A Framework for Energy Efficient Routing Protocol Using IPv6 in WSN

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Abstract-Wireless Sensor Network (WSN) is a group of nodes that are connected to each other by wireless connection. WSN work on the dynamic topology of the network because positions of nodes in the wireless network are changing continuously. The nodes in WSN are basically made up of small electronics device which are used for sensing, computing and transmitting the data. The nodes are run on the battery power during communication process. The battery consumption in WSN is very high due to high computation operations on it. In the recent years WSN grows as a highly popular research area and its practical applicability also increased to provide effective computation. By considering the network structure routing is categorized into two parts that are flat and hierarchical routing. In this proposed work cluster are made by Grey Wolf Optimization (GWO) on the basis of distance and energy parameters. The cluster head is also selected on the basis of GWO and IPv6 in three different metrics. At the end the performance evaluation of the proposed work, it is compared with the existing approach Low Energy Adaptive Clustering Hierarchy (LEACH) on the parameters of throughput, dead node, alive nodes and energy.

Index Terms-*WSN, IPv6 Leach. GWO Leach, Optimization, Energy, Efficient*

I. INTRODUCTION

WSNs are the application based networks which consist of a number of sensor nodes. WSN is a composition of hundreds of sensor devices which communicate with wireless networks with the help of limited energy consuming routing protocols. WSN share dense wireless networks of small, inexpensive, low-power, distributed autonomous sensors which accumulate and propagate the data related to physical environments for its monitoring and controlling with better accuracy from remote locations. Generally, it is assumed that each sensor in a network has certain constraints with respect to its energy source, power, memory and computing capabilities. The wireless connectivity is linked with the traditional wired networks and distributed nodes through gateways present in WSN.

WSN nodes have constrained battery limit. To build the life expectancy of WSN the usage of vitality in a productive way is a most normal issue. As the utilization of WSN are expanding step by step and has numerous applications. These applications require fast correspondence between sensor nodes. The main goal of this research is to provide the energy efficient routing protocol. These protocols are used to provide efficient data transfer between sensor and the sink. In the development of the protocol energy consumption is the main concern because the energy resources of sensor nodes are limited.

II. LITERATURE REVIEW

Shekle et al. proposed a congestion-aware routing protocol in the wireless sensor network. It works on the opportunistic theory and selects the optimized route. For scheduling on the network, it uses sleep mechanism. The proposed protocol reduced the congestion on the network and enhances the node's life and entire network life time. It also reduced the partitioning of the network. It mainly used to provide the appropriate path on the wireless network to the nodes [1]. Jumira et al**.** describe about a routing approach named as energy efficient beaconless geographic routing with energy supply (EBGRES). It provides source to sink loop free routing. It reduces the communication overhead without using neighbor. It can determine the duty cycle of the each node and estimates the budget for each node. Every node send data packet and then control the message. This technique works on the handshake and timer assignment function. In this paper, lower and upper bounds estimated hops are used to count the energy consumption [2].Luo, H. et al formulate the energy efficient data gathering algorithm. In this paper, a novel routing algorithm termed as adaptive fusion steiner tree (AFST) is designed. It gives an optimization on cost for data transmission and fusion. It also helps to evaluate the benefits and cost of data fusion along information routes. It adaptively adjusts weather fusion on a particular node. AFST performs better than existing algorithms like secure localization technique (SLT), shortest path routing tree (SPT) and minimum fusion steiner tree (MIFST). It has been concluded based on analytical and experimental results [3].

Chang, et al presented a routing protocol named as maximum energy cluster head (MECH). It has the properties of self-configuration and hierarchical tree. In several aspects, MECH has improved Low-Energy Adaptive Clustering Hierarchy

(LEACH). In MECH, depending upon the cluster members and their respective range the clusters are formed. To reduce the distance of the cluster-head to the base station a hierarchical tree routing method is also proposed in this protocol [4].

