International Journal of Scientific Research & Engineering Trends
Volume 7, Issue 2, March-April-2021, ISSN (Online): 2395-566X

Reliable and Energy-Efficient Routing Protocol for Under Water Acoustic Sensor Networks

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***Abstract*- The research for UASN has attracted a lot of people in recent years. Here, propagation and globalization are done for 3-D environments. The Acoustic Sensor network (UASN) works extensively with activities such as groundwater data and water filtration. An aquatic reactor network has been created to be used for marine harvesting, pollution control, marine exploitation, disaster prevention, cruise assistance, and monitoring applications. The UASN is a chemical sensor that uses batteries as a power source. Due to the difficult environment of UASN, replacing these batteries is difficult. One way to alleviate this problem is to extend the life span of UASN batteries by reducing energy consumption (improving energy efficiency). This proposes an Energy-Balanced Unequal Layering Clustering (EULC) algorithm that can improve acoustic sensor operation. The UASN layer produced by the EULC algorithm differs greatly from the nodes, providing a solution to the "hot spot" problem by building different clusters of similar size. Simulation results show that the EULC algorithm can efficiently balance the energy of the UASN platform, thus enhancing network life.**

***Keywords*- UASN, EULC, Routing Protocol, Debcr and Leach**

I. INTRODUCTION

The Wireless sensor networks (WSN) are a set of sensor nodes for performing the collaborative task in a given area. WSN has an extensive variety of potential applications to attract many researchers.

WSN are classified in different types such as given below;

- **(Aftab et al., 2015):** Terrestrial WSN: It is a collection of tiny sensor nodes, which are deployed in a given area.
- **Underground WSN:** In an underground WSN, the sensor nodes are buried in the underground for observing the underground conditions.
- **Underwater WSN:** It is comprised of sensor nodes and vehicles which are deployed in underwater.

UWSN applications have been recognized in support of the development of monitoring systems, maritime surveillance, deep sea surveillance, monitoring of multiple environmental and resource sources. not an expert. The UWSN has seen applications in areas such as military surveillance and monitoring, oil extraction, offshore oil and gas exploration, natural disaster killings, mining inspections, park operations, coral reefs and habitat monitoring of marine life and fisheries (Felemban et al., 2015).

ACMENet, for underwater acoustic sensor network for efficient utilization of bandwidth and sensor battery lifetime The European Union has sponsored the project for underwater aquatic environment monitoring. ACMNet uses TDMA based master-slave protocol that allows the data transfer across the sensor nodes. Casey et al. (2008) have proposed a system for tsunami detection and migration using wireless ad-hoc sensor networks. The sensors sense the data and report to Commander nodes for analyzing the data and predict. This system works by sensing a response approach. The system uses direct diffusion routing protocol for communication purpose.

The construction of AUVs based on an autonomous distributed sensor system for antisubmarine warfare (ASW). Real time processing, ASW processing and adaptive autonomous behaviors utilized to optimize target localization are demonstrated. The authors (Sage et al., 2011) have developed a system to monitor swimmers performance in a network of wireless sensor nodes. This system is a real time type to provide the feedback about swimmers to the coaches.

Underwater Sensor Networks are a developing research area in wireless sensor networks. USN has gained the attraction of many researchers due to its various potential applications. This chapter provides an introduction the underwater sensor 21 networks.

The communication architecture of USN is discussed and the difference between terrestrial sensor networks with USN is given. The underwater sensor node, automatic underwater vehicles and acoustic propagation are discussed. The various layers of USNs and various

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applications for underwater sensor network are also presented.

II. LITERATURE SURVEY

In order to extend wireless sensor networks to the underwater environment, the Acoustic Sensor Network (UASN) has been gaining ground in the community. At UASNDue to the diverse underwater environment (such as the well-known oil monitoring) (based on the importance of energy consumption in establishing multiple UASNs, efficiency and reliability data transmission is extremely difficult.) EGRC design.

