Simulative Analysis of Various Attacks and Estimation of QoS in WSN through Genetic Algorithm

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Abstract: *In the rapid growth of communication, the machine also connected through each other. This growth reach entire human life as a network. A network which is for everyone from human to machine. The WSN play an integral part of the machine communication. The securities issue is also very concerning area for machine and reliability point of view to adopt in real time. The estimation of quality in WSN network reflect the communication reliability. The loss of energy proportional to the life time of network, as the communication need energy to communicate the node to node and node to base station. This energy in time domain degraded as ultimately loss of whole energy in certain time. The time solely depend upon the assigned energy and communication. The Various algorithm estimate the loss of energy during the communication. This research explored the estimation of various algorithm LEACH, EAMMH, SEP etc., for the account of dead node in time domain of communication. Further explore the estimation of QoS in WSN specially during the time of malicious attacks using certain detectable algorithm. As per the review and exploration in this area suggest that the genetic algorithm find best suited algorithm for the estimation.*

Key Word: QoS, WSN , Genetic Algorithm, machine communication , LEACH, SEP

I. Introduction

In recent years, rapid development of cellular compositions; wireless communication [1], micro sensor, and microprocessor hardware, low-power resources combined with significant advances in signal distribution, ad hoc network arrangement [2] and their rule, and computer availability have made more significant effect on the wireless sensor network.

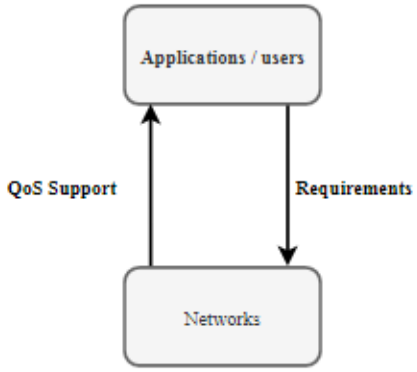

Fig. 1. A Network Model based on QoS

In general the WSN has very good capability to extend and update in real time. Various innovation and change as per the demand needed could be perform in real time system. The network has one or more base station as per the need of the network and the requirement of the data needed in real time. The QoS is much more concerning area that need to be explored in various research. The quality of services that is defining everything about the WSN existence is demonstrated through various simulative tools before implementation physically. QoS is the essential analysis in WSN network deployment. The QoS parameter [3] are basically provide the life time, energy degradation ratio, data loss and throughput of the network.

1.1 QOS Support in Traditional Data Networks

QoS [4] on wired networks can often be achieved by excessive provision of resources and / or traffic engineering. Wireless ad hoc networks can be considered as a standalone or offline wireless extension as a standalone system, it has a set of rules

to use, while as a standard wireless broadband extension. The QoS cycle process requires a means that is inadequate but not limited to resources, which enhances the possibility that resources can be verified when QoS signing requires storage. Without a QoS route, QoS signing may still work but the resource booking process may fail.

1.2 QOS Assessment WSN

Most occasion driven projects on WSNs are intelligent, deferring bigotry (continuous), strategic, and unending programming. It implies that occasion sensors are required to be basic to the accomplishment of the application. The reaction activities to the recognized occasion may should be scattered to sensors or activators as fast and dependably as could reasonably be expected. These sensors and activators may not be a similar arrangement of sensors that they have found out about the occasion. This information conveyance model incorporates numerous standard WSN applications that require occasion recognition and sign/following estimation, e.g., feeling and reacting to a crisis because of the synthetic arrival of the structure [5].

1.3 Parameter of QoS in WSN

Since wireless networks need to cooperate with underlying scenario, their standards can be relied upon to be integrated platform from other standard information systems. Along these lines, while WSNs advantage from most of QoS challenges from standard remote systems, their particular highlights present one of a kind difficulties [6].

a) Major resource constraints
b) Limited traffic
c) Data classification
d) Network Power
e) Power Balance
f) Scale
g) Multiple sinks
h) Multiple traffic types
i) Packet Sensitivity

1.4 Attacks on WSN

A. Internal Attack: This is mainly due to sensitive areas. These potentially compromised environments seek to disrupt or balance the network [7].

