An Energy Efficient using Distance Vector Scheme and Classify the Performance based on Neural Network

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Abstract- Recently, UWSN is an significant area for researchers due to its well-known applications like as a disaster prevention, off-shore exploration, pollution monitoring, data collection and device monitoring etc. Several research challenges are reliable for under water sensor network the framework of routing scheme is one of them. UWSNs is a data collection from the structure and transfer them and on surface to send them to centre for further procedure. Since of the channels normal to Under Water Sensor Networks, they have minimum bandwidth, higher exception probability and longer propagation time compared to radio channels. In these properties of underwater sensor networks them good potential candidates for using routing protocol concepts to packet delivery to the destination. To Classify the previous methods in dissimilar classes, describes representation illustrations for each group of routing methods and un-cover the necessaries measured by the dissimilar routing schemes as-well-as the framework requirements and disadvantages under which they operate. UWSNs have a emerged as a capable network method for several UW applications. An efficient energy routing schemes play a important role in transmission the data and applications. In this research work, we focus on study the various routing schemes in UWSNs. AODV routing protocol to manage the rule to transfer the data packets one SN to another SNs and working with two phases : (i) Route Discovery and (ii) Route Maintenance. Then, we implement a NN approach to classify (Input Layer, Hidden Layer and Output Layer) the data packets, to improve the delivery rate in the UWSNs and error rate decreases in the network. To evaluate the performance parameters like PDR, Throughput, Error Rate and Collision and compared with the existing methods.

Keywords- UWSNs, Routing Schemes, AODV, Classification method (NN).

I. INTRODUCTION

These are distributed wireless sensors that equipped with under-water vehicles mainly to search ad find out the natural underwater resources. To collaborate and collect all data together, the requirement of wireless sensors enhanced and therefore wireless sensor networks are introduced in underwater sensor networks. [1]

A Wireless Sensor Network is essentially a system of detecting device associated together and for the most part to some sort of a base station, by remote means. What is detected, how frequently, how much pre-handling is done, and how regularly the qualities are spoken with the base station are for the most part factors which must be exchanged off against the utilization of intensity. Most WSNs are presently based around devices which are called bits. Every bit will comprise of a processor, some on-board memory (both ROM and RAM), a radio handset, at least one sensors and a power source [2]. The uses of wireless sensor networks are seen in the underwater sensor networks that are called UWSNs (underwater sensor networks). Submerged applications extending from early cautioning frameworks for common disaster (like tidal waves), environment checking, oil penetrating, and military reconnaissance have been investigated. For certain oil boring applications, the water profundity might be more than 3000m. Savvy sensors that can screen natural and framework parameters can be sent on the seabed [3].These cooperate with Remotely Operated Vehicles (ROV), which are controlled from the ship, or Autonomous Underwater Vehicles (AUV), which can explore the profound waters self-governing in view of a given arrangement of standards and guidelines. In such a framework, the sensors, grapples, and ROVs/AUVs gather data from the seabed and feed the information to the vessel. The sensors and grapples can quantify parameters like establishment quality and mooring pressures, and in a perfect world give exact position references to the AUVs while they overview the remote ocean condition with modern observation hardware [4].

There are various uses of underwater sensor networks that are described in the following section:

(i) **OSN (Ocean Sampling networks):** Systems of sensors also, AUVs, for example, the Odyssey-class AUVs, can perform brief, agreeable versatile testing of the 3D seaside sea condition Trials, for example, the Monterey Bay field try exhibited the favourable circumstances of uniting refined new automated vehicles with cutting edge sea models to enhance the capacity to watch and foresee the qualities of the marine condition.

(ii) **Navigation:** to navigate the natural resources in oceans, underwater sensors are playing out a crucial role. It must be approached to find out the hazards or seabed. Moreover, search out the shoals in shallow water and to identify natural disasters.[5]

(iii) **Surveillance:** AUVs and settled submerged sensors can cooperatively screen zones for observation, surveillance, focusing on and interruption identification frameworks. For case, in a 3D submerged sensor organize is intended for a strategic observation framework that can distinguish and

characterize submarines, little conveyance vehicles (SDVs) and jumpers in light of the detected information from mechanical, radiation, attractive and acoustic micro-sensors.

