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Novel Path Selector in Wireless Sensor Networks

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Abstract: - The Sensor Network is a system with a more number of sensor nodes that can maintain itself. The dispersed nodes sensor converses with one another. the node sensors gather data and transmit it to the base station. The deployment of the WSN spans many different applications, such secure military software, healthcare systems, and monitoring software. Numerous studies have concentrated on boosting communication efficiency and increasing network lifetime. In The conventional style Base station, sensor nodes, and cluster heads (CH) make up the typical WSN architecture. Traditional sensor node communication methods use a lot of energy, cause delays, and have poor network performance. To solve the system's restriction in its current state in this paper, it was suggested to implement Path selector a special node which contains all clusters information in WSN and their sensor energy information of all sensor nodes so that directly we can send data to destination sensor node fast without any delay, energy consumption. There by we can improve packet delivery ratio, throughput decrease delay.

Keywords: Path selector, Wireless sensor network, delay, throughput, Energy Performance

I. INTRODUCTION

A Sensing system is a group of geographically dispersed sensor nodes used for collecting the environment's circumstances and sending the information gathered in a centralized fashion. The CPU, memory, communication bandwidth and energy of sender of each individual sensor device, also referred to as a "sensor node," are all finite resources. To increase network longevity and reduce resource management complexity currently present in WSNs, novel network topologies are needed [1]. The combination of Direct upload routing and multi-hop routing into a suggested Router with adaptive dual-mode energy efficiency [2]. an enhanced ant colony optimization-based routing technique for directing traffic between the main station and the cluster's heads [3]. Compared to the current system, the suggested joint routing and charging architecture better in terms of energy performance balance [4]

A wireless sensor network is composed of numerous, independent, flexible gadgets that collect facts about different environmental variables and send it to other gadgets for controlling and managing systems [5]. The sensor's wireless device may have a temperature, humidity, wetness, or pollution sensors. [6]. Wireless sensor networks (WSNs) are gaining popularity in both the business world thanks to smart devices made to check on a system's performance and in academic research as a prospective new area of study [7]. Due to the restricted battery capacity, WSNs typically consist of tiny devices called sensor nodes with minimal compute capabilities. The longevity and energy consumption of nodes are significant barriers that prevent their proper deployment because of their limited battery capacity. The widespread use of various energy-harvesting methods, including RF, solar, and wind methods [8].

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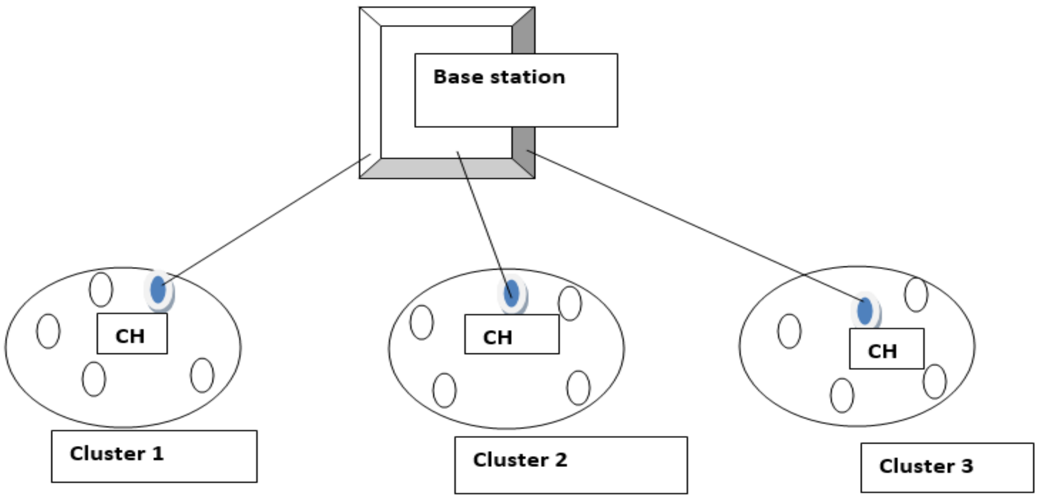


Fig 1 Architecture for wireless sensor networks

The network divides into an excessive number of clusters, each of which elects one CH. The sensor nodes are used in a variety of applications to gather environmental data. The Cluster heads transfers the sensor information to the B.S after receiving it from the sensor node.