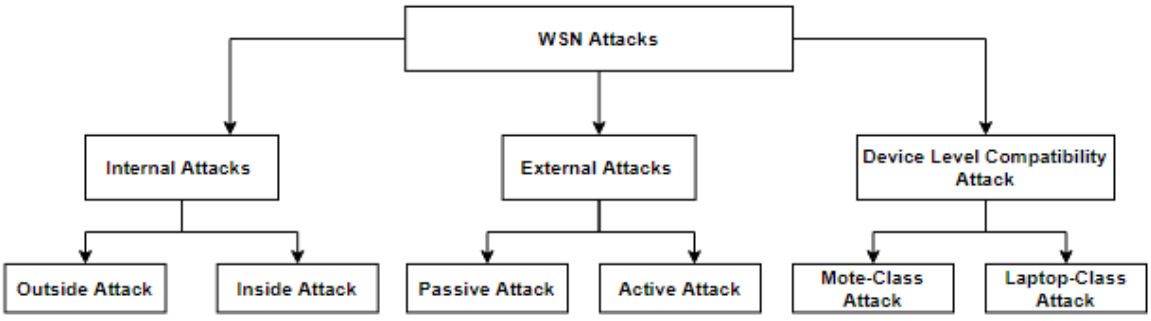

Fig. 2: Attack classifications in WSN

B. External Attack: In this attack, the attack area does not always play the authorized role of the SN. Depending on the behavior of the attackers, it can be divided into [7]:

• Passive Attack - creates the appearance of hacking or packing of packets planted within WSN. Includes only unauthorized listening to route packages.

Generally, encryption is the standard protection solution from this attack.

• Active attack - includes a few changes to the data stream or inappropriate streaming. Also, it results in disrupting network performance by informing DOS attacks, jamming attacks and hacking capabilities.

C. Device Attack: This type of attack is categorized depending on the device used to attack. An attacker can attack WSN either using a sensor device (Sensor Level) or a powerful laptop (Laptop Level). The enemy can seriously damage the system if you use the Laptop Class against high power, storage and battery life. In addition to the above classification, an attacker can use one or more of the following attack techniques.

II. Research Background

Ragavan and Ramasamy (2019), this paper concentrated on building up Adhoc topologies dependent on hereditary calculation. Unthinkable hunt is utilized over the set up unique topology in choosing the ideal course. Change administrator with elitism is utilized that ensures the ideal arrangement in directing. This paper proposed a structure steering convention with fundamental objectives, for example,

(i) A metaheuristic search utilizing hereditary calculation with change administrator to build up unique topology

(ii) Forbidden inquiry dependent on sending solid course parcels (FRRPs) for ideal course determination,

(iii) To improve the nature of administration parameters like dependability and vitality limitations by finding various advanced way. The reproduction results shows this proposed convention can accomplish better nature of administration because of ideal way choice procedure. The accomplished information conveyance proportion is constantly over the necessary one and it outflanks the customary conventions with dependable information transmission.

Rezaeipanah et al. (2019), in this paper, during the route of the route a networked approach was developed to reconstruct sensory integration, if needed. The proposed clustering was performed based on three objectives including reducing the distance between sites within the cluster, reducing the distance between cluster head (CH) candidate segments and sink node, and the appropriate online distribution of the locations within each cluster. Advanced analytical algorithms are used to make combinations. In addition, a genetic algorithm (GA) is used as a route algorithm.

Hamidouche et al. (2018), in this paper, they proposed hereditary calculation based methodologies for bunching and steering in WSNs. The goal of this instrument is to draw out lifetime of a sensor and increment the nature of administration. They perform broad reproductions of the proposed calculations and contrast the reenactment results and that of the current calculations. The outcomes exhibit that the proposed calculations outflank the current calculations as far as different execution measurements including vitality utilization and number of bundles got by the base station.

Ezdiani et al. (2017) introduced the design of a functional app quality assessment area (AQoS). The concept provides the discovery of a dynamic system capable of responding to dynamic changes of process requirements. The initial stages of organizational testing, taking into account the performance of the program and subsequent reactions to the required configuration of the WSN operating system, have shown encouraging results.

Farzana et al. (2017) in this paper, approved the process of using the routes in a user-friendly setup with QoS. In this protocol, the quality of the link and the delay in coordination are estimated for each of the locations. The quality of the connection is measured depending on the packet acceptance rate, the signal strength indicator, and the connection quality indicator.

Ali & Singh (2017) Wireless Sensor Networks (WSNs) consist of a few small sensor nodes; those are connected wirelessly to form a network. Data packets are transmitted from a source to a specific location through multiple central and secondary nodes, transmitting data packets to a neighboring sensor node. On the other hand, each sensor node participates simultaneously in data transmission. This indicates that each sensor node handles several data packets, which in time need to be transmitted depending on the availability of the channel. Depending on the system, data packets can be real-time or not real-time and therefore, direct delivery of data packets may be critical. In this paper, a QoS-aware protocol (QAP) is used that uses a packet configuration scheme for WSNs. Using this method, priority can be defined for each incoming data packet depending on delays, losses and other constraints. After analyzing and prioritizing data packets, planning is done on the basis of the packet priority. This system ensures the delivery of data packets as their primary focus on QoS development.

