challenging aspects of WBSNs are sensor node energy consumption, delay, and security (communication and data) while maintaining regular wireless sensor network (WSN) capabilities. Data aggregation, as a common procedure in data gathering applications, can waste a lot of energy since sensor nodes may stay in the listen to state even when they are not receiving data during the data collection process. In this research work, introducing the Self-Executing-Dynamic Cross-Propagation Clustering (SE-DCPC) algorithm helps to improve the node energy consumption positively by turning nodes to the accessible state when not in use and waking them up when necessary. The algorithm is energy-based and uses a self-executing-based dynamic cross-propagation clustering system to send/receive scheduling data in the WSN platform. The energy level of the nodes is the most essential component in constructing network communication, in contrast to earlier clustering algorithms. The purpose of this proposed algorithm is to enhance the traditional notion of the clustering algorithm (location-based clustering), leading to the primary goal of enhancing the permanence of the wireless sensor network, which is to conserve network coverage, using self-executing DCPC clustering technology for location and power. The result of performance analysis of the SE-DCPC is achieved by simulation using two different communication processes of clustering and intelligence decision-making methods. The numerical results shows that SE-DCPC can effectively handle and maintain a high rate of network node energy consumption. The simulation result shows that the proposed approaches securely obtain the high throughput and very minimal delay at the client side, compared to existing clustering algorithm approaches. This SE-DCPC algorithm increased by 21.89% the communication medium lifetime and by 37% the energy consumption and reduced by 23.27% the overhead compared with existing clustering algorithms.

## 1. Introduction

Large-scale WSN has been widely used in a variety of applications, including security, environmental monitoring, and surveillance. A WSN is made up of several tiny sensor nodes (SN). Because the sensors are normally connected with a nonrechargeable battery, energy efficiency is a major design issue in extending the network life. The SN of a WSN typically has limited storage, reduced power, and transmission capabilities. The measurements and monitored events are delivered to a static sink when transmission capability is enabled. There is no assurance that direct transmission to the sink will result in a stable energy load distribution across the network's sensors. Therefore, various clustering techniques were designed specifically for WSN to improve data aggregation (DA) mechanisms. Data collection helps to

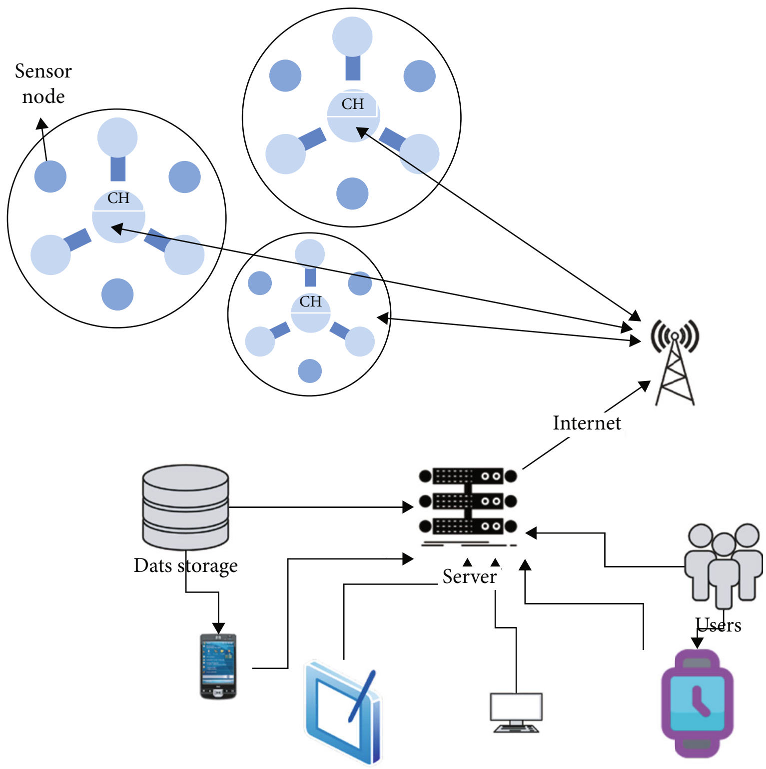


Figure 1: Energy-efficient routing schemes based on clusters.

tackle both redundant and coherent problems. It is one of the most important tasks in a WSN, since it takes sensor data and sends it to a specific node, known as a sink.

*1.1. Data Aggregation.* Data aggregation (DA) in sensor networks has been the focus of many researchers. In the WSN, important research is being conducted on the effective use of node energy while improving the accuracy of sensing and aggregation. An Internet of Things (IoT) migrates and collects data from the S before reporting it to the sink. Because they are the position without any preinstalled programmer, IoT-centered WSNs support self-adaptive apps. Instead, users employ networks, which are a self-contained programmer with the capacity to go from node to node to complete the work and send the results to the sink node as shown in Figure 1. The static itinerary is determined centrally at the sink, and this method is used by most WSN sensor node-based DA protocols.