Zhang et al. define a novel approach based on geographic routing called as Energy-Efficient Geographic Routing (EEGR). In this, geographical information and power characteristics are used for forward decision making. It is a loop-free protocol and based on hop count for sensor to sink packet delivery. This paper analyzed the energy dissipation and energy consumption. The simulation results of this paper show that EEGR provides better results by using the local information [5].

Wu, Shibo et al. presented the geographical power efficient routing (GPER) for wireless sensor network. In this routing process, each node is able to make local decision based on how far to transmit the data. By establishes a sub-destination in its maximum radio range, it works in very power efficient and scalable way. The node, however, may decide to relay the packet to this sub-destination through an intermediary node, if it preserve the power. The simulation result of this paper shows that it saves the energy and provides more efficient results [6].

Agrawal, Deepika, et al. introduced an unequal clustering algorithm which is based on Fuzzy rule to enhance the lifetime of the wireless sensor network in this paper. It balanced the energy consumption by making the unequal clusters. Cluster heads are selected by using the fuzzy logic. Density, energy and base station distance are the input variables of the network. Rank and competition radius are the outputs of the fuzzy system. The performance of the proposed algorithm is compared with existing protocols and found that the proposed algorithm performs effectively in this work [7] .

Vinod et al**.** proposed work mainly focuses on the routing process in sensor networks that is a challenging task in wireless network. This paper summarize the research result of packet sending in WSN and describe the classification on the basis of six main categories, namely QoS, Network Flow, Data Aggregation, Data Centric, Hierarchical and Location Based [8].

Kirubakaran et al. IW- MAC (invite and wait) protocol is proposed to provide efficient wireless sensor networks. This protocol is used to provide the efficient use of battery power by sensor nodes. It transfers the minimum control packets and maximum data packet in the given time. Energy on the nodes is used to transfer the data and reduce the overhead of control packets and channel reservation. This approach is used to save the energy during the data transmission on the nodes [9].

Gowtham et al. proposed congestion control and packet recovery in cross-layer approach. It reduced the problem occurred by the traffic like congestion and contention on the data link layer and transport layer. This protocol recovers the missing packets by storing the copy of the data packets. To avoid the congestion on the network it assigns the priority to the nodes for transmitting data. On the basis of priority, the packets are transmitted to the next node. The packet which has the highest priority transmitted first and then next according to the assigned priority. The performance of the packet is tested on the simulator and gives effective results[10].

Swain et al. work on the diagnosis of fault in the wireless network and proposed a protocol for it named as Heterogeneous Fault Diagnosis Protocol. This protocol consists of three phases that are clustering phase, fault detection phase, and fault classification phase. This method detects the faulty nodes and classification is done by using probabilistic neural network protocol. The simulation result of the proposed method is tested on NS-2 simulator [11].

III. METHODOLOGY

This section of the paper explains the methodology of the work that is based on the wireless sensor network and Grey Wolf Optimization algorithm with LEACH. The LEACH algorithm is basically a media access control protocol which is used for clustering and routing in the wireless network. This algorithm is mainly used in this work to reduce the energy consumption to create and maintain the clusters in network.

A. Technique used

1) Step 1**-** Deploy the wireless sensor network.
2) Step 2**-** Make the cluster of nodes in WSN
3) Step 3**-** Use the distance and energy of the nodes.
4) Step 4**-** Check the distance from the sink node.
5) Step 5**-** Initialize the GWO and input the population as nodes.
6) Step 6**-** Set (NewCH/ OldCH) = **-** ∞
7) Step 7**-** After this compute the fitness functionand objective function.
8) Step 8**-** Update the value of cluster head θ^*
9) Step 9**-** Analyze the value of dead node, live node, throughput and energy of nodes.

IV. RESULTS AND DISCUSSION

In this section, the comparison of three algorithms GWO Leach, IPV6 Leach and Leach algorithm is performed. The comparison based on the number of rounds and the nodes in the cloud. The comparison is based of the following parameters Live Nodes, Dead Nodes, Throughput, Average residual Energy.