Malik (2017) this paper presents an improved subterranean insect based QoS-steering convention for cutting edge remote sensor organize (EAQHSeN). It is a divided QoS separator utilized for remote sensor systems with mixed media and scalar hub. They have utilized bio-roused course heuristics, and the primary component of the convention is their capacity to meet

the different QoS necessities required by the traffic produced by these locales. Course choice is taken freely to control traffic, scalar traffic and interactive media traffic, therefore expanding system execution and usage. The reproduction results show that the proposed EAQHSeN convention is more productive than the specially appointed on-request separation vector (AODV) convention and the dynamic insect based directing (EEABR) convention. The normal percent improvement in lingering quality is EAQHSeN over EEABR at around 4% which is an indication of life span.

Rao (2018) is a preparation method for introducing the proposed SMAC exchange window (Sensor MAC) based on a survey of mid-range behavior that affects intermediate access delays and jitter delays, in view of any given competitive mode. They find excessive delays in the expected intermediate reach reveal the strengths and weaknesses of conventional conflict resolution techniques. In addition, it is found that their delayed tendency for elasticity only results in limited improvements in central access performance because the uniform selection method results in greater jitter penalties and a conflict between reduced chance of collision and inactive listening time. To overcome this problem, and, in addition, a forward-thinking model for the distribution of front-line contours is proposed to minimize the aforementioned friction in the form of a slot design procedure. Lastly, a built-in dynamic variable-response window (SICA) method that includes a delay-ready optimization for conflict resolution, a counter-argument method and a measure for the number of opponents.

Rachedi and Benslimane (2016) tended to the effect of the security concern regarding vitality utilization, preparing the network for general traffic control for data in Wireless Sensor Networks (WSNs). They propose another arrangement dependent on multi-target streamlining utilizing hereditary calculation for security, QoS, and vitality effectiveness in WSNs.

III. Formulation of process

In this section, the performance of each classifier in terms of packet delivery rate [8], completion delays, and comparisons was compared. To better understand comparisons of results, we introduce these processes. Packet Delivery Rate - Displays the total number of print messages received by each subscriber, up to the total number of print messages generated by all the print media of events you subscribe to. The following formula can be calculated:

PDR = ((total loss) / total packets) * 100

End2End Delay - The packet delay on the network is the time it takes the packet to reach its destination after leaving the source [9].

Throughput –- An entry is a packet number that passes through a channel at a specific time point. This performance metric shows the total number of packets successfully delivered from destination to destination and can be enhanced by an increasing number of people [10].

Throughput=total packets/End2EndDelay.

IV. Simulation Results

The performance of each partition in terms of packet delivery, delay, and pass were compared. To better understand comparisons of results, we introduce these processes.

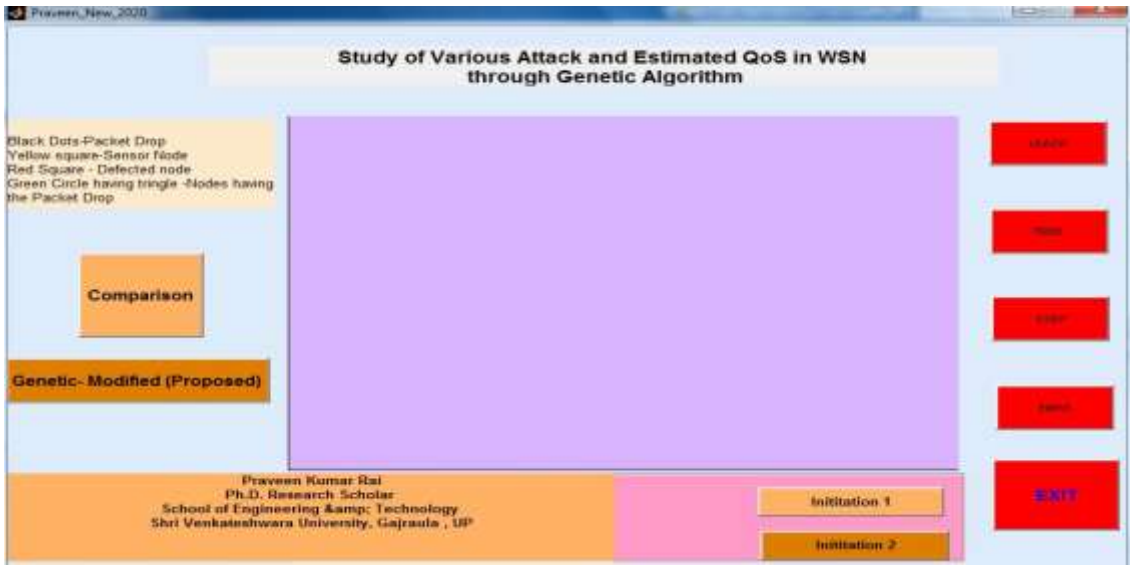

Fig 3: This is basic lay out construct in MATLAB

The above layout constructed in MATLAB 2013. This layout has several button namely LEACH, SEP , Comparison, Genetic etc.,. This provide existing working algorithm as well as proposed for estimation of WSN.