In this system, a simple solution is required to properly maintain the energy of the equipment. Routing in a similar manner distributes the processing load throughout the whole network. Networks that are energy efficient, especially those that incorporate coordinated devices, are crucial. Figure 1 examines an energy-efficient routing schema with cluster, i.e., server, storage, clustering nodes, data communication, and sensor functionalities.

*1.2. Wireless Body Sensor Networks (WBSN).* A wireless body sensor network also called a Wireless Body Area Network (WBAN) is one of the types of wireless sensor networks. Various sensors are used to calculate different electronic values of medical themes during various reductions. Sensors transmit different signals for analysis of the details of patients; information passes through wireless network. For traditional sensor network communication, data are sent directly to the base station for further processing. With direct signal communication, sensor signals are distracted with reflection, absorption, movement of the body, and other environments behind the body.

Existing clustering algorithms concentrate on different aspects for various environments. But existing clusters are mainly supporting standard network node energy consumption and static decision-making-based network communications. So, at present, the maximum sensor network consumes more energy to transmit data to the target. Generally, clustering algorithms play a vital role on wireless sensor networks or WBSN for increasing the lifetime of communication network topology management and network node energy conservation. For this reason, improvements need to be made on the clustering algorithm, in which the network needs dynamic topology adjustments to conserve sensor nodes and network node energy. It is also worth noting that the phrase is used interchangeably in the text to refer to both nodes and device sensor nodes in an IoT network. The suggested routing protocols ensure that this problem is handled by extended network boundary and dispersing dynamic routes. This research work SE-DCPC protocol is implemented for the IoT network schedule planning based on selection, determination, and migration expenditure, as well as the strategies used to state such a design, which are the key considerations that the IoT network must address while dispatching. Furthermore, the SN execution is

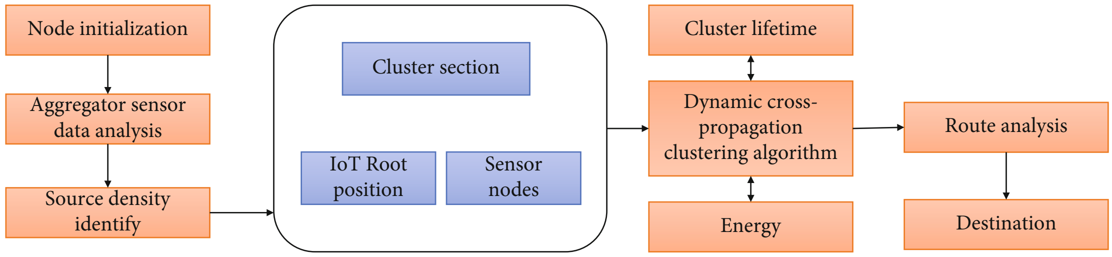


Figure 2: SE-DCPC structural flow.

constrained by maximum memory storage, power consumption (battery restrictions), and compute capability, making IoT network itinerary planning a tough distributed task.

The effective Self-Executing-Dynamic Cross-Propagation Clustering (SE-DCPC) algorithm, also known as routing, may be influenced by the itinerary design. As a result, the aggregation approaches are divided into two categories: (i) structured aggregation and (ii) structure-less aggregation. Widely varying SN structures are produced in the former DA to collect data, aggregate the data, and transfer the data to the base station (BS). Chain-centered, tree-centered, cluster-centered, tree-cluster-centered, or hierarchical cluster-centered DA architectures exist. In the chain, tree, and cluster, the intermediary nodes are elected as the leader node, root, and clustering head (CH), respectively. Existing DA has lesser accuracy; thus, an efficient DCPC aggregation in WSN is presented to solve the issue.

(1) Clustering advantages are fully leveraged by applying the cluster head which results in reduced energy consumption

(2) The variance of network nodes' energy and lifetime is reduced. So, improvement of comfortable decision-making with a dynamic environment is needed, through legitimate nodes balancing the energy of CH

(3) The proposed work, SE-DCPC, is confirmed for different network performance metrics as equated with other existing dynamic work solutions

The organization of the proposed work is as follows: Section 2 describes and examines related studies on the approach suggested. Section 3 offers a brief overview of the proposed approach of SE-DCPC, Section 4 examines into the experimental results, and Section 5 concludes the proposed work.