It has the following characteristics: consider in-water media, such as 3D editing, high-speed propagation, motion and distance. island and a cluster node crown. First, from a practical standpoint, the whole network model is treated as 3D cubes, and this 3D cube is divided into several cubes, which the court shall be as dung for the dung.

In one 3D, the sensor node makes adjustments to the duty cycle of the MAC line. Second, to improve energy efficiency and extend the life of the network, EGRC has developed an energy consumption model that takes into account the remaining energy and position of the sensor nodes to purchase the best cluster head. In addition, EGRC uses the rest of the energy, space and end-to-end to find the next hop season to maintain data transfer confidence. The success of the proposed algorithm is evaluated at the regional level, and the EGRC's performance is proven to be superior to the usual algorithms in terms of energy efficiency, reliability, and ultimate delay. When the source is sent from the node to any destination, there is a delay.

Delivery and Receiving Time: Delays the sending or receiving of the entire package via the channel. It is a function of packet packing and data transfer. The time the signal is transferred from the source node to the receiver. It is related to the speed of acoustic signals in water. How long does it take for a bag in the queue. He is defined by network migration. Selecting a cluster head within most routing protocols of WSN involves two steps, namely selecting a cluster head and creating a flower. However, in this article, the whole network is divided into multiple SCs, which are considered as cluster.

As a result, selection of cluster heads is possible in the SC. In cluster protocols, data transfer is usually divided into two phases, namely the transition from the normal node to the cluster head and the transition from the cluster head to the BS. To select the best value in the telecommunications sector due to the high frequency of the spectra during this simulation, we calculated the regional averages (numerical simulations and SC lengths) to see the average values. a decrease in communication value. There is one cluster node in each cluster, which is responsible for the collection of data and the transfer of cluster members. The new algorithm is selected for the formula head. The algorithm selects the node with the highest energy and the shortest distance to the base station as the head of the cluster. In addition, we propose a method to search for the next hop of the hop based on energy, distance and ultimate delay.

Saleh Ibrahim et.al. (2019) The performance of UWSN water networks is limited by the low bandwidth and the delay in the transmission of high quality communications services. Installing high-speed gates with radio capabilities can improve the UWSN alert band, reduce end-to-end speeds and distribute traffic loads to reduce energy consumption. In this article, we have explored the problem of setting up a gateway to increase the effective visibility of this UWSN certification. We have created a mixed integer gate (MIP) system. We have analyzed the trade-offs between the number of terrestrial gates in the best case scenario and the expected delays and energy consumption of the terrestrial media. We use MIP fuel to solve the optimization problem that has been developed, and we have included the best results since we have introduced simulation to evaluate the benefits of the gate system. We have studied the effect of radio waves and how to disperse the sensors in water in solution.

Our results show the great benefits of exploiting the terrestrial gate and provide useful guidelines for establishing a viable network. One way to mitigate the suspension of high frequency propagation in acoustic communications is to install multiple gates above them. Within the sensor network, each sensor node can monitor and monitor what's happening in the local environment, and transfer those measurements to the gate system (also known as the gateway). as a UWSN receiver) via the network, and then relay to the administrative center. Unlike a drainage network that uses a subway to reach a single peak, in a submarine underwater sensor network. The ground gate then uses an electromagnetic wave to send packets to the control station. Given that the spread of electromagnetic waves is much more orderly than radio propagation, it is certainly safe that windows can send data packets to the monitoring office.

With less energy consumption in real time, because acoustic radio communication is more powerful Get energy. Radio communication. In this way, all the gates of the earth (or receivers) create a scenery. Although architectures that use multiple gateway gates have been mentioned, no studies have been conducted on gate extension. It is not possible to analyze the effects of the use of multiple terrestrial gates on the energy consumption of the network or its characteristics, or guidance on the construction of this multi-faceted architecture. In this article, we investigate the distribution of gate systems and provide a guide to determine the number and location of hidden gate gates in the context of water supply network optimization. By finding the minimum number of points

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and the position of the gateway necessary to achieve a design goal, we focus on improving the cost of the common gate expansion, which can be table-based, energy consumption, tolerance of faults or their combination. The issue of extending the external gateway is presented as a security issue, which models the movement of data packets from the water horse portals to the virtual receivers under the constraints of accessibility. link and traffic blessing. Various goals have been proposed.