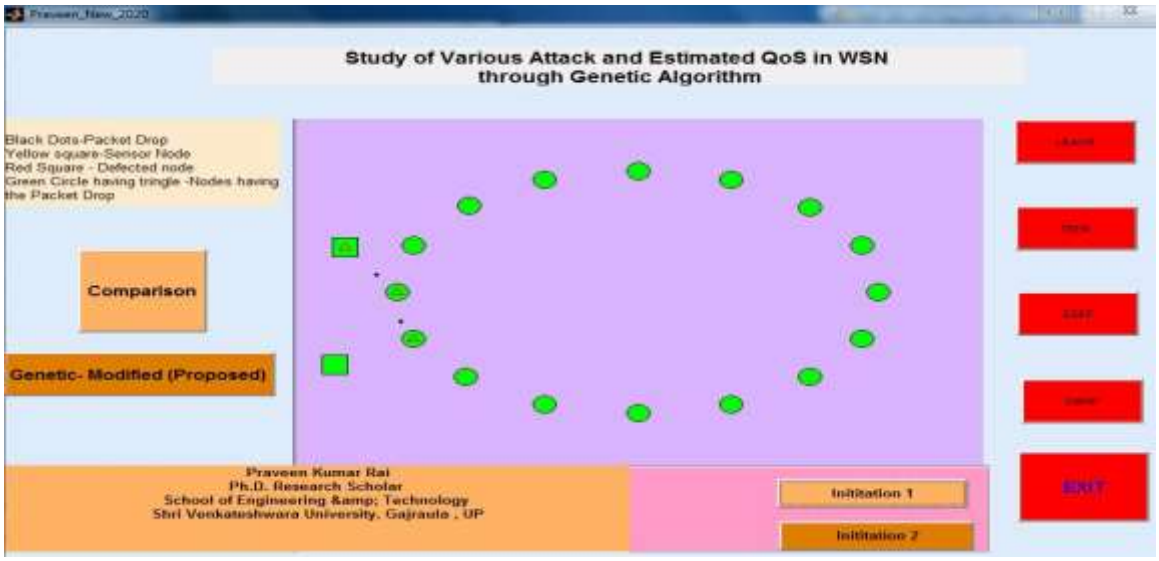

Fig 4: A communication started in network.

Further TEEN algorithm has been applied through MATLAB. The portion present the cluster and the circular point is the communication node. Beside the dark node is the local base station call cluster head.

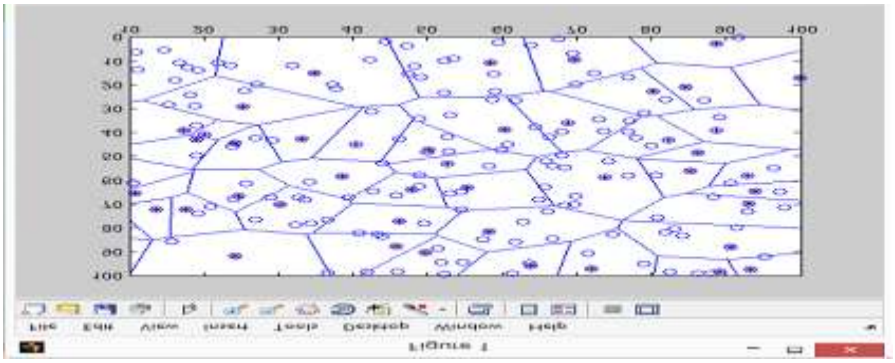

Fig 5: TEEN Clustering Protocol

After the end of communication the result has come out as below. The graph has been drawn in average energy and number of round of communication. TEEN is basically threshold sensitive energy-efficient sensor network protocol which used for optimizing use of energy for communication in WSN.