## 2. Literature Survey

There is a need to transmit more data over the network. As the number of devices on an Internet of Things (IoT) network increases, so do the transmission bandwidth and transmission power consumption. In IoT networks, compressed data aggregation (CDA) has been proposed as an effective approach to reduce the amount of data collected [1–3]. In the WSN system, with regard to the time of packet transfer from one node to another node, the possibility of security risks was generated. For all of the nodes and battery in the system, if any of the nodes fails bue to battery drain, the following courses may be harmed. In other words, they usually break this strategy [4] malevolent hub. Hoping on several levels is required to keep the network's power usage and energy balance in check. Most active research efforts and approaches on high residual energy selection, but which do not consider WBAN terminal processing, are now underway. Because each node's power and energy consumption ratio may differ from that of the WBAN distribution, the chosen distribution node must take into account a number of criteria [5].

The various situations are unable to deliver the required quality modification and service type, causing severe network management issues. A new system of crisis exposure was performed by the CN- (Computer Network-) linked software-defined network (SDN), which was constructed in order to improve the performance of the the system. If a lane becomes congested, it is recommended that the old road be replaced such that the ideal route has the lowest link cost and the least amount of traffic. The output latency and packet loss [6, 7] in the fat tree are used to evaluate algorithm performance of the data center network (DCN).

In WSN, load balancing includes delaying bandwidth in order to improve communication quality and reduce jitter and error rates. A new routing will balance different metric routes and load metrics. The load between the service terminal and the network route is what the metric balance is all about [8]. The load distribution is encoded via reliable multicast protocols for detecting geographical information networks. It is described as a measurement of the load balance factor; it is coded to determine the load status and the node's projected transmission time [9].

Routing to different protocols distributes the vital traffic; load balancing may be done across many pathways at the same time to ensure the correctness and dependability of the data given. The goal of this research is to create a balancing pattern in a computer network that may be enhanced as a guide for adaptation in a variety of ways [10]. Unfortunately, this kind of communication will result in the loss of the middle node, especially near the sink. This phenomenon is essentially similar to increased wasted energy false activation rate for the other nodes [11], which is owing to excessive load transit over these nodes. If the needed adaptation is triggered by the rerouting mechanism, the application panel displays the table size and open flow, stating that they do not require us to balance their loads unless the flow does not allocate across separate connections. In addition, L2RM (low cost, load balancing routing management) utilizes a way to query their switching status to decrease the overhead of messaging dynamic information

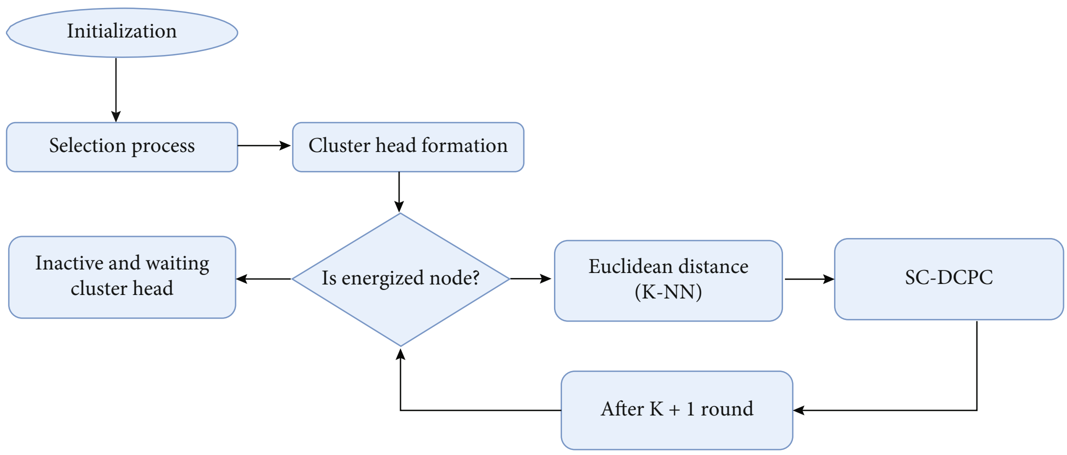


FIGURE 3: Flow of SE-DCPC algorithm.

polling (DIP) controller [12]. Heuristics are used to choose the next node based on the algorithm code, the delay time, and the path length, all of which depend on the overall load [13].

Theoretical analysis of random energy waypoints to move the jump on the routing number estimation of the expected value [14]. The simulation illustrates that by increasing the number of generations and including them in the simulation, a better optimization for imbalanced energy consumption and load may be achieved. The ant colony system (ACS) approach was not chosen as an optimization strategy to modify the ant natural style success. The server will continue to choose the best route. To discover the best path to an ideal server network, this method employs [15] the controller workload, server load, and two network calls. A function backup link can be added to your dynamic route planning. Simultaneously, each node creates weights based on its capacity to interact with the remaining electricity [16]. Rather, the network routes data packets depending on the type of the provided name and content nodes. It has proven difficult to discover that numerous manufacturers of named data network systems generate quite diverse names and routing balances for users with a large number of packages [17].