Underwater sensor networks are pivotal devices that increased dramatically in this world of technology. There are a huge variety of features that are useful in each and every ocean related things. Some of the important advantages of underwater sensor networks are as following-

i. The capacity of underwater networks is higher as compared to other networks due to the low error rates and extreme energy.
ii. The underwater sensor networks are of tiny size so that the consumption of power is reduced and which associates huge processing speed.
iii. In USWNs the monitoring of highly pressured waves and water sounds are better identified through underwater networks rather than any other devices [6].

In research work, to deploy an underwater sensor network with N number of nodes and N number of ids with data packets for the deployment. This network architecture would consists of one or more than one source node to be deployed and destination mode in the similar fashion. To organize the coverage set table for the sensor nodes to show the successful implementation of the data transfer from source to destination and to initialize the flow of the water to the network area so that the change in the coordinate axis can be noticed. To implement AODV and NN network to bring back the sensor nodes into the coverage area if they are out of the bound of the source node and to evaluate the parameters such as energy consumed per data transfer and throughput of the system per transfer. To evaluate the performance parameters like end to end delay, throughput and energy consumption and compared with the existing performance parameters.

II. LITERATURE SURVEY

Sahana, S., et al., (2016) [16] proposed a research on underwater sensor networks with applying a short-path routing protocol. The main focus was on UWSNs, routing approaches, delay and energy consumption. Submerged Wireless Sensor Networks (UWSNs) comprise of an alternate kinds of sensors, that were put both at submerged and at the surface. It would perform undertakings over a specific territory. This could be appropriate in different fields, for example, sea inspecting, natural observing, military application, fiasco aversion, and conveyance strategic reconnaissance. The present as of late developed in innovation, the requirement for submerged correspondence had turned out to be more articulated. In any case, the UWSN interchanges were portrayed by constrained battery vitality since every hub assumes the part of an individual switch. Thusly, it was extremely basic to utilize vitality legitimately and successfully in submerged systems. Through this examination the consideration was on different parameters of UWSN and learnt a considerable measure about this theme. A convention that finds the most brief separation vector between the hubs and transmits of the information through that way in a vitality productive way. Likewise, thought about the execution of four conventions ERP2R, Leach, DBR and EADA-RAT as far as deferral investigation and vitality utilization.

Akyildiz, I.F., et al., (2005) [17] proposed a brief description of research problems which was seen in the underwater sensor networks. Further the objective fully based on acoustic communication. Submerged sensor hubs would discover applications in oceanographic information accumulation, contamination observing, seaward investigation, debacle counteractive action, helped route and strategic observation applications. In addition, unmanned or independent submerged vehicles (UUVs, AUVs), outfitted with sensors, would empower the investigation of common undersea assets and social event of logical information in cooperative checking missions. Submerged acoustic systems administration was the empowering innovation for these applications. Submerged systems comprise of a variable number of sensors and vehicles that were conveyed to perform community oriented observing undertakings over a given territory. In this paper, a few principal key parts of submerged acoustic correspondences were explored. Distinctive models for two-dimensional and three-dimensional submerged sensor systems were talked about, and the qualities of the submerged channel were point by point. The fundamental difficulties for the advancement of productive systems administration arrangements postured by the submerged condition were point by point and a cross-layer way to deal with the incorporation of all correspondence functionalities was proposed. Besides, open research issues were talked about and conceivable arrangement approaches were sketched out.

Chandrasekhar, V., et al., (2006) [18] done a survey on localization and application along with the major challenges that were generated in underwater sensor networks. The common terms were algorithms and performance. In submerged sensor systems (UWSNs), deciding the area of each sensor was critical and the way toward evaluating the area of every hub in a sensor organize was known as limitation. While different limitation calculations had been proposed for earthly sensor systems, there were generally few limitation plans for UWSNs. The attributes of submerged sensor systems were on a very basic level not the same as that of earthbound systems. Submerged acoustic channels were described by cruel physical layer conditions with stringent transfer speed confinements. The variable speed of sound and the long proliferation delays submerged represent an interesting arrangement of difficulties for restriction in UWSN. This paper investigates the unique limitation calculations that were pertinent to submerged sensor systems, and the difficulties in meeting the necessities postured by rising applications for such systems, e.g. seaward designing.