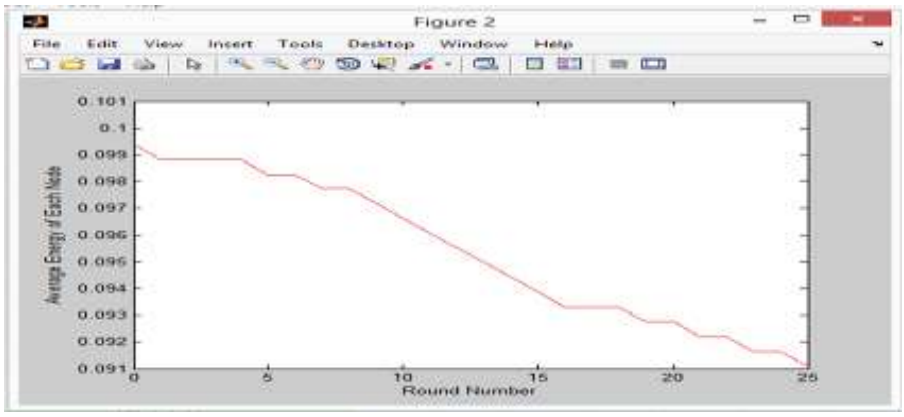

Fig 6: Energy vs. Round in WSN (TEEN protocol) –Trail for 5 round

The graph has been drawn in average energy and number of round of communication. EAMMH Clustering is basically **clustering** Energy aware multi-hop multi-path hierarchical protocol which used for optimizing use of energy for communication in WSN.

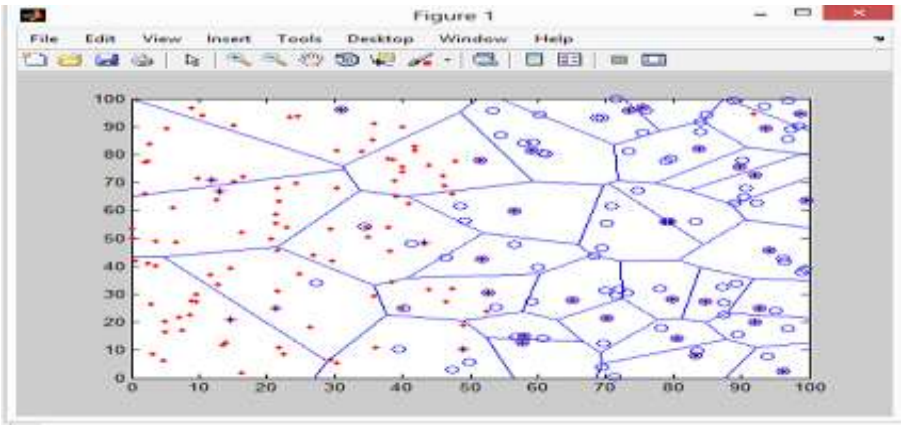

Fig 7: EAMMH Clustering

After the end of communication the result has come out as below. The graph has been drawn in average energy and number of round of communication.

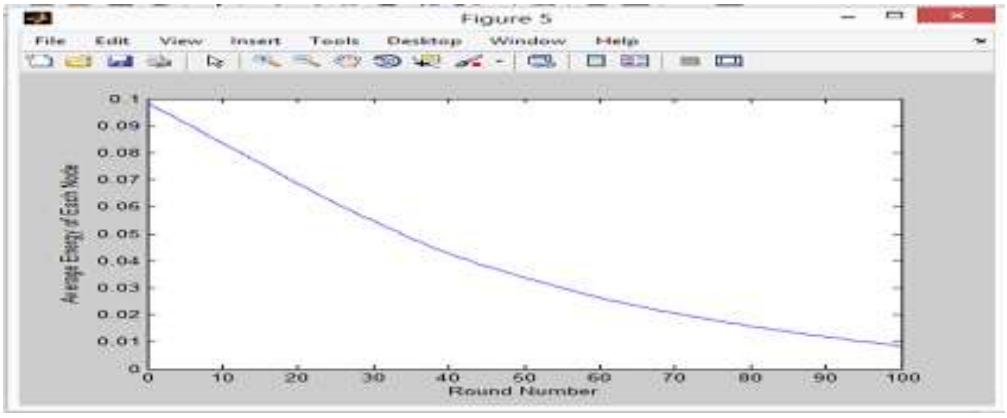

Fig 8: Round Vs. Avg. Energy (EAMMH Clustering) 100 round trails

Further LEACH algorithm has been applied through MATLAB. The portion present the cluster and the circular point is the communication node. Beside the green node is the simple communication node. Green with dot is cluster head. And plus sign nodes are non-active nodes. After the end of communication the result has come out as below. The graph has been drawn in average energy and number of round of communication.