II. Literature Review

An energy-conscious routing algorithm with an overhead reduction strategy was put forth by Fang Liu et al. [9]. This algorithm enables industrial services and optimum energy use in WSN. Data packet aggregation is a feature that the implementation of the software-defined multichip to manage the complexity in WSN. The suggested process compares shortest path approaches to extend the WSN network's life. Achieve better PDR quality as well. Although the performance of the suggested method beats that of the existing techniques. But in WSN, a novel innovation algorithm is crucial to lowering the neighbor advertisement packets and enhancing network longevity.

For effective clustering in WSN, Gajendran Malshetty et al. [10] presented a load-based self-organize approach. In WSN, the LBSO method used three distinct phases. The primary task involved choosing the Cluster Head, and in next involved choosing among the sensor node clusters. The third stage is then followed by the rotational phase-based reselection of the cluster head. Yet, the network's efficiency and network development both increased. Unfortunately, the network performance is poor due to a variety placement of base stations and dead nodes

Nelofar Aslam suggested a novel logical data transmission using a grouping and strengthening method. et al. [11]. the proposed approach is also described as clustering and as an answer that minimizes both energy use and network instability The WSN node's architecture incorporates the portable charging system . The suggested strategy enhances the functionality of the network by drawing its inspiration from an objective function. However, C-deployment SARSA's in WSN led to an improvement in performance. However, the WSN does not have a RWSN with a proper deployment and recharge schema.

W. Heinzelman and colleagues [12] suggested a procedure that is flexible. In essence, this protocol acts as a way of sending information to the WSN’s. This protocol is used to transmit the data to every wireless sensor network node. Data can be easily and rapidly acquired by other nodes or users with the use of this protocol.

A ground-breaking sending protocol is called Efficient Node Stable Routing Sathyasri et al.13] suggested. Less energy is saved using this method. Considerations for selecting a dependable mobile node include remaining strength, the number of hop necessary, and the calibre of the links that lead there. Because a reliable node is utilised to route the data, it is known as stable routing. Its other names include conserving protocol and energy protocol.

Katayoun Sohrabi et al. suggested sequential assignment routing as a component of the multi-hop routing system. This protocol combines the methods for single-winner and multiple-winner elections to facilitate cooperative and uninterrupted data flow between the starting and concluding nodes. This strategy is highly effective as it utilizes a network of nodes that often switch their operational status, together with nodes that adaptively adjust to different carrier frequencies.

To make WSNs last longer, Muhammad Adil et al.[15] suggested a load balancing routing design that uses minimal energy With an effective hybrid routing method, the Interactive Protocol for Clustered Based Static Routing (ICBSRP) was established. The Hierarchy of Low-Energy Adaptive Clusters Routing with On-Demand Ad-Hoc Distance Vector were combined to create the suggested protocol. Create a WSN using a range of clusters and a choice of CHs according to this procedure. Generally speaking, the DCBSRP protocol behaves as a normal node and does not broadcast at most chosen cluster heads device's from the early cycles. The proposed protocol, however, significantly increased network longevity.

III. Proposed Methodology

3.1 Problem Statement

In Wireless sensor networks when one Clustered sensor node want to communicate in a different cluster sensor nodes, they are passing to so many middle nodes and finally reaching to destination sensor node there by delay will be more, packet delivery ratio is less,throughtput is also less. Because of the very low security on intermediate nodes, several forms of attacks, such as listening in on a network furthermore, attacks by "man-in-the-middle", are feasible. Additionally, data packets are buffered at nodes due to the sluggish transmission speed.