Our system provides the best choice of gateway from the location given to a gateway server. Because they use shared media for communication, each node cannot use only part of the bandwidth of the water connection. The actual design of interference disruption depends on a large part of the UWSN media access control protocol. If we do not know the details of the media access protocol, we can create a nonsensical protocol, which contains one of two media projects, namely distance and non-slots time. It has been shown in the literature that due to the reduction in the weight of the control signal, the execution of the slotted protocol is less than the efficiency of the protected protocol.

III. PROPOSED SYSTEM

In the proposed framework, the algorithm used is Energy Balanced Inequality Hierarchical Clustering (EULC), which divides the UASN into several layers based on the depth and the mixing within each layer. The algorithm selects the cluster head to look at the residuals of each node, the specifications and the distances of the converter nodes, making the cluster head distribution consistent. To reduce energy consumption in the network, select the next hop node depending on the energy and the depth. EULC ranks among the most active DEBCR and LEACH on energy consumption, single-line management, and network life, ensuring energy efficiency using the EULC with UASN.

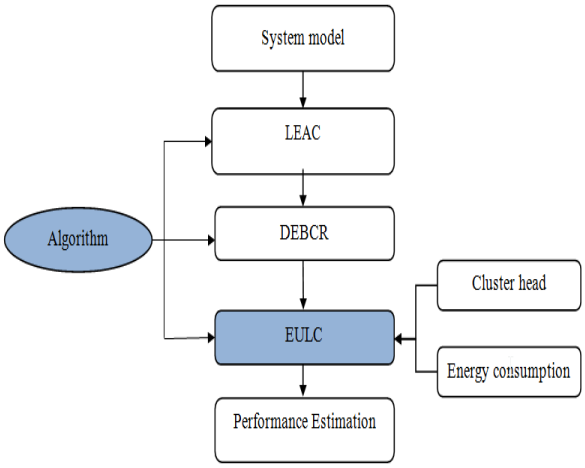

Fig 1. Proposed Flow Diagram.

Sensor nodes collect data constantly. The nodes in one layer transmit the data in the cluster to this cluster, the cluster head sends data from the cluster head to the next layer, and the head of the cluster the cluster in the top layer sends data to the sink node. The database may cause the twin heads of the UASN to be distributed evenly, simplifying the network model and helping to balance energy consumption. To solve the problem of "hot spots," the EULC model divides the UASN into space with a non-uniform surface area, and the sliding line gradually ascends to the top.

1. Benefits:

- Select the cluster head for cluster formation.
- Improve EULC by using clumps.
- Compared to other protocols, it reduces energy consumption and enhances network life.

2. Modules:

- System model
- EULC Routing algorithm
- Unequal layering model
- Cluster head selection
- Cluster establishment
- Energy consumption
- Data transmission stage

3. Module Descriptions:

3.1 System Model: The three-dimensional UASN system is composed of static nurse cells built up to the sea floor, a motion sensor that floats in the water, and a floating meeting place above the water. During the installation process of the UASN, the sensor plate is distributed separately into the dough product, while the sample is immersed in water. All sensor nodes are dispersed in cubed water and have the same structure and energy, but have a unique ID; moreover, each node knows its location. Each node can think of the function of a normal node or a head node. All nodes are capable of inserting data packets and adjusting the transfer power according to the data transfer distance. The access node is located in the center of the 3D network and can connect to any shadow of the network. Sensor nodes collect data continuously. The nodes in a layer transmit the data to the cluster in this layer, the cluster head sends the data to the cluster head in the previous layer, and the cluster head the cluster at the top sends the data to the sink.