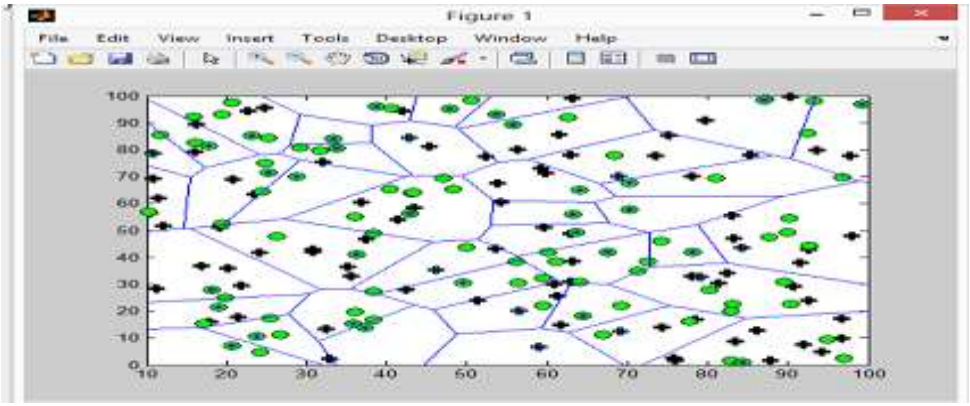

Fig 9: LEACH Protocol based communication

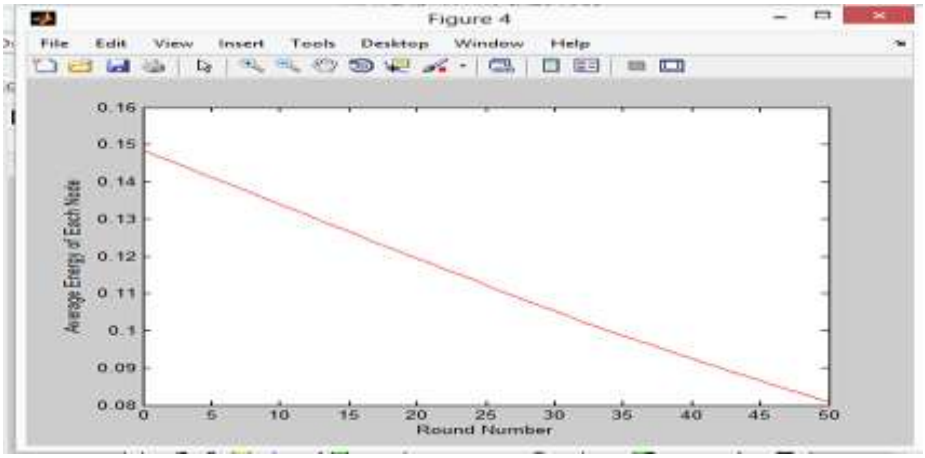

Fig 10: Round Number Vs. Average Energy of each Node

Further SEP algorithm has been applied through MATLAB. The portion present the cluster and the circular point is the communication node. Circular nodes are cluster head and simple communication node.

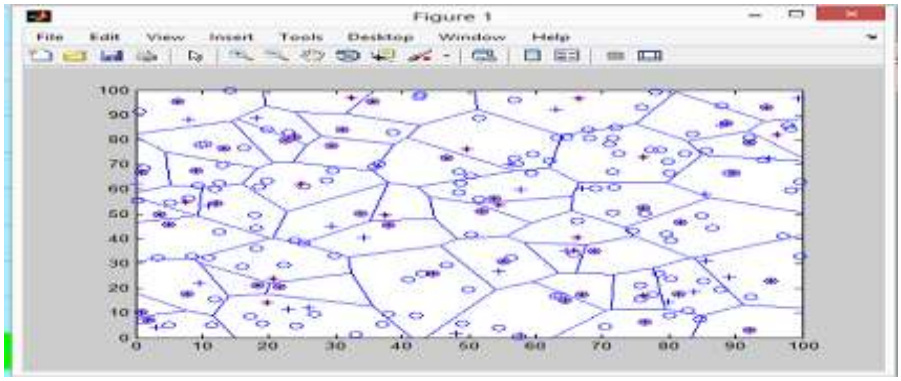

Fig 11: SEP Protocol

After the end of SEP communication the result has come out as below. The graph has been drawn in average energy and number of round of communication.