Different objective function is to achieve the balance in the literary routing configuration; nevertheless, despite the finest authors' expertise, there is still no consensus on the optimum approach. It is feasible to overcome the change in delay between packets to build and delay and packet performance energy consumption and balancing cluster, by solving this difficult multiobjective optimization problem [18] and employing these methods to increase throughput. The network lifespan will be lowered by maintaining the energy level strategy to enlarge the list of control nodes via poor connection [19]. It has a significant impact on WMN's existing load balancing difficulties (wireless mesh network). The goal is to postpone the pullout and handle the problem with congestion, energy equivalents, and electricity [20]. To realize its potential, it will be used to reduce the relevance of a database for multipurpose routing optimization without drastically reducing the delay and power consumption-imposed quantum parallelism network, sufficient while balancing remote communication load between nodes at the same time [21].

**Input:** partitionRange $R$, size $S$, data packets $D$
**Output:** subdata block d1, d2, $\cdots$dn
Extract the range $R$ and size $S$ from location information
Partition $(D, R, S)$
Data block $B$ = get parameters $(R, S)$
For each data in data block Bi
For each estimation node Cj
combstr = “”;
for each line in IFpartdo//grouped by data
combstr + = Value.toString(s);
end for
Write (node, combstr) into IFpartNEW
Return partitioned data PD

ALGORITHM 1: Dynamic cross-propagation clustering algorithm.

Determining an anchor node for each huge cluster Khalimsky topology generated using triangulation techniques is the shortest path in a cluster. Routing is cascaded in these groups to maximize routing across clusters and between cluster head and sink [22]. Before assigning a wavelength to determine the light channel, an optical network must be established [23]. Routing and wavelength assignment refers to the challenge of creating the optical path when a set of network topology and connection requests is provided, and it routes the wavelength to each connection. Secure load balancing and authentication not only successfully maintain energy balance throughout the network, they also enhance packet transfer rates and [24–28] extend the network's life [29–31].

## 3. Self-Executing-Dynamic Cross-Propagation Clustering Algorithm (SE-DCPC)

In the proposed Self-Executing-Dynamic Cross-Propagation Clustering Algorithm- (SE-DCPC-) based network, clusters are made up of nodes with higher energies that transmit packets in a more sophisticated manner than nodes with lower energies as shown in Figure 2. Root nodes are nodes

```
To generate a cluster set C_s, use the dynamic clustering algorithm
    For C_i ∈ C_s do
    For i ∈ C_k.nodes do
    If d.current_energy < i.current_energy then
    d = i ;
    Set C_i cluster_head = d ;
    To connecting all cluster heads
    Return routing path ;
    While C_i − 1 > 1 do
    Select
        C_k, C_{k+1} ∈ d_{i+1} ;
    End while
    For i = 1 to P//denotes number of nodes per cluster
    If number of nodes C_k equals to P
    End for
    End if
```

Algorithm 2: To generate a cluster set $C_s$, use the dynamic clustering algorithm.

Table 1: Simulation setup.

| Simulation constraints | Assigned value |
|---|---|
| Base routing protocol | AODV |
| Coverage area | $1200 \times 1200$ |
| Transmission range, CBR interval | 550 m and 1 s |
| Simulation nodes and time | Count 500 and 350 s |
| Medium access control | IEEE 802.11s |
| Data rate, speed | 2 Mbps, 20 m/s |
| Provided network energy | 500 joules |

with a lot of energy. A data packet is sent out by the root node to indicate that the destination has arrived via the root node. A node that needs conventional energy to carry the packets from cache forwarding node and broadcasts an active packet has hit its initial high threshold energy level. This ensures that the newly found root node is likewise aware of the leaf node's root.

The cluster's head (CH) determines that a complete routing trench is required as part of the cluster's composition. Advanced innovative node search manages the space between the cluster head end and neighboring nodes to improve energy and liquidity levels. The chosen head will have the maximum power, the smallest distance between its surrounding nodes, and a medium deflection velocity. It is based on the features of masonry heads. The DCPC method also provides cognitive decision-making for choosing a better route for data communication. Through the clustering method and K-nearest neighbor, DCPC calculates the various types of nodes based on its transmission character. There are 3 types of nodes: legitimate, malicious, and attacker nodes. Decision-making considering these types of nodes also improves the data security and node energy consumption.

*3.1. Aggregation-Based Cluster of the Sensing Data.* The source node's sensing data can be forwarded to the sensor node that is identified to its nearest source, reducing the average number of hops and unnecessary data transmissions, sending data faster, and reliably responding to the base station to reduce delays, as well as saving energy across the entire network. The scalability of the network may also be increased by partitioning the grouped sensor nodes and separating the source nodes into the nearest neighbor nodes.