3.2 EULC Routing Algorithm: Given the limitations of the above method, it is suggested that a hierarchical clustering scheme with energy balance is proposed. The proposed EULC algorithm differs from the above method in three main ways. First, we divide the UASN into sheets based on the depth and branching of each layer. The algorithm selects the cluster head to look at the residuals of each node, the specifications and the distances of the converter nodes, making the cluster head distribution consistent. Second, it sets the competitive environment at

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each cluster head depending on the distance between the cluster head and the node node. Third, it uses multi-hop networks and hops for data transfer and inter-cluster. To reduce energy consumption in the network, select the next hop node depending on the energy and the depth.

3.3 Unequal Layering Model: The database may cause the twin heads of the UASN to be distributed evenly, simplifying the network model and helping to balance energy consumption. To solve the problem of "hot spots," the EULC model divides the UASN into space with a non-uniform surface area, and the sliding line gradually ascends to the top. The acoustic sensor nodes are locked in a grid based on the distance between the heads of their respective clusters and receive nodes with competing radius regions.

3.4 Cluster Head Selection: The cluster head plays a key role in the UASN. In EULC, the cluster head is set to dynamic. At the beginning of the UASN broadcast, the channel sent information to all nodes in the network. Each node calculates the distance from the node node based on the power of the received signal, and then estimates the depth. After pollination, all the islands enter the cluster selection stage. In EULC the head of each cluster is automatically selected. Each cluster head consists of cluster selection, cluster formation and migration steps. In each case, the node selected as the cluster head must record the remaining node, node height, and node node distance. Because the UASN cluster is distributed in different ways, the energy is saved by not requiring all nodes to participate in the cluster cluster selection. In this case, the whole network is divided into several circuits, and a selected cluster is the local coordinator for the circle. Each node uses a circular method to determine if this node has become a cluster island. A node that has become the head of a flower can no longer be the head of a flower.

3.5 Cluster Establishment: Cluster construction is divided into two stages: cluster head and cluster clustering. In the first step, depending on the election window and their conditions, the exit of a page becomes a cluster head competitor, and sends a competition message about the cluster of head clusters, radius, weight, and so on. The weight is selected as the cluster head and the message is sent within the competing radius to declare its selection. In the second step, after receiving the message of the successful cluster head, the other cluster head candidates in this contest withdraw from the election and join the cluster with the non-cluster islands in this case.

3.6 Data Transmission Stage: Data transmission is the transmission of data through a communication channel or point-to-point. Examples of these channels are copper wire, optical fiber optic cable, storage media and bus. The data are displayed as electromagnetic signals, such as sensors, radio waves, radio waves or infrared signals. In each cluster, the non-cluster head sends packets to the cluster island, and the cluster head integrates those packets and exports the results to the next cluster head, which is further synchronized and exported upward. In EULC, each cluster title contains a source of information about the title of the adjacent cluster.

4. Algorithm Used:
The Energy Balancing Inequality Hierarchical Cluster (EULC) divides the UASN into layers based on the depth and volume of the individual plates. This algorithm is used to reduce the energy of communication between clusters.

5. Data Transmission Stage:
In each cluster, the non-cluster head sends packets to the cluster island, and the cluster head integrates those packets and exports the results to the next cluster head, which is further synchronized and exported upward.

6. Cluster Establishment:
Cluster construction is divided into two stages: cluster head and cluster clustering. In the first step, at the level of the election and in each of these conditions, the exit in a tab becomes a cluster presidential candidate and sends a message about the cluster's competition, including the cluster head, radius of contention, weight, etc. The highest-value node is then selected as the head of the group and sends a message within the competing group to announce the election. In the second step, after receiving the message of the successful cluster head, the other cluster head competitors in this layer exit the cluster and join the cluster, as well as the non-cluster nodes. 'this conversation.

