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A Survey on Wireless Sensor Network of Acoustic Environment Types & Techniques

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Abstract- Underground Acoustic Networks (UAN) are made up of sensors that are placed in a certain sound area to work together to collect data and keep an eye on things. These networks are used so that different nodes and ground stations can talk to each other. The paper gives an outline of the problems with UAN communication. This paper is an overview of the work that other experts have done to improve WSN network standards, hardware, and other aspects. This article talks about different kinds of UAN networks and route methods that use less energy to send packets. The last part of this piece is a list of assessment criteria for comparing techniques.

Index Terms- Energy Optimization, Clustering, UAN, Routing, Channel Optimization

I. INTRODUCTION

Radio Frequency (RF) employed for terrestrial wireless communication is also enabled for Acoustic communication; it achieves high data rate for short communication range and suffers from Doppler Effect. Optical transmissions also used for the marine environment where the blue-green wavelength is recommended for transmission that requires line-of-sight positioning. Another technology is the magnetic induction that is mostly used for internet of Acoustic things enabling real-time communication with significant bandwidth since its independent of the environmental impairments multipath fading and time-varying signal distortion. However, two issues restrict the use of this technology. Path loss caused by coupling and conductivity between coils. The near-field property due to the non-propagating property of the magnetic wave in the absence of the electric component. The latter technology is acoustic communication, which is the most popular in the Acoustic communications for its long communication range. Researchers working on the development of Acoustic sensor network should consider a design of a long-term goal that gives self-configuration ability for distributed sensor nodes within the network.

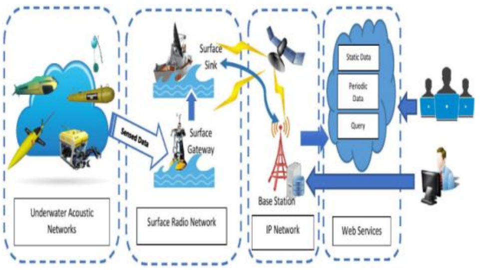

Fig. 1 Acousticacoustic network.

The AWN is a network used to perform monitoring of tasks over a specific region; it is equipped with smart sensors and vehicles that are adapted to communicate cooperatively through wireless connections [1]. The surface sink retrieves the data from sensor nodes. The sink node has a transceiver that can control acoustic signals received from Acoustic nodes. The transceiver also can transmit and receive long-range radio frequency signals for communication with the onshore station. The collected data are used locally or connected to another network for a particular purpose [2]. Figure 2 illustrates an overview of the AWN environment. The network architecture incorporates traditional acoustic wireless sensor networks designed by [3] and real-time acoustic wireless sensor network architecture in the form of Internet of Acoustic Things proposed.

II.CHALLENGES OF ACOUSTIC NETWORK

AWN is an exciting new field that could help us learn more about the unknown world of sound. It also comes with a lot of challenges and chances.

1. An unpredictable sound environment. The factors for sound are very hard to predict. It is hard to build and set up AWNs because the high water pressure, random sound activities, and uneven sound surface depths make it hard to do so.
2. Hard to design and set up networks. It is very hard to set up an acoustic network that works reliably and wirelessly because the surroundings is so random. The tethered technology we have now only allows limited contact, but it costs a lot to set up, maintain, and recover devices in unstable underwater circumstances.
3. Inability to grow. Most of the time, either a single expensive sound device or a small network of sound

devices are used for traditional sound exploring. Neither of the technologies we have now can be used for tasks that cover a large area. To explore a very large sound area, you need to be able to use a scalable audio sensor network technology.

4. Information You Can't Trust. Because the water currents are always moving the sound nodes, it becomes much more important to find them. Acoustic systems don't work with traditional systems for tracking and location. Because of this, acoustic conditions change where the nodes are located and the structure of the network, which makes the transfer of information less reliable.

III.RELATED WORK

In [7], the most recent analysis of the available evidence is presented through a review of five-year-old studies on various aspects that enable network activities and implementations in AIASNO environments. This work was motivated by the need for robust and adaptable solutions that can meet the requirements for the rapid development of wireless sensor networks submerged in water. This paper defines the vital requirements for accomplishing essential services and common AIASNO platforms. It also contributes a classification of the critical elements in AIASNOs by classifying architectural elements, connectivity, routing protocols and standards, security, and AIASNO applications.

In [8] authorpresents a "reliable multipath energy-efficient routing protocol (RMEER)". This research aims to increase the network's lifetime and determine the optimal route for delivering information to the intended destination. The entire network is separated into five distinct, equal layers. The final destination node is situated atop the water's surface, and powerful static carriers are deployed in the surprisingly. The final network layer consists of standard sensor nodes. Following the multipath data routing mechanism, the information is delivered. Multiple sinks utilizing the multipath disjoint algorithm are utilized to enhance the packet delivery ratio. In this algorithm, if a node expires, an alternate usage of advanced will bypass the route of the deceased node [9]. The process of data forwarding is defined by a routing table. The courier node transmits a greeting packet; after receiving this packet, each source node changes its routing table. This table includes the residual energy, the link quality, and the ID of the node. By analyzing all of these parameters, the optimal forwarder node for data transmission to the sink is chosen.