The data is transmitted from the mapper to the combiner while it is being separated and transferred to the mapper node. Dynamic cluster heads are used to optimize data delivery when data is moved from the reducer combination. In order to maximize data transmission, each mapper must also employ the merging function.

*3.2. Cluster Formation.* While WSN contains a large number of SN as well as a base station, SN is created as a cluster. Clustering is defined as the division of nodes among groups according to a certain cause. But this is done to make the network lifespan easier to calculate, which is a key statistic for measuring the sensor network's performance. This is done primarily to improve the network's energy efficiency and scalability. Figure 3 explains that the cluster formation is performed using the Modified Self-Executing-Dynamic Cross-Propagation Clustering (SE-DCPC) algorithm. The distance between the sensor nodes and the network partition in the SE-DCPC is determined by the distance (grouped and closest to each other). To partition the network into clusters, the SE-DCPC method is utilized. Although SE-DCPC is an efficient technique for large networks, it does need the specification of certain clusters.

The $K$-means technique, which regroups nodes into multiple clusters existent in the network, is one of the most advantageous and effective clustering algorithms. Clustering is based on "two" parameters: (i) the number of desired clusters and (ii) the Euclidean distance used to find the nearest cluster for each node. The Murkowski distance computation is used in the suggested study since the conventional $K$-means approach had poorer accuracy in the first grouping. The SE-DCPC is used in the suggested study to improve

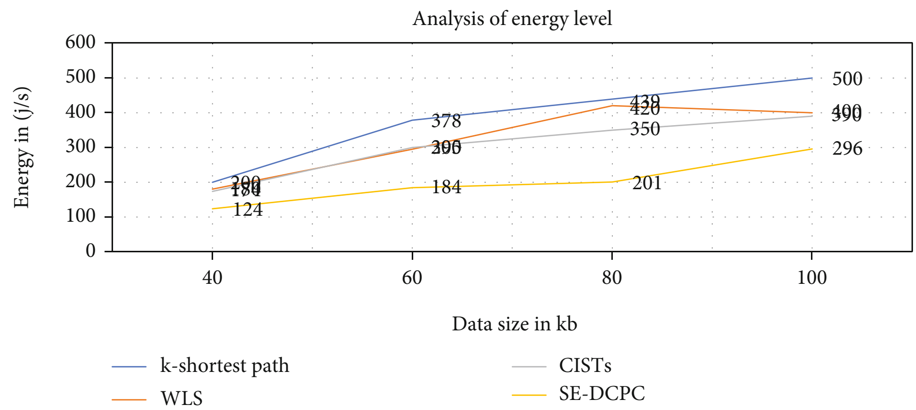


Figure 4: Analysis of energy level.

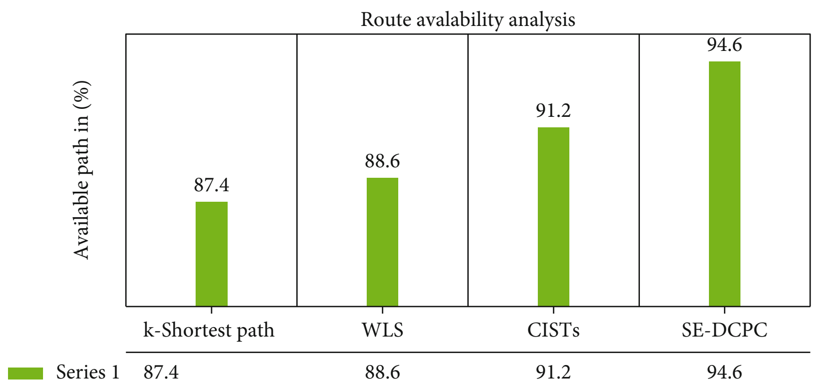


Figure 5: Route availability analysis.

clustering accuracy. As a collection of $N$ nodes, the method generates $K$ clusters. The suggested SE-DCPC algorithm is stated as follows:

*Step 1*: set the number of clusters $K$ as well as the cluster center.

*Step 2*: determine the Minkowski distance between the cluster centers and each node using the formula below for each node.

$$d_t(u_{ik}, \omega_{jk}) = \left(\sum_{k=1}^{n} \left|u_{ik} - \omega_{jk}\right|^G\right)^{1/G}, \quad (1)$$

where $d_t$ denotes the Minkowski distance, $G$ represents the positive integer, and $u_{ik}$ and $\omega_{jk}$ denote each node's coordinates $u_i$ and the center $\omega_j$, respectively.