Lanbo, L., et al., (2008) [19] researched on the prospects and issues generated in the communication of underwater systems. This paper surveys the physical essentials and building usage for effective data trade by means of remote correspondence utilizing physical waves as the transporter among hubs in a submerged sensor arrange (UWSN). The physical waves

under exchange incorporate sound, radio, and light. Firstly, the crucial material science of various waves at that point analyzing the upsides and downsides for embracing diverse correspondence transporters (acoustic, radio, and optical) in light of the crucial first standards of material science and building practice. The exchanges were for the most part focused at submerged sensor systems (UWSNs) with thickly conveyed hubs which based on the correlation think about the suggestions for the determination of correspondence bearers for UWSNs with building countermeasures that could upgrade the correspondence proficiency in determined submerged conditions.

In any kind wireless sensor nodes, [7] the routing protocols are utilized to transfer and receive data form one node to another node. Directing in remote sensor routing contrasts from customary routing in settled systems. There is no framework, remote connections are temperamental, sensor hubs may come up short, and directing conventions need to meet strict fundamental needs. Numerous routing calculations are created for remote systems [8]. The basic three kinds of routing in underwater sensors are-

i. Energy Based Protocols
ii. Geographic Routing Protocols
iii. Hybrid Routing Protocols

Table 1. Types of Routing Protocols

Sr. No.	Name of Routing Protocol	Benefits	Research Gap
1	Energy based routing protocols	Fully based on the messages and application needs Delay time is less Create 3D zone	Different delivery priorities. Only access to nodes that are in 3d Zone.
2	Geographical based routing protocols	It is dependent on locations of nodes. Initiate fitness factor Provide route discovery and maintenance.	Energy balance issues. Sink node distance considered for fitness factors [9]
3	Hybrid routing protocols	It consisting of excessive packet forwarding Reduced power consumption	Link quality of transmission of data changes. Hard to manage and update in a given time [10].

III. PROPOSED WORK

In this section, we described that the underwater sensor network using AODV and NN classification method. Under water sensor network implement a proposed work in steps wise:-

Step I: Initialize, deploying the underwater sensor network w.r.t to the network area (Network Length and Network Width). Calculate the area of the underwater sensor network.

Step II: After network area calculation, we select the number of data packets or rounds. If select this section, then input the two phase i.e, (i) Time and (ii) Energy based.

Step III: Search the source and destination node in the network. Source node send the request to the inter mediator nodes in the UWSNs for Signal Broadcasting and communicate the information's and packets one node to another sensor node in the network.

Step IV: Implement a AODV routing method to implement a two phases:

(i) Route Maintenance

(ii) Route Discovery

In this section described the Route discovery means search the sensor node in the underwater sensor network. So many routes are creating in the network to communicate the one node to another node in the network. When a sensor node wishes to transfer a packet to some sink :-

(i) It verifies routing table to determine if it has a recent route to the destination.

if true, forwards the packets to next hop node.

If false , it starts a route discovery procedure.

(iii) Route discovery process starts with the initialize of a RREQ packet --- source node designs it.

(iv) The packets contains -- source node address , source nodes current SEQ Num, DEST Address and DEST Node.

In the network issue will occurs very high routing head and less reliability of data packet delivery. An intermediate node receives a Route Request , the underwater sensor network sets up a reverse path entry for the Start node on its route table.

Request reach destination node in the UWSNs. Ultimately, the path req will make to the sink node. Intermediate node might also send a Route rep given that it knows a more current route than the existing called to SENDER S.

AODV stands for ad hoc on demand distance vector. AODV is a receptive specially appointed steering convention which implies does not keep up any way before than request. Each

hub's directing table just contains the following bounce to a specific goal. AODV convention utilizes two directing bundle to make the way: course ask for (RREQ) and course answer (RREP). AODV including three principle stages: way revelation, turn around way setup and forward way setup. When we need to impart between two hubs on the system, course revelation stage starts. Now source hub broadcasting a RREQ bundle to its neighbours. Remote RREQ when going through each middle of the road hub sets a pointer to the past hub (make invert way). Whenever a hub gets RREQ, checks goal address if the collector had goal then uni-casts a RREP by the switch way to the RREQ source hub (forward way setup). Something else, way disclosure stage will be rehashed [11].