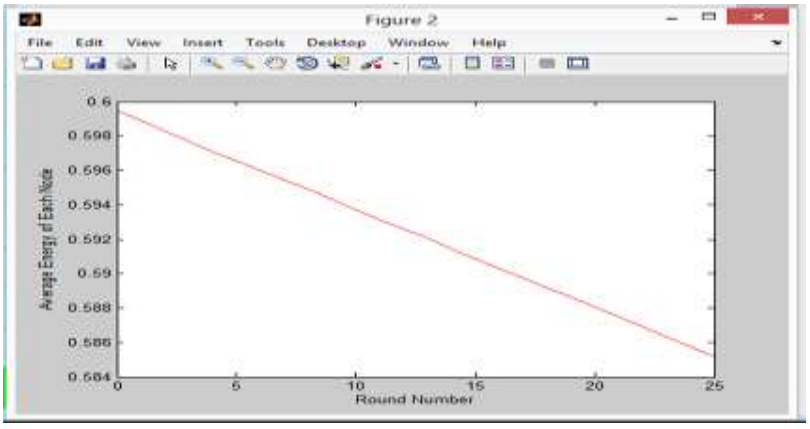

Fig 12: Round Number Vs. Average Energy of each Node

Set all the parameters of the proposed function will give a clear result of the basic communication cycle. As this study found a very positive effect on energy conservation time and network lifetime. It is also noteworthy that the drawings obtained from the simulations showed improvements in power consumption parameters and network health; this means excellent WSNs.

V. Comparison of earlier and proposed QOS analysis

Table 1: Result come out by Proposed Algorithm

Test Condition	Packet Transmitted	Packet Drop	PDR	E2Edelay	Throughput
Test 1	170	6	99.96	0.160	1056
Test 2	170	9	99.94	0.188	902
Test 3	210	9	99.95	0.113	1853
Test 4	150	0	100	0.058	2547
Test 5	170	10.5	99.93	0.158	1069
Test 6	200	7.5	99.96	0.110	1810
Test 7	210	9	99.95	0.110	1900

Table 2: Result come out by earlier base algorithm

Test Condition	Packet Transmitted	Packet Drop	PDR	E2Edelay	Throughput
Test 1	190	24	99.87	0.159	1194
Test 2	200	15	99.92	0.112	1784
Test 3	150	0	100	0.057	2641
Test 4	180	9	99.95	0.110	1623
Test 5	190	30	99.84	0.158	1195
Test 6	190	18	99.90	0.161	1173
Test 7	180	9	99.95	0.115	1552

By comparing the two tables above it is clearly shown that the performance of all the results of the above table is very clear that the latter. This will provide a better WSN test environment for generating real status.

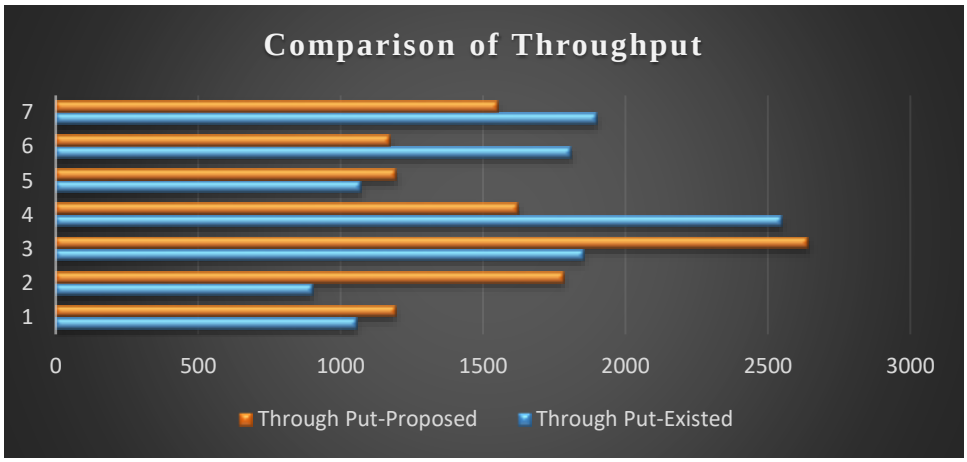

Fig 13: Comparison Table (Existed & Enhanced Genetic Algorithm)

As find from above table the throughput come out after the simulation of MATLAB 2013. The proposed algorithm based on genetic placed better result compare with loss of data packets.

VI. Conclusion

Wireless sensor networks (WSNs) have recently attracted much attention due to their use in many domains. Sensors have limited energy sources and in many applications cannot be reconstructed or replaced because of the environment. Finding solutions close to a power problem is still a problem for WSNs. The new era opens with natural-inspired algorithms to solve optimization problems. However, satisfactory service quality (QoS) requirements for different application domains remain a major problem due to high traffic flow, dynamic network conditions, and service problem status. This paper explored the estimation of various algorithm LEACH, EAMMH, SEP etc., for the account of dead node in time domain of communication. An application-based protocol without specific restrictions on its ready use in military, medical, and commercial applications will be subject to our future studies. At the end of the conclusive part of this research of WSN it is found that the enhanced genetic algorithm gives through put better. This gives more efficient for WSN network.

References

[1]. Godoy, P. D., Cayssials, R. L., & Garino, C. G. G. (2018). Communication channel occupation and congestion in wireless sensor networks. *Computers & Electrical Engineering*, *72*, 846-858.