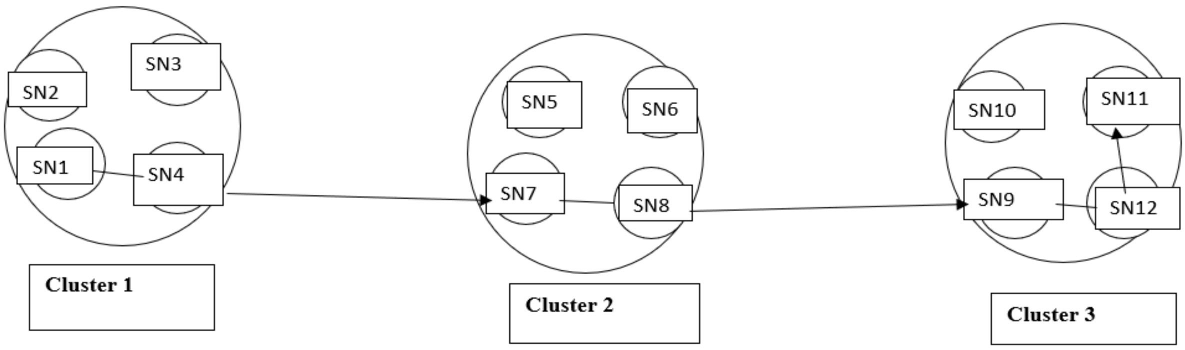


Figure 2 sensor node communication process

3.2 Path selector

This paper proposes advanced path selector routing between sensor node in one cluster to sensor node in other cluster without contacting intermediate sensor node by using the path selector cloud can directly contact to destination sensor node.PS (Path selector) is a special device which contains all cluster information along with their sensor node energies.

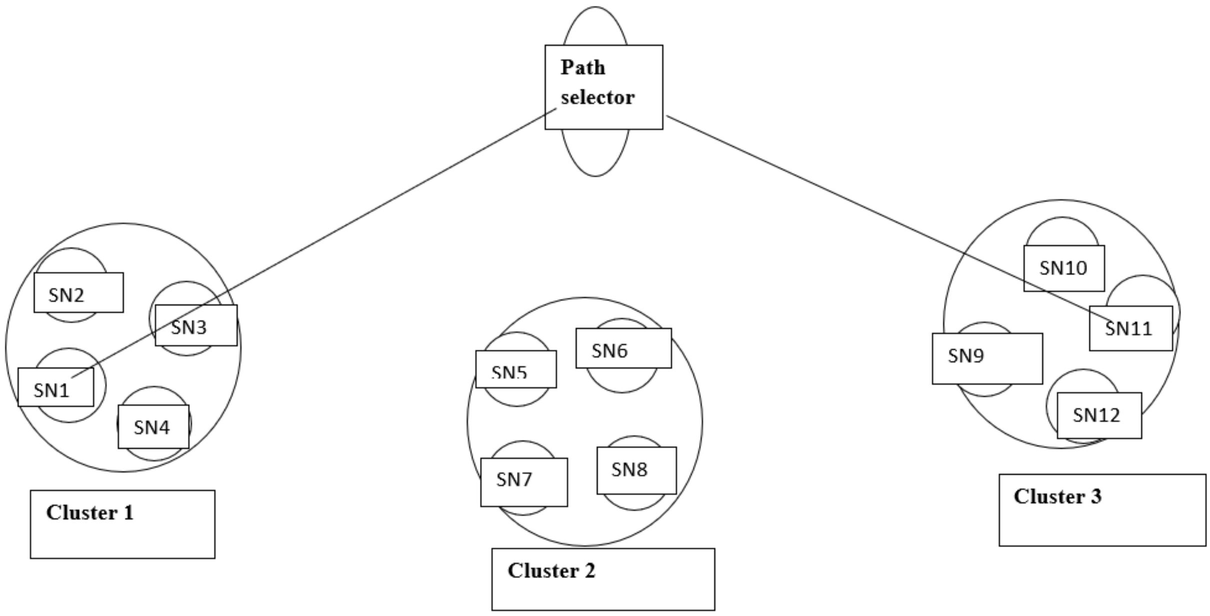


Figure 3 Path selector communication process

<u>Path selector internal view</u>

<u>Table 1</u>

Cluster1	**Energy(J)** Sensor node 1-30 Sensor node 2-34 Sensor node 3-31 Sensor node 4-26
Cluster 2	**Energy(J)** Sensor node 5-27 Sensor node 6-32 Sensor node 7-35 Sensor node 8-28
Cluster 3	**Energy(J)** Sensor node 9-29 Sensor node 10-40 Sensor node 11-33 Sensor node 12-29

Algorithm Name: Optimize Path Selector.

Input: Network nodes that consider energy and distance

Output: Path optimization

1. Start process
2. Snreq packet is send from source node to path selector a middleware node.
3. Path selector check internal view table and finds destination cluster followed by their sensor node and its energy.
4. If destination sensor node has efficient energy it will receive packet from Path selector.
5. Path selector maintains all sensor node information by SSUM and TTL values.

6. If path selector find destination sensor node has zero or less energy.
7. Path selector will Forword packet to neighbor node
8. Once destination sensor node receive energy, it will take packet from neighbor sensor node.
9. Path selector even remove unwanted data like noise etc. which is moving towards destination sensor node by fuzzy logic which is their path selector.
10. Path selector will effectively utilize bandwidth by fuzzy logic.
11. End.

