International Journal for Research in Science Engineering and Technology

A REVIEW ON UNDERWATER WIRELESS SENSOR NETWORK DIFFERENT ROUTING PROTOCOLS

[1] P. Sathya, [2] Dr. P. Sengottuvelan
[1] Ph.D Research scholar, [2] Associate Professor,
[1,2] Department of Computer Science,
[1,2] Periyar University PG Extension Centre,
[1,2] Dharmapuri, Tamilnadu, India.

ABSTRACT - A wireless sensor network (WSN) has significant applications, for example, remote environmental monitoring and target following. This has been empowered by the accessibility, especially lately, of sensors that are littler, less expensive, and keen. In submerged milieus, the sensor networks face a perilous circumstance because of inherent water nature. Be that as it may, critical challenges in this worry are high power consumption of acoustic modem, high proliferation inertness in data transmission, and dynamic geography of nodes because of wave developments. Directing protocols working in UWSN has low security period because of expanded data flooding which makes nodes terminate rapidly because of pointless data sending and high vitality consumption. In this paper, we are introducing a complete survey of various steering protocols utilized in UWSN.

Keywords: [wireless sensor network, Routing protocols, Underwater wireless Sensor Network, energy consumption.]

1. INTRODUCTION

Wireless sensor network is a wireless comprising of huge number of dispersed low power and in costly gadgets. Sensor nodes are hoping to be battery worked. Sensor nodes have the accompanying asset limitations Communication Power consumption, Computation, Uncertainty in sensor readings. A WSN regularly has practically no foundation. It comprises of various sensor nodes (not many tens to thousands) cooperating to screen an area to acquire data about the earth. There are two kinds of WSNs: organized and unstructured. An unstructured WSN is one that contains a thick collection of sensor nodes.
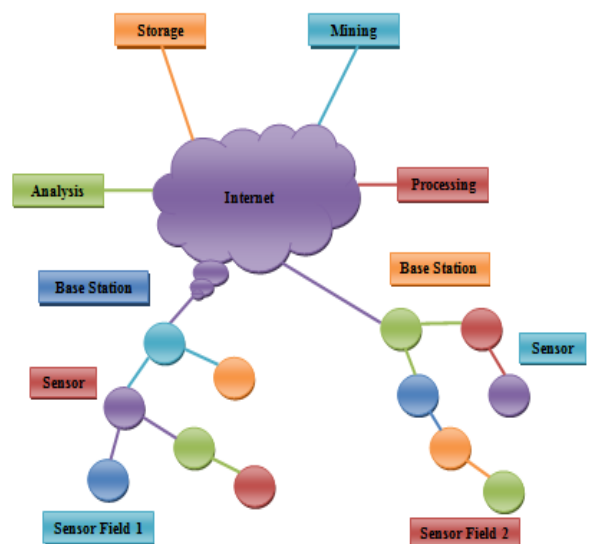

Figure 1: Basic Structure of WSN

The sensor hubs are ordinarily dissipated in a sensor field as shown in Fig. Every one of these dissipated sensor hubs has the proficiencies to accumulate data and course data again to the sink and the end clients. Data are coordinated by and by to the end customer by a multi skip framework less