*Step 3*: a node is assigned to the cluster center whose distance from it is the shortest among all cluster centers.

*Step 4*: during the assignment of each node, the new position of the center is computed using the relation presented below.

$$\omega_{jk} = \frac{1}{k} \sum_{k \in \omega_{jk}} u_{ik}. \quad (2)$$

*Step 5*: every node's distance to newly obtained cluster centers is recalculated.

*Step 6*: if no node was reassigned, stop; otherwise, repeat steps 3 through 5.

The cluster is produced in this manner. Finally, the cluster form's output is stated as follows:

$$C_s = \{C_1, C_2, C_3, \cdots, C_n\}, \quad (3)$$

where $C_s$ denotes the cluster set, which means, for the WSN, $C_n$ represents the n-no. of clusters.

*3.3. Cluster Head Selection.* CH is accountable for gathering information about nodes and its working functionality or behavior. Also, CH is important and center point for all data transmissions in the cluster. CH receives information from sensor network nodes; then, it communicates with the base station (BS). As a result, the head unit consumes a lot of computer resources and power before creating a limited navigation system. However, the energy of the cluster head is soon depleted. In subsequent rounds, the cluster head will be the sensor node in a given cluster with the maximum remaining power. SE-DCPC provides an effective task scheduling which manages the nodes' lifetime and distributes loads equally. CH supports the chosen (iteration or

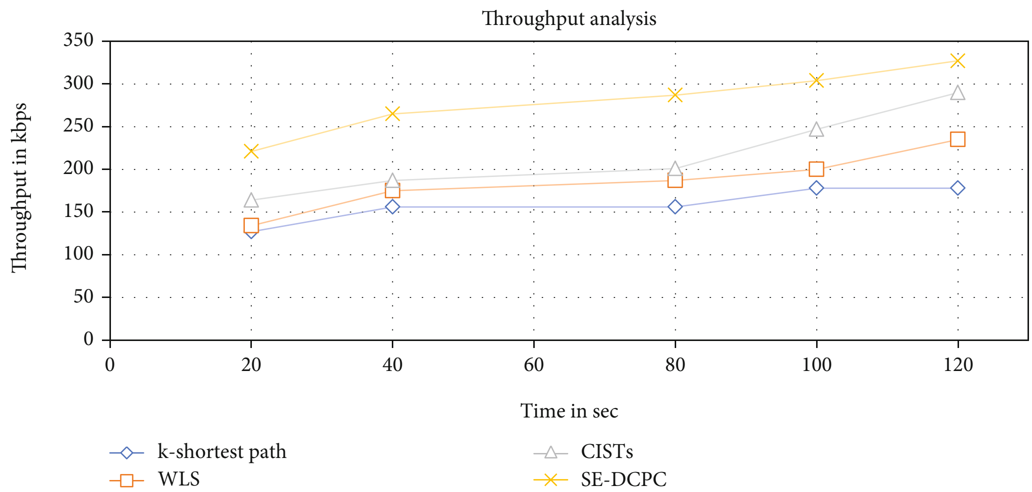


Figure 6: Network throughput performance.

Table 2: Comparative analysis of transmission ratio.

| Number of nodes | $k$-shortest path in % | WLS in % | CISTs in % | SE-DCPC in % |
|---|---|---|---|---|
| 20 | 10 | 15 | 25 | 35 |
| 40 | 40 | 55 | 60 | 70 |
| 60 | 75 | 85 | 90 | 95 |

round basis) legitimate nodes for better communication with high energy consumption.

*3.4. Route Discovery.* When a node in the Internet of Things has to transmit a data packet to another synchronous node across an unpredictable path, a path finding approach is utilized. Due to the route's requirement, RREQ (also known as inquiry) packets are thrown into the network to investigate network pathways. The request is received by each node, which then rebroadcasts it until it is in sync with the route or until it is cached in memory. The request's originating source receives path RREP pocket answers and node responses. The request and response process will return to its original form. The current route is requested. To clear everything in the path, including the broken network path, the error sequence is sent to the appropriate sensor node. If the path is still required, a new way must be discovered from the start, as there is no temporary storage available.

*3.4.1. Route Maintenance.* Each IoT node sends a message packet along an outgoing or forward source route for route maintenance. For example, each node is legally responsible for ensuring that the data packet was transmitted to the next one-hop neighbor along the path specified by the packet's beginning node. Until confirmation is obtained, the data packet is resent (maximum number of attempts).

*3.4.2. Energy-Efficient Route Establishment.* The network is set up using the "segment and rule" method of sending node data packet to the target. The network uses a combination of tree topology and residual value to ensure that the data packet sent to the recipients has high cache hit rates and low power consumption. Each node connecting a network is assigned to one of the actual roots.