IV. RESULT ANALYSIS

The sophisticated algorithm path selector technique uses network simulation 2.35 version for implementation. The outcomes of the empirical simulation demonstrate how well the Path selection performs during data transfer. The comparison findings are discussed in the sections that follow. There are various different routes one can follow in a wireless sensor network to travel from one node to another. I'm utilizing the path selector cloud for my project. The path selector can be select the optimized path, between sensor node to sensor node by communication by middleware Path selector, If the destination sensor node in cluster has zero or less energy path selector handover to data to neighbor sensor node respectively. After destination node receive energy data will be collected from neighbor sensor node.

4.1 Situational Simulation

Table 1 gives the environment for network simulation for the empirical study.

S NO	Parameter in network	Value in network
i	Total Simulation Time	100
ii	Network Interface	Physical wireless
iii	Radio-Propagation	Double-Ray Ground
iv	Model of Antenna	omnidirectional Antenna
v	Interface Queue Type	Tail drop
vi	Routing Protocol	NOV
vii	Length of Queue	70
viii	Data Rate	4 M.B.
ix	Basic Rate	2 M.B.
x	Number of Systems	200
xi	Type of Channel	Wireless connection

Table 1: Experimental study

The Path selection simulation design's detailed network parameters are listed in Table 1. The deployment of WSN utilizes two-ray ground radio propagation, and proposed processes are assessed using performance criteria that are compared. Throughput, delay, energy use, and packet delivery ratio are indicators of the enhanced performance. The Path selector is compared to a number of earlier mechanisms, including Utilising Optimal A hybrid routing system is proposed that utilizes a protocol to implement dynamic cluster-based static routing, The Load Based Self Organise method for effective clustering in WSNs, and the Wireless Sensor Networks (WSN) The algorithm is called Energy-Efficient Load Balancing Ant Based Routing Algorithm (EBAR).Performance metrics are detailed in the section below.

4.2 Comparative Measure Evaluation

Performance metrics and The algorithm Energy-Efficient Load Balancing Ant Based Routing Algorithm (EBAR) mechanism are contrasted. The description of the equation and definition is provided below.

4.2.1 Packet Delivery Ratio (PDR)

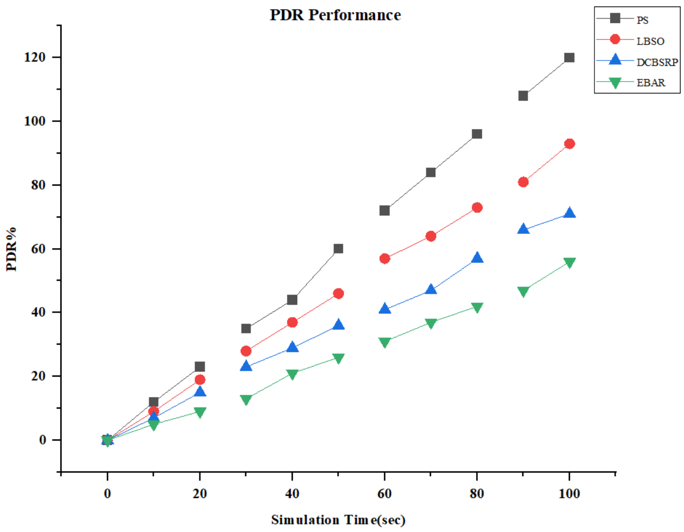
The packet loss rate is a metric that quantifies the ratio of transmitted packets to received packets. The equation is shown at the specified node (1).

$$PDR=\frac{\sum_{i=1}^{c} rpi}{\sum_{i=1}^{c} psi} \quad \ldots (1)$$

Table 2 demonstrates the performance comparison of the PDR of PAWSN.

Simulator Period	Performance in PDR			
	PS	**LBSO**	**DCBSRP**	**EBAR**
0	0	0	0	0
10	12	9	7	5
20	23	19	15	9
30	35	28	23	13
40	44	37	29	21
50	60	46	36	26
60	72	57	41	31
70	84	64	47	37
80	96	73	57	42
90	108	81	66	47
100	120	93	71	56

Look at the PDR performance graph in Figure 4 together with the corresponding simulation timings. Comparative findings between the suggested mechanism and the current mechanism are shown in Table 2. In comparison to the current LBSO, DCBSRP, and EBAR, PS has a higher packet delivery ratio, as seen in the simulation findings discussed above (Table 2). According to the experimental results, 10-sec PS has 12 Performance PDR: 9 in LBSO, 7 in DCBSRP, and 5 in EBAR. The PS PDR is 23 and the LBSO PDR is also if the simulation time is 20sec is 19, and DCBSRP PDR is 15 respectively. For all 10 sec of simulation time, the overall performance values are calculated and measured, and at 100 sec PS has 120 PDR, LBSO has 93, DCBSRP 71, EBAR 56 respectively.