A neural system is an interconnected get together of straightforward preparing components, units or hubs, whose usefulness [15] is approximately in light of the creature neuron. The preparing capacity of the system is put away in the inter unit association qualities, or weights, got by a procedure of adjustment to, or gaining from, an arrangement of preparing designs [12]. Artificial neural network is a system of computing both hardware and software. The architecture of ANN dependant on the bio computation and information processing approaches. NN, back propagation neural networks is the branch of this network which has capability of learning and recalling [13]. This network is mostly preferred network and a best technique for feed forward training. The invention of NN was in 1986 by Rumelhart, Hinton and Williams. The process of learning errors is done by estimating the output errors to minimize the hidden layer errors [14].

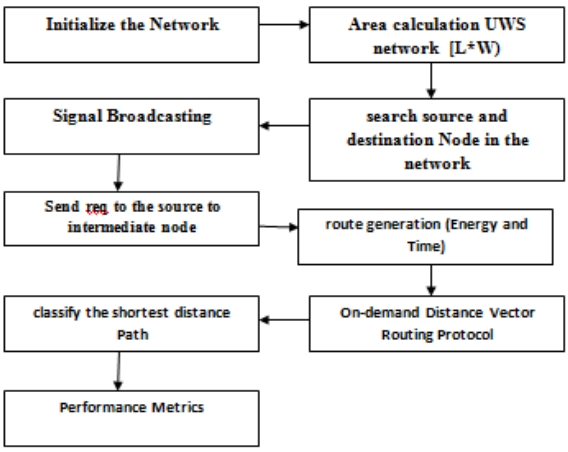

Fig.1: Proposed Flow Chart in AODV and NN

STEP IV: Then , implement a NN (Neural Network) algorithm. To classify the routes in the network and overcome the error rate and overhead in the UWSNs.

Step V: Evaluate the performance parameters like Throughput, PDR (Packet Delivery rate), Routing Overhead and Error Rate and compared with the existing algorithms.

IV. EXPERIMENTAL SETUP

This section determines the evaluated results of the proposed under water sensor network in security networks. Also the Percentage of error rates using NN algorithm determined with the overall throughput of the concept is evaluated. The proposed image processing concept is implemented in MATLAB with GUI (Graphical User Interface). The considered GUI is shown in figure 2. Here, the considered command window. display message in command window. Enter the underwater sensor nodes according to user choice; enter the network length and width. Calculate the area of wireless sensor network. Select your routing schemes like two phases :

(i) Time based
(ii) Energy efficiency

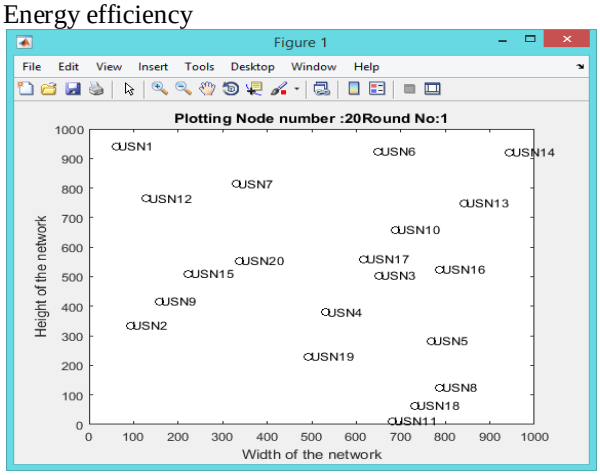

Fig.2: Network Deployment in time and energy based

The above figure 2 defined that the underwater sensor network framework system and plot the number of sensor nodes according to the user selection. To identify the source node and sink node in the UWSN. It calculates the coverage set and range verify the UWSN in the network. To find data means routing schemes design the user to communicate the sub-nodes and then packet transferring one node to another nod. It represents that the line format continue communication in source to destination node.