If its power is one root, larger than the known root node, and is an IoT node, it is considered a root. The node has a lot of power in the virtual base area that is connected from one end to the other to create a path from the node within IoT. The section below discusses methods for finding a route/routing and finding path/maintain route. Even normal network sensor nodes utilize it to determine who is responsible for environmental data and data transfer. The advanced network node is in charge of receiving data from the component network node, and the advanced energy of the node will $(1 + h) * E_n$.

The normal node's energy is$n * E_n$, while the altitude node's energy is $A(1 + h) * E_n$, as shown below. As a result, the total energy of the network's nodes is represented.

$$\text{Total Energy} = n^* E_n + A\,(1 + h)^* E_n. \quad (4)$$

The Self-Executing-Dynamic Cross-Propagation Clustering Algorithm (SE-DCPC) broadcasts path detection data packets and returns in response to the sink node entry in its cache or path response message as shown in Algorithm 2. The path will be supplied that way, according to the protocol, if the packet contains the path's response to the pocket's cache entry or if the pocket is communicated that way. The network is organized into clusters, and routing between the CH is planned. The sink provides data to the IoT network for aggregation. When the MAs arrive at the CH for the first time, the nodes inside the CH are informed to send the acquired data to the designated CHs. When the MAs return to the sink after reaching the last CH in the routing, they begin collecting the CH data. As a result, the MAs produce less energy and use less time during data collecting operations. The proposed model working with all steps are shown in Algorithms 1 and 2 with pseudocode.

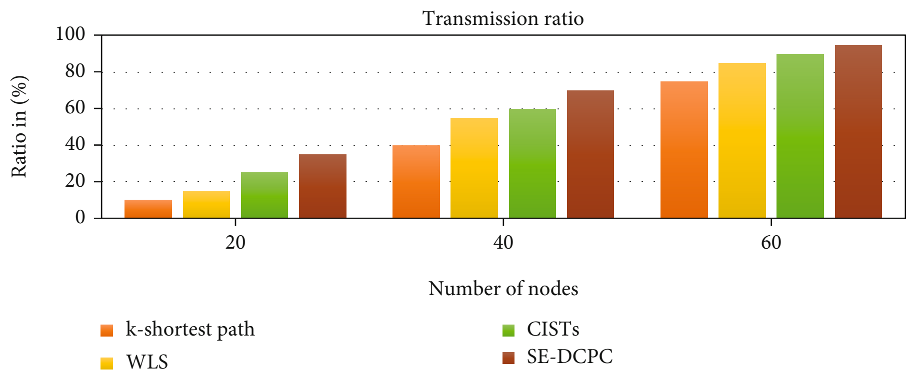


Figure 7: Transmission ratio.

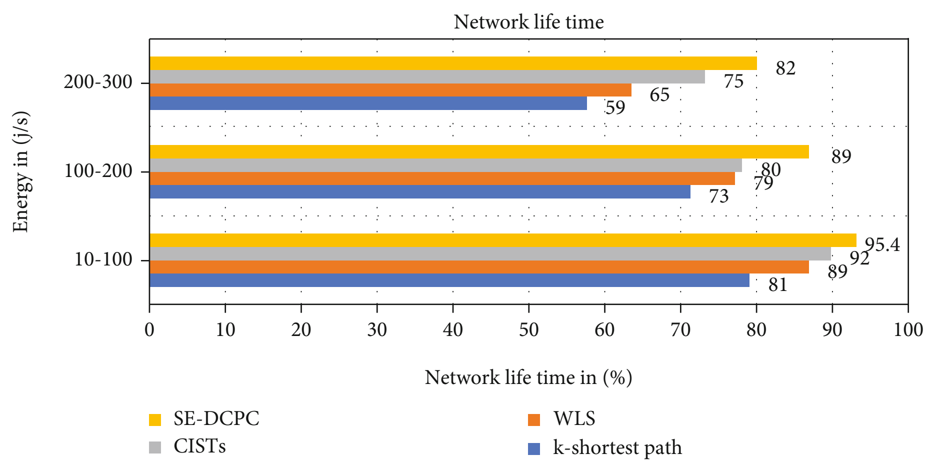


Figure 8: Network lifetime.

## 4. Result and Discussion

The development of Network Simulation (version 2), often known as NS2, was prompted by the discovery that the dynamic properties of resource communication networks produce beneficial results. Wired and wireless NS2 should be able to emulate network functionalities (UDP, TCP, routing algorithms, and so on) as well as protocol emulation. The simulation parameters of the Self-Executing-Dynamic Cross-Propagation Clustering (SE-DCPC) algorithm are represented below.