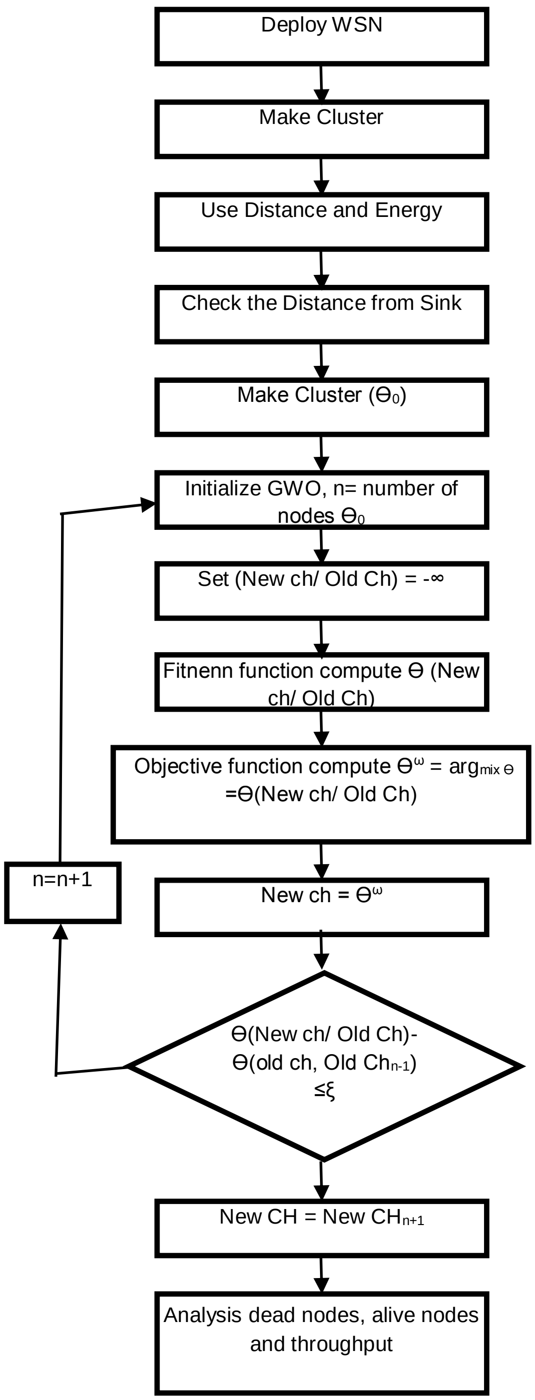

Table 1.1 Number of live nodes in GWO Leach, IPV6 Leach and Leach

Number of Rounds	Number of Live Nodes (GWO Leach)	Number of Live Nodes (IPV6 Leach)
100	200	199
200	198	194
300	187	180
400	178	170
500	164	152
600	155	142
700	148	135
800	143	136
900	139	128
1000	134	116

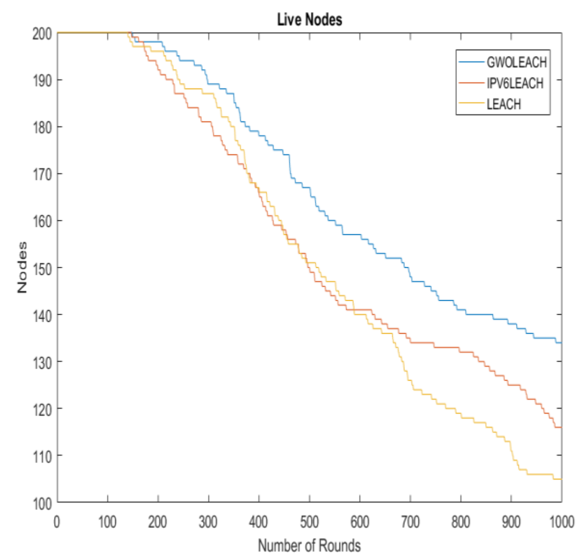

Fig 1.1 Number of live nodes in GWO Leach, IPV6 Leach and Leach

The above given Figure 1.1 represents the live nodes in the number of rounds on the three algorithms GWO Leach, IPV6 Leach and Leach. The round starts from the 0 to 1000 and the maximum number of live node is present in round 200 and changes according to the number of nodes changes.