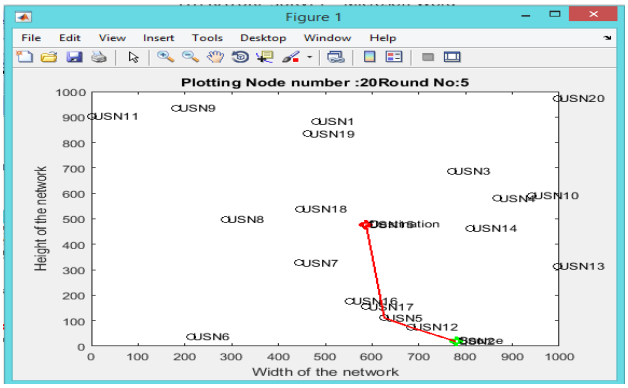

Fig.3: Communication process in Time and Energy based

Above figure defined that the numbers of nodes are implemented in the network randomly under the control of an administrator. These are well configured, energy efficient, and trustable nodes in the network. During node creation, each node will get a HELLO message from the BS with a timestamp message indicating the node creation time (birth time) in the network. The message verification source to other intermediate nodes. The AODV routing protocol algorithm is used during the discovery and data transmission in the network, where the nodes information is checked from the Base Station node information . After verification of on demand distance vector algorithm, the algorithm collects the ID, timestamp, and current location address of the nodes and compares with initial information when they are registered. The results of the AODV routing protocol algorithm can provide only the trusted nodes in the route to ensure secured data transmission.

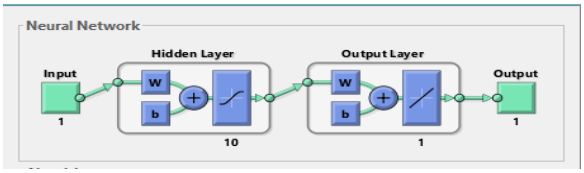

Fig.4: Neural Network

In this section described the neural network depends on three layers i.e., Input layer, hidden layer and output layer. In this layer calculates the weight value of the packets. then hidden layer is stored to in build backup in the network . in output phase, to filter the input values suing activation function. The levenberg Marquardt algorithm to identify the performance graphs. Epochs means number of iterations in the network. It consumed 0 second of time. Performance identifies based on the mean square error rate , gradient, mutation and validation checks.

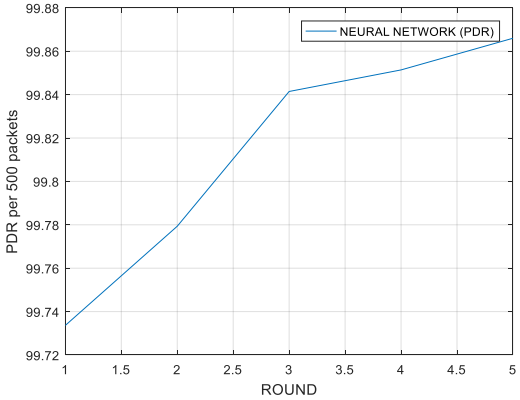

Fig.5: Packet Delivery Rate in proposed work (In Time and Energy based)

The above figure shows that the packet delivery rate in the proposed work in time based in the underwater sensor network. PDR is depends on the received and created packets as recorded in the trace record. Packets by the sink and the created packets by the start node.

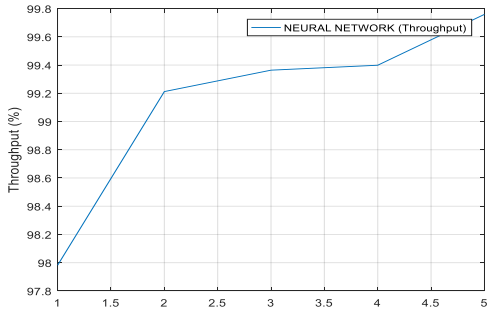

Fig.6: Throughput in Proposed Work (in Time and Energy Based)

The above figure shows that productive capacity as well as the total number of units the procedure can create separated by the process interval of time period. Then the calculate creativity process interval time period separate by total time available.