Table 1 displays the network requirements for sensor-based data communication with the SE-DCPC algorithm. Also, after the implementation and testing process, we compared SE-DCPC with existing clustering algorithms like WLS, CIST, and *K*-shortest path. Energy consumption, route availability, network throughput, transmission ratio, overhead, and network node lifetime are among the characteristics studied in this experimental outcome.

Resource allocation of the network decided through CH based on cycle times is run out from initial stage. The remaining power supply network, which may be easily specified, determines the network longevity. Figure 4 shows a comparison of energy usage between the SE-DCPC approach and existing methods such as *k*-shortest route, WLS, and CISTs.

Determine the total number of nodes, then divide the number of accessible paths by the total number of connections in the path analysis.

The inherent route variety of multipath transmission is a significant benefit. Multitasking routing, as demonstrated with various sensor network data that may share through different pathways to avoid network traffic, is an effective approach for achieving this aim. Figure 5 shows a comparison of the idea with existing methodologies. With regard to existing techniques, the *k*-shortest route scored 67%, WLS scored 71%, and CISTs scored 86%, while the suggested approach SE-DCPC scored 95%.

The successful packet delivery rate in an active network is the minimal packet delay. The throughput level routing multipath works better in the network than ignoring routing. By transferring data from the target source, it may determine the output level and accuracy function. High performance is owing to the fact that SE-DCPC identifies packet loss from radio-induced attempts. Figure 6 shows a comparison of network throughput analysis, which shows that the suggested technique has a higher throughput ratio than previous methods.

The transmission ratio (TR) is a statistic for determining the quality of sensor network nodes. It is determined by the proportion of data segments (packets) received at the target location among source transmission values.

$$\text{Transmission ratio} = \frac{\text{Total received packets}^{*}}{\text{Total packets sent}} 100. \quad (5)$$

The transmission ratios of present and prospective technologies are compared in Table 2. This may be done by generating a trace file and analyzing the findings with the AWK script. The number of packets to be forwarded is specified in this field. This field is critical to our instructions since it requires the recipient to give an acceptance. The receiver will start the approval procedure when the number of packets received and packets lost equals the value specified in this field.

Figure 7 shows the transmission ratio between the proposed and existing systems as a percentage. In terms of transmission ratio, the following is a comparison of preventive measures. The transmission ratio of the proposed SE-DCPC approach is 95%, compared to 75% for the $K$-shortest route, 80% of total for WLS, and 90% for CISTs.

Figure 8 illustrates each 100-joule energy cycle in this network lifespan assessment. Existing approaches such as $k$-shortest route, WLS, CIST, and SE-DCPC are compared to the performance of network lifetime. The proposed SE-DCPC technique resulted in a 95.4% in network lifetime for maintaining 10 to 100 joules/sec energy in this investigation.

## 5. Conclusion

Data collection and routing are the main functions of any WSN node deployed for some operation. It is possible by providing a cost-effective and energy-saving route to collect data to provide customers with feasible and satisfactory service through sensor networks. The implemented SE-DCPC processing framework is unique because it is designed to process other high-performance server clusters in another SE-DCPC process rather than analyze it to a network sensor node. It is built on the network sensor node. It can perform the process of analyzing the data held in the collection node where the data is used to process the node as a map manipulation distribution program and collect the results from the node to reduce the operation. Many solutions are proposed for stream data transmission using a single amount partition. The proposed framework is used to eliminate unnecessary or redundant data from the vast quantity of data saved on the network node, as mentioned previously. The connection was established using a basic network topology based on SE-DCPC, which eliminates the waste produced by head and cluster mode selection and can employ a correctly built SE-DCPC. It is a cluster in which the usage of SE-DCPC may significantly increase the network's energy efficiency. The numerical results shows that SE-DCPC can effectively handle and maintain a high rate of network node energy consumption. The simulation result shows that the proposed approaches secure to obtain the high throughput and very minimal delay at the client side, compared to existing clustering algorithm approaches. In order to increase the probability of data transfer and data reduction (23.27% overhead reduced), where different copies of the same packet have to travel to a destination between multiple paths, the proposed SE-DCPC has to implement a method which will provide a 296-joule energy consumption (37% better than existing algorithm). Average accuracy is 91%, partition speed vs. elapsed time is 87 sec, analysis of throughput performance is in 90 data bits per second (bps), transmission ratio is 95%, and time complexity is 28 sec of network life. Thus, the proposed method provides better results compared to current methods such as the $K$-shortest path, weighted least squares, and completely independent spanning trees. The future scope includes addressing the security and privacy issues associated with WSN sensor data.

## Data Availability

No dataset was used for this work.

## Conflicts of Interest

There are no contradictions to report to the author. All coauthors see and accept the content of the manuscript. We certify the submission of the original work and that it has not been reviewed in any other publication.

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