4.2.2 Throughput

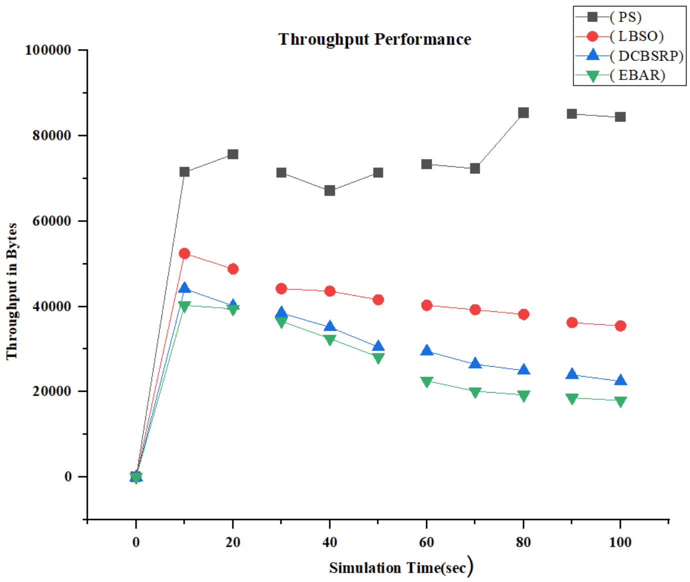
The overall amount of data transmitted to the target node, along with the time spent simulating those bytes. You can locate the formula.

$$\text{Throughput}=\sum_{i=1}^{n}\frac{Pi}{Time}*8 \text{ --------------- (2)}$$

Table 3 exemplifies the performance throughput in contrast outcomes for PS

Simulation Time	Throughput Performance			
	PS	**LBSO**	**DCBSRP**	**EBAR**
0	0	0	0	0
10	71502	52445	44151	40257
20	75651	48784	40144	39456
30	71351	44184	38456	36527
40	67094	43597	35147	32459
50	71351	41564	30488	28157
60	73352	40256	29486	22547
70	72341	39255	26457	20126
80	85374	38144	24985	19257
90	85110	36234	23955	18568
100	84380	35458	22457	17964

At simulation time 10, the PS throughput performance was 71502 (Table 3); in comparison, the load-based self-organization technique (LBSO) had a throughput of 52445, The throughput of the Protocol for dynamic cluster-based static routing of 44151, and the EBAR protocol had a throughput of 40257. (see in Table3).



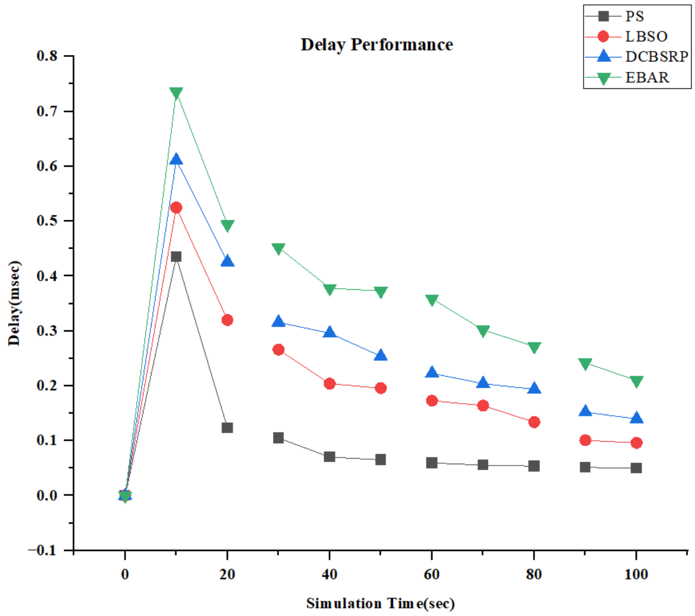
4.2.3 Delay

The time between a packet's sending and receiving

$$\text{Delay} = \sum_{i=1}^{n} \text{PKs} - \text{PKr} \qquad \text{... (3)}$$

Simulation Time	Delay Performance			
	PS	**LBSO**	**DCBSRP**	**EBAR**
0	0	0	0	0
10	0.4349	0.525	0.611	0.736