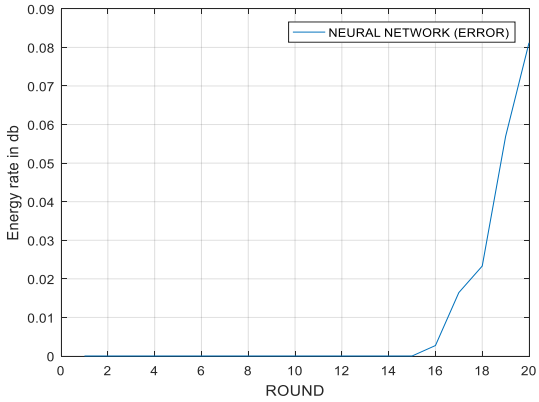

Fig.7: Energy with NN approach (Time and Energy Based)

Figure shown that the error rate with aodv and Neural network in time based. In Energy ration has been decreases in the neural network. If packets load increases in the UWSNs then AODV routing scheme used for shortest distance calculated in the sensor networks. Classification method to filter the packet rates in the network.

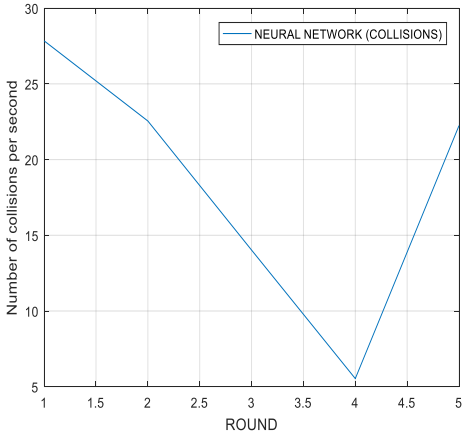

Fig.8: Number of Collision (Delay) per second in proposed work (Time and Energy based)

The above figure shows that the number of collision per second in proposed work (AODV and Neural Network) decreases the network rate. The collision is the consequence of binary instruments on the similar network attempting to transmit information (PACKETS) at exactly the similar interval time. The Underwater Sensor Network detected the collision rate of the two transmitted packets and discards them both.

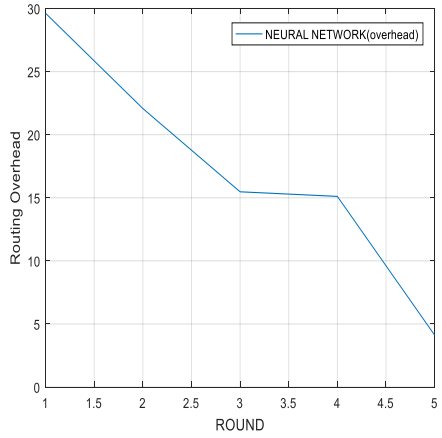

Fig.9: Overheard in proposed work (Neural Network) time and Energy based

The figure described that the routing overhead and data information's have to divide up the same network bandwidth most of the times, and hence, packets are considered to be an overhead in the network. This overhead is called routing overhead. A good routing protocol should incur lesser routing overhead.

TABLE 2: PROPOSED PERFORMANCE PARAMETERS

Performance Metrics	Values
Routing Overhead db	0.917
Throughput (%)	99
Packet Delivery Rate (%)	99
Collision (Delay) sec	8.65~ 0.086
Energy joules	0.08

Table 1: explained the proposed performance metrics (Routing Overhead, Collision, PDR, Throughput and Error Rate). Reduce the rate of the energy consumption and delay metrics.

Table 2. below described that the comparison between proposed and existing work performance metrics are energy consumption in joules and delay in second.