Table 1.2 Number of Dead nodes in GWO Leach, IPV6 Leach and Leach

Number of Rounds	Number of Live Nodes (GWO Leach)	Number of Live Nodes (IPV6 Leach)
100	0	0
200	2	8
300	11	18
400	22	37
500	30	42

600	44	57
700	47	62
800	54	62
900	57	69
1000	62	82

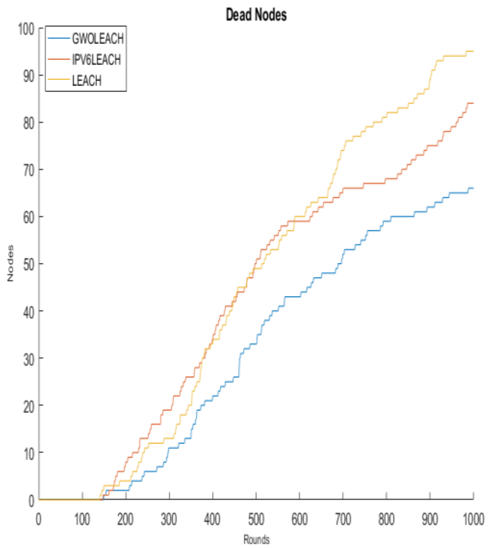

Fig.1.2 Number of Dead nodes in GWO Leach, IPV6 Leach and Leach

The above given Figure 1.2 represents the Dead nodes in the number of rounds on the three algorithms GWO Leach, IPV6 Leach and Leach. The round starts from the 0 to 1000 and the minimum number of dead node is present in round 150 and changes according to the number of nodes changes.

Table 1.3: Throughputs on GWO Leach, IPV6 Leach and Leach

Number of Rounds	***Number of Live Nodes (GWO Leach)***	***Number of Live Nodes (IPV6 Leach)***
100	0	0
200	2	8
300	11	18
400	22	37
500	30	42
600	44	57
700	47	62
800	54	62
900	57	69
1000	62	82

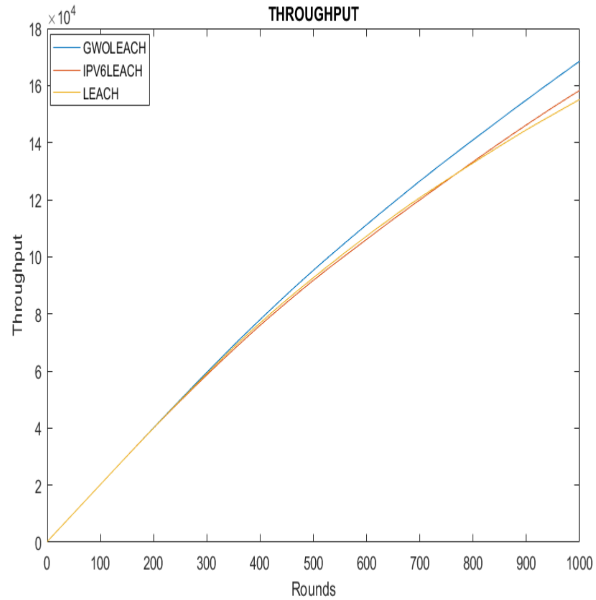

Fig 1.3 :Throughputs on GWO Leach, IPV6 Leach and Leach

The above given Figure 1.3 represents the throughput in the number of rounds on the two algorithms GWO Leach and IPV6 Leach. The throughput of the grey wolf optimization algorithm with Leach is better than the existing IPV6 and Leach.