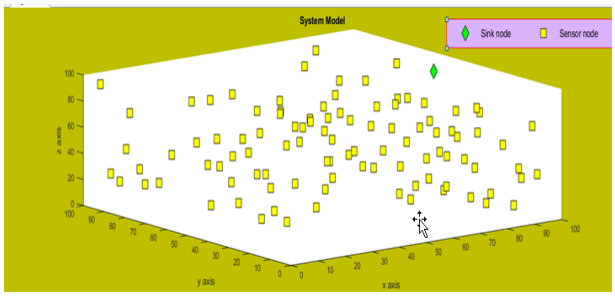

Fig 2 System Model.

The UASN is equipped with an acoustic sensor that uses batteries as a power source. Because It is difficult to replace these batteries in underwater systems using UASN. One way to alleviate this problem is to extend the life span of UASN batteries by reducing energy consumption (improving energy efficiency).

An algorithm for Energy Balanced Inequality Hierarchical Clustering (EULC) that can improve the efficiency of acoustic energy. The EULC algorithm generates a UASN with a layer that differs from the depth of the node, providing a solution to the "hot spot" problem by building different clusters of the same size. Simulation results show

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that the EULC algorithm correctly balances the energy in the UASN arena, extending the network life.

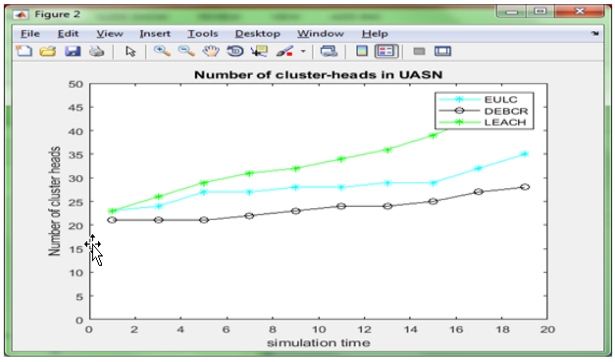

Fig 3. Cluster –Heads in UASN.

The change in the number of cluster heads can be used as a measure of clustering accuracy. Figure 3 shows the evolution of more than 20 cluster heads per algorithm. It can be seen that the number of clusters in the EULC and DEBCR clusters is more stable than the cluster clusters in the EELC.

This is because LEACH relies on a reliable metric to determine the number of clusters per cycle, and the metric that can exist on each side, while the EULC and DEBCR both consider the president cluster. Other non-physical properties. In particular, the use of the EULC diffraction method imposes a more precise flowering.

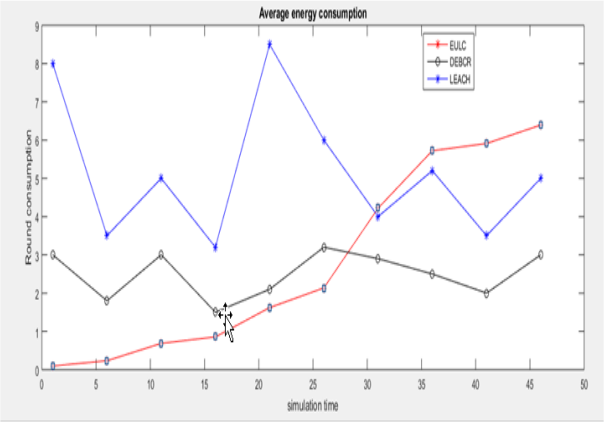

Fig 4. Average energy consumption Number of cluster-heads in UASN per node over one turn.

Figure 3 mshows the energy consumption of each revolution. It can be seen that LEACH has the highest value. Figure 4 shows the energy consumption of each node in a circle. Higher energy consumption and higher race, while EULC has the lowest energy consumption and the lowest reduction, indicating that the EULC algorithm has higher energy efficiency.