Cooperation and multihop energy-efficient routing techniques for UA-WSNs are introduced in [10]. The data is produced by the nodes, and a multihop algorithm routes this information to the receivers. One-hop communication is introduced with a cooperation scheme to increase network reliability. The data transmission phase is completed in two phases. In the first phase, the forwarder node receives the data, and in the second phase, the forwarder node and one relay node are configured to transmit the data. When both forwarders get the information, the MRC technique is used to combine the two packets into a single, reliable packet. RSS is an algorithm that measures the relative distance between nodes. The effects of the proposed scheme provide the greatest energy and network stability responses.

The fuzzy vector technique, which addresses delay reduction and battery life issues, is determined in [11]. This is a sophisticated variant that employs fuzzy logic technique (FLT). The source generates data and then transmits it to the sink via a multihop mechanism, taking into account the utmost residual energy for data transmission. The optimal forwarder selection is determined by the residual energy and node position. All of the source's neighbours receive the data packet when it is broadcast. One optimal neighbour is selected to send information to the following neighbour. The selected node's residual energy should be maximised so that it does not expire quickly, and its distance from the sink node should be minimised. The experimental results provide the fastest data transmission speeds, and the network has the greatest number of active nodes.

In [12], author proposed a novel machine learning-based clus-tering and routing scheme, named energy-efcient clustering and cooperative routing based on improved K-means and Q-learning (ECRKQ), to reduce and balance energy consumption among sensor nodes in a mobile UASN and improve the bandwidth utilization. In the cluster head (CH) selection stage, ECRKQ modies the K-means algorithm to dynamically select a CH based on the residual energy of the node and the distance from the node to the centroid in a cluster. In the clustering stage, ECRKQ adopts the Q-learning algorithm by incorporating the residual energy of the CH, the energy consumption of data transmission from the node to the CH, and the energy consumption of the data transmission from the CH to the base station into the Q-value function. In the data transmission stage, ECRKQ applies the dynamic coded cooperation (DCC) transmission to improve the bandwidth utilization and the robustness of the underwater communications. In the DCC transmission, cooperative nodes are also dynamically selected based on the residual energy and the energy consumption of transmitting a packet to their destinations.

IV.APPLICATION OF ASN

1.Military applications

The military sector was the first human activity to deploy WSNs, and it is also said to have sparked interest in sensor network research.49 These early research projects, which were conducted in the late 1990s to create sensor nodes capable of performing espionage operations despite their incredibly small size, are best exemplified by Smart Dust.Due to recent technology advancements, WSNs may now handle a

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variety of operations. The three primary subcategories of the military uses of WSNs, such as battlefield surveillance, combat monitoring, and intruder detection, as well as the most typical sensor types utilized in each, are depicted.

2.Health applications
Wireless sensor networks are used in the healthcare industry to track patients' vital indicators, including temperature, blood pressure, and heart rate. Using wearable electronics, healthcare providers may provide real-time monitoring of patients' vitals both inside and outside of healthcare facilities, such as hospitals and nursing homes. Patient wearable monitoring, home assistance systems and hospital patient surveillance are the three primary subcategories of health applications of WSNs that are presented together with the types of sensors that are most frequently employed in them.

3.Environmental applications
Wireless sensor networks can be used to enhance environmental applications that seek continuous surveillance of ambient conditions in dangerous and distant locations.60 The primary environmental applications of WSNs are water checking, air checking, recognizing floods, earthquakes, volcanic eruptions, air pollution and emergency alerting.

4.Wildlife and plants applications
Every nation needs its wildlife and plants. The primary subcategories of wildlife and plant applications of WSNs, namely greenhouse monitoring, crop monitoring, and livestock husbandry, are presented together with the most typical sensor types utilised in them.

5.Industrial applications
Wireless sensor networks may be used in a variety of industrial applications to address a wide range of connected issues.64 The three primary industrial uses of WSNs are machinery health surveillance, robots, and logistical.

6.Urban applications
Wireless sensor networks' wide range of sensing capabilities also provides users with the chance to learn an unparalleled amount of data about a target region, whether it be inside or outside of a structure or apartment. There are various uses for WSNs, which are a tool for measuring the spatial and temporal characteristics of any phenomenon in an urban setting. Smart homes, smart cities, transportation systems, and structural health monitoring are the most widely used WSN applications in the urban setting.

V. CONCLUSION

Acoustic Wireless Networks (AWNs) are made up of cars and sensors that are placed in a certain sound area to work together to collect data and keep an eye on things. These networks are used so that different nodes and ground stations can talk to each other. There are problems and issues with AWNs right now, including low bandwidth, long transmission delays, 3D layout, media access control, routing, resource use, and power limits. Because of the changing nature of the acoustic world, some of these problems and issues are still not solved, even though researchers have come up with many ways to solve them over the last few decades. This paper talks about a lot of different ways to improve Acoustic networks. According to past studies, most of the work is about making the best use of energy. In the future, scientists will be able to come up with an energy-efficient program that is based on sound conditions.

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