20	0.1232	0.320	0.426	0.494
30	0.105	0.266	0.316	0.452
40	0.0704	0.204	0.296	0.378
50	0.0654	0.196	0.254	0.373
60	0.0596	0.173	0.223	0.359
70	0.0557	0.164	0.204	0.302
80	0.0537	0.134	0.194	0.272
90	0.0516	0.101	0.152	0.242
100	0.0502	0.096	0.140	0.21



The comparison results of PAWSN's delayed performance are shown in Table 4. 10 simulation runs PS has 0.4349,LBSO has 0.525,DCBSRP has 0.611,EBAR has 0.736,Experimentally 20 simulation time PS has 0.1232,LBSO has 0.525 &DCBSRP has 0.426,EBAR has 0.494 overall PS has less delay when compared to other models.

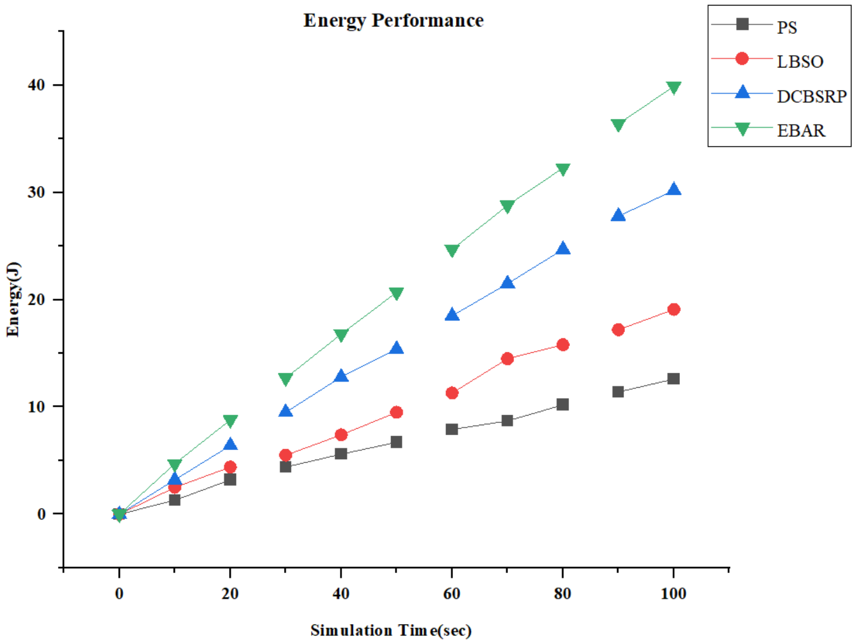
4.2.4 Use of energy

It indicates the Total energy amount consumed by the sensor nodes during data transfer and other network activities. The equation can be

$$\text{Energy} = \text{ISn1} + \sum_{i=1}^{n} \text{Mn} ------------ \text{Eq}(4)$$

Simulation Time	Energy Performance			
	PS	**LBSO**	**DCBSRP**	**EBAR**
0	0	0	0	0
10	1.1	2.4	3.3	4.6
20	2.3	4.5	5.5	8.7
30	3.2	5.6	8.6	11.8
40	4.4	7.5	11.9	15.9
50	5.2	9.6	14.5	20.7
60	6.8	11.4	17.6	23.7
70	8.9	14.6	20.6	27.8

80	10.2	15.8	24.7	32.3
90	11.4	17.2	27.8	36.4
100	12.6	19.1	30.2	39.9



The energy utilized by PS model for 10 simulation time 1.3 J,LBSO model 2.5 J,DCBSRP has utilized 3.2 J and EBAR 4.7 J respectively. Over all model PS model utilizes less energy.

V. CONCLUSION

The path sector is important for data transfer and choosing the best paths for sensor communication. The intermediate node Path selector additionally maintains the optimum path selection process. The path selector sends directly to the destination node without reaching all between nodes since it has information about all clusters in WSN and their sensor nodes in the form of their energies. Performance in terms of latency, throughput, PDR, and energy use were all improved by the suggested schema. However, when compared to several energy-efficient WSN techniques, the suggested PS has sophisticated performance. NS2 simulations are used for the implementation. The empirical findings showed that the suggested strategy significantly improves performance. In future we can extend machine learning based path selector for effective optimal routing in networks of wireless sensors.

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