TABLE 3: COMPARISON BETWEEN PROPOSED AND EXISTING WORK

Performance Metrics	Proposed (NN and AODV)	Existing (Leach)
Energy Consumption (J)	**0.08**	**6.5~0.65**
Delay (Sec)	**0.086**	**0.089**

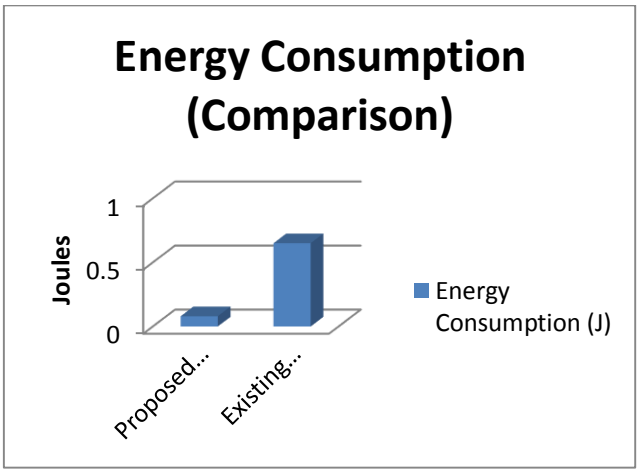

Fig.10: Comparison (Energy)

The above graph described that the comparison between proposed and existing work (AODV+NN and Leach). In proposed work has been improved the energy performance with AODV and NN approach.

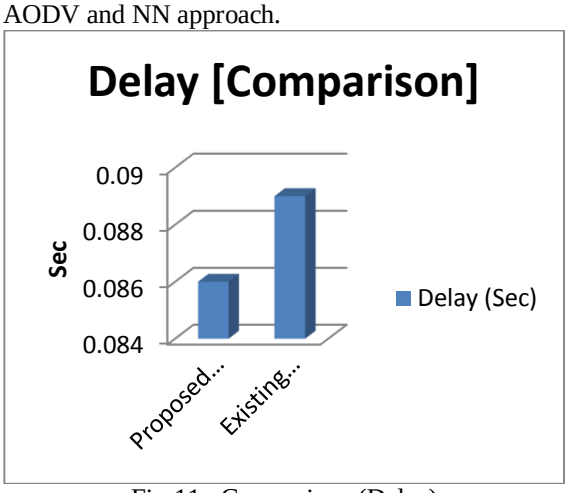

Fig 11. Comparison (Delay)

The above graph described that the comparison between proposed and existing work (AODV+NN and Leach). In proposed work has been improved the delay performance with AODV and NN approach.

V. CONCLUSION ANF FUTURE SCOPE

Routing for UWSNs has been a standout amongst the most essential issues in submerged applications. In the course of recent years, numerous steering conventions have been proposed for UWSNs in light of the one of a kind attributes of UWSNs. In this article we show a point by point review of submerged steering conventions. Each directing convention is precisely examined, and its focal points, weaknesses, and execution issues are featured. What's more, we think about the conventions as far as vitality productivity, way idleness, multi-way capacity, unwavering quality, powerful strength, gap bypassing, and so forth. From the examination it is discovered that there are as yet numerous exploration challenges not yet illuminated. Thusly, additionally work ought to be performed with a specific end goal to explore the accessible arrangements

in more noteworthy detail, and propose new ways to deal with accomplish a superior steering convention for UWSNs. The principle thought of OR is to consolidate frail connections and make a solid virtual connection so as to have one dependable connection. UWSNs utilize acoustic channels, which have bring down transfer speed and longer engendering postpones contrasted with radio channels. These sort of systems confront an inconsistent situation contrasted with WSNs. These properties of UWSNs make them appropriate contender for utilizing the OR idea, bringing about more dependable connections and less transmissions. The reproduction reaction of the steering conventions with their basic investigation and we watched that the way based directing conventions are more effective than FAB, FDB, and CBS. It is likewise watched that the MRP directing convention is more productive among every one of the information sending steering conventions because of the utilization of great settled super hubs and layer development component. So we reasoned that for a system of around 20 hubs, AODV and NN (Neural System) performs superior to anything the other three and lifetime of the system increments. Different conventions do function admirably however in various spaces as indicated by the need of the system applications.

The future scope, will implement a highly speed routing scheme used to filter the packet rate and improve the Jitter rate in the underwater sensor network. This work will implemented an Energy efficient Channel Adaptive MAC protocol in a wireless sensor network with static nodes. This scheme had provided improvement gains in Energy efficiency, Throughput, Delay, Bandwidth and Delivery Ratio. But the superior nature of this scheme depends on many environmental factors, such as operation scenarios, specific data types etc.

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