[2]. Kumar, K., & Khera, S. (2019, February). Optimization of Transceiver Energy with LEACH Protocol for Wireless Sensor Ad-hoc Networks. In *2019 IEEE International Conference on Electrical, Computer and Communication Technologies (ICECCT)* (pp. 1-4). IEEE.

[3]. Mushtaq, A., & Patterh, M. S. (2017, October). QOS parameter comparison of DiffServ-aware MPLS network using IPv4 and IPv6. In *2017 International Conference on Recent Innovations in Signal processing and Embedded Systems (RISE)* (pp. 113-118). IEEE.

[4]. Ezdiani, S., Acharyya, I. S., Sivakumar, S., & Al-Anbuky, A. (2017). Wireless sensor network softwarization: towards WSN adaptive QoS. *IEEE Internet of Things Journal*, *4*(5), 1517-1527.

[5]. Huerta, M., Gonzalez, R., Perez, A., Clotet, R., Villarroel, K., Rivas, D., & Hernandez, Y. (2016). QoS on Wireless Sensor Network applied in post-seismic assessment. In *2016 IEEE Colombian Conference on Communications and Computing (COLCOM)* (pp. 1-6). IEEE.

[6]. Geetha, B., Archana, N. B., Thirumagal, E., & Tiwari, S. (2018). A Mac Protocol Which Reduces The Qos Parameters Like Energy Efficiencyin WSN *International Journal of Advanced Research in Computer Science*, *9*(Special Issue 3), 93.

[7]. Siri Maidhili, R., & Karthik, G. M. (2018). Authentication and overhearing to prevent internal and external attacks in WSN. *International Journal of Engineering & Technology*, *7*(2.8), 477-487.

[8]. Karthikeyan, T., Brindha, V., & Manimegalai, P. (2018). Investigation on Maximizing Packet Delivery Rate in WSN Using Cluster Approach. *Wireless Personal Communications*, *103*(4), 3025-3039.

[9]. Hosni, I., & Hamdi, N. (2016, November). Cross layer optimization of end to end delay in WSN for smart grid communications. In *2016 International Symposium on Signal, Image, Video and Communications (ISIVC)* (pp. 217-223). IEEE.

[10]. Luo, J., Xiang, L., & Rosenberg, C. (2010, May). Does compressed sensing improve the throughput of wireless sensor networks?. In *2010 IEEE International Conference on Communications* (pp. 1-6). IEEE.

[11]. Rezaeipanah, A., Nazari, H., & Ahmadi, G. (2019). A Hybrid Approach for Prolonging Lifetime of Wireless Sensor Networks Using Genetic Algorithm and Online Clustering. *Journal of Computing Science and Engineering*, *13*(4), 163-174.

[12]. Ezdiani, S., Acharyya, I. S., Sivakumar, S., & Al-Anbuky, A. (2017). Wireless sensor network softwarization: towards wsn adaptive qos. *IEEE Internet of Things Journal*, *4*(5), 1517-1527.

[13]. Farzana, A. F., & Neduncheliyan, S. (2017). Ant-based routing and QoS-effective data collection for mobile wireless sensor network. *Wireless Networks*, *23*(6), 1697-1707.

[14]. Ali, M. S., & Singh, R. P. (2017). QoS-aware protocol using priority packet scheduling scheme for wireless sensor networks. *International Journal of Advanced Research in Basic Engineering Sciences and Technology (IJARBEST)*, *3*, 57-65.

[15]. Malik, S. K., Dave, M., Dhurandher, S. K., Woungang, I., & Barolli, L. (2017). An ant-based QoS-aware routing protocol for heterogeneous wireless sensor networks. *Soft computing*, *21*(21), 6225-6236.

[16]. Rao, Y., Deng, C., Zhao, G., Qiao, Y., Fu, L. Y., Shao, X., & Wang, R. C. (2018). Self-adaptive implicit contention window adjustment mechanism for QoS optimization in wireless sensor networks. *Journal of Network and Computer Applications*, *109*, 36-52.

[17]. Ragavan, P. S., & Ramasamy, K. (2019). Optimized routing in wireless sensor networks by establishing dynamic topologies based on genetic algorithm. *Cluster Computing*, *22*(5), 12119-12125.

[18]. Hamidouche, R., Aliouat, Z., & Gueroui, A. M. (2018). Genetic algorithm for improving the lifetime and QoS of wireless sensor networks. *Wireless Personal Communications*, *101*(4), 2313-2348

[19]. Rachedi, A., & Benslimane, A. (2016). Multi-objective optimization for Security and QoS adaptation in Wireless Sensor Networks. In *2016 IEEE International Conference on Communications (ICC)*, 1-7, IEEE.