Table 1.4: Average Residual Energy on GWO Leach, IPV6 Leach and Leach.

Number of Rounds	**Number of Live Nodes (GWO Leach)**	**Number of Live Nodes (IPV6 Leach)**
100	0	0
200	2	8
300	11	18
400	22	37
500	30	42
600	44	57
700	47	62
800	54	62
900	57	69
1000	62	82

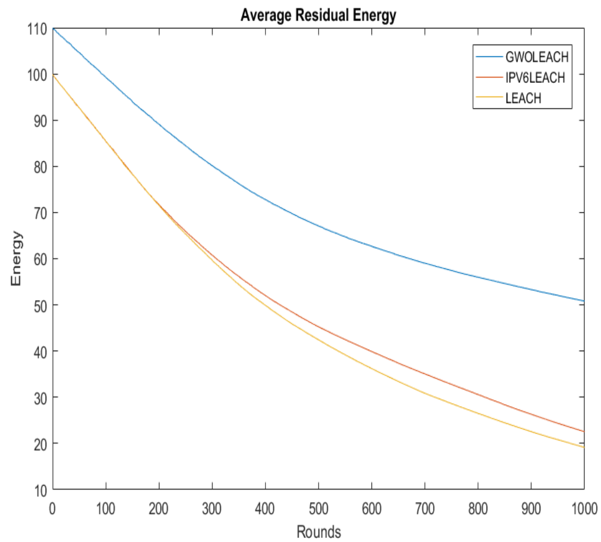

Fig 1.4 Average Residual Energy on GWO Leach, IPV6 Leach and Leach

The above given Figure 1.4 represents the average residual energy in the number of rounds on the two algorithms GWO Leach and IPV6 Leach. The average residual energy of the grey wolf optimization algorithm with Leach is better than the existing IPV6 and Leach.

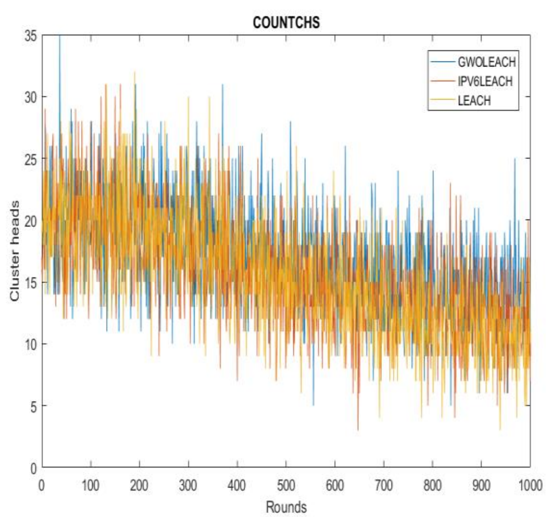

Fig 1.5 Cluster Heads according to rounds

The above given Figure 1.5 represents the cluster head in the number of rounds on the two algorithms GWO Leach, IPV6 Leach and Leach algorithm. The spike in the graph represents the changes in the algorithms according to the rounds.

V. CONCLUSION

In the proposed work GWO Leach, IPV6 LEACH and Leach algorithms are used to provide the optimal result in the nodes of WSN. GWO Leach work on the fitness level of the nodes and provide an effective solution. In this work GWO Leach is used for selection of cluster heads according to their size. It works on the alive nodes, dead nodes and the energy consumption by the nodes. The results depicts that the GWO Leach performs better than the existing approach IPV6 LEACH and Leach in every scenario. The proposed is enhanced by including more parameters to take the decision in cluster selection. The approaches based on the cluster head characteristics are important in energy efficient routing. The data delivery rate is enhanced by reducing the nodes failure. The scheduling mechanism is also used to achieve the effective performance and it is useful in the achievement of future goals.

VI. REFERENCES

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