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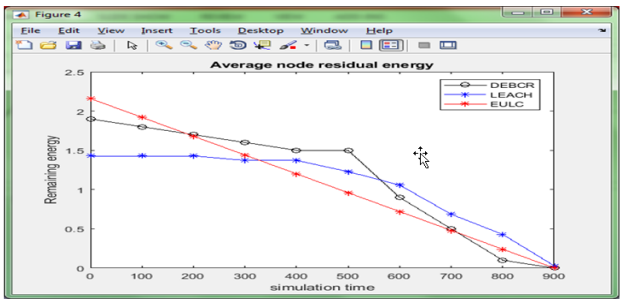

Fig 5. Average Node Residual Energy.

Figure 5 shows the change in residual energy as the number of chemical cycles increases. Of course, the highest average energy reduction in teaching is zero, with a maximum of 325 degrees. In contrast, EULC uses a non-uniform method and active modeling to solve effectively address the "hot spot" problem and balance the energy consumption by distributing energy between the nodes and within the cluster.

In EULC, cluster head selection is taken into account, which makes the cluster head propagation more uniform and the energy balance more balanced. The amount of packets received by the recipient under each algorithm is shown.

It can be seen that over a period of time, the packet receives a large amount of data packets under the EULC and DEBCR through the code contained within the LEACH algorithm. Of these three algorithms, EULC has successfully implemented the most efficient data packets from the cluster head, demonstrating that EULC can dramatically improve energy use rates. Calculate the energy, the other levels, and the distance of the flight.

Figure 6 shows the lifecycle of each algorithm, showing that as the number of rotations increases, the number of idle lifetimes decreases, and the time to die of the first node and all nodes is 30%. For LEACH, DEBCR and EULC, the first died at 208th, 587th and 609th. In the instruction, the energy consumption increases as the cluster head at a distance communicates directly with the sink node.

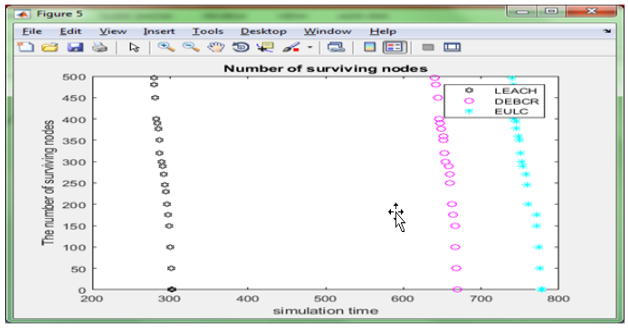

Fig 6. Number of Surviving Nodes.

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In DEBCR, the residual energy and the level of the nodes are taken into account when choosing the joint head, so the blood supply is uniform. In EULC, so that the propagation of the cluster head is the same and energy consumption is more balanced.

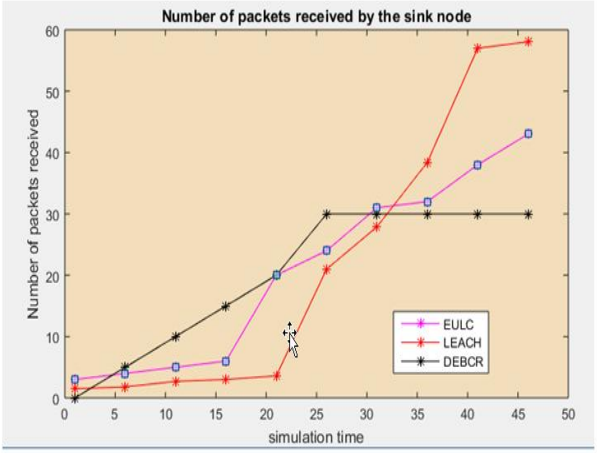

Fig 7. Shows the number of packets received by the sink.

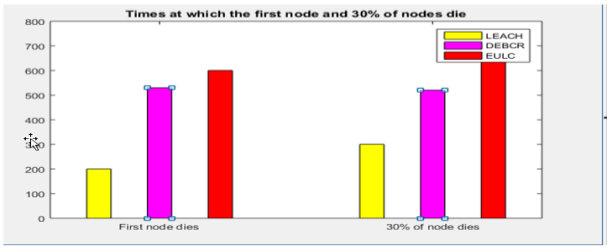

Fig 8. Times at which the first node and 30% of nodes die.

Node under each algorithm. It can be seen that over a period of time, the packet receives a large amount of data packets under the EULC and DEBCR through the code contained within the LEACH algorithm of these three algorithms, EULC has successfully implemented the most efficient data packets from the cluster head, demonstrating that EULC can dramatically improve energy use rates.

IV. CONCLUSION

Energy efficiency has a direct impact on the life of the UASN. In each cluster, the non-cluster head sends packets to the cluster head, and the cluster head integrates those packets and exports the results to the next cluster head, which is further synchronized and exported. going up. In EULC, each cluster's header contains the information table for the adjacent cluster.

This paper proposes the UASN standard for Energy Balanced Inequality Hierarchical Clustering (EULC). The main advantage of EULC is that the layers are not uniformly based on the depth of the sensor node; when selecting the cluster head, the remaining energy, the distance of the converter nodes and the height of the nodes; "Hot spot" problems; and it is based on the energy edge and node distance to determine the best hop response that EULC performs better than the DEBCR and LEACH algorithms in terms of energy consumption, head management cluster and network life, confirming it as EULC Success at UASN.

These protocols are analyzed based on the standard parameters that cover most of the basic aspects of the protocols on the path.

In addition, each protocol sharing technology will be briefly explained, as well as the advantages and disadvantages.

The survey plan falls into two main categories:

- A location-based protocol, that is, a routing protocol that requires geographical information for a node to successfully perform its operations, and
- A non-local protocol specifies a non-destructive protocol that does not require geographical coordination of a node to successfully perform its operations. Each of these categories is further divided into protests.

Most protocols that offer for the underwater acoustic sensor network consider statistical nodes and / or anchor nodes with limited mobility and ignore the free and nonspecific water sensor nodes together. in free float free. Position of motion. Sensor nodes cannot move freely in running water. Examining this situation will bring new challenges and major changes to the popular architectural system that is considered in most of the advanced designs offered by the submarine acoustic sensor network.
For example, with the free movement of the sensor node, the separation of the network becomes inevitable as the series moves nonstop over time. Network partitioning is not the same as the length of the connection, which refers to a situation where free movement causes the network to become unstable or two, with no access to the sink, or path. an old estimate that is outdated. Due to the change of information nearby.

In addition, in addition to network zoning, there is an expectation of increased connectivity. In addition to fluids, the evolution of communication may also occur due to changes in the environment, as a result of changes in the nature of radio waves under different conditions, such as heat and salt. This can lead to situations where previous nodes cannot be reached, which introduces network-related instabilities. In addition, the change in speed may also affect the positioning of genes, which may affect the operation of location-based strategies.

Another problem related to free theft of nodes is the constant change in network topology. For a network that is moving to the same stream, the top layer may not change in a short period of time because of the same river movement and the change in location. 'of relatives.

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However, in the older and the older times, the topology may change, resulting in reduced network incompatibility, that is, some networks may have greater error if, however, other areas are diverging and there are potential obstacles. It has created a need for protocols that may change their traffic policy in different parts of the network based on sparseness. Adding to this is the need to include mechanisms for implementing protocols to determine network availability.

The free movement of the shadow also determines the major changes in the network architecture of the network in most of the schemes offered. This design seems impossible because the sensor's mouth (moving freely with the flow of water) moves quickly through the door socket and cannot talk to the gutter. This makes it impossible to get the mental data. A push-on sink node can be used, which can monitor the water network and adjust its position by moving with the network and connecting to the water network.

In most test schemes dedicated to the water sensor network, nodes near the water level are often selected as repetitive due to their proximity to the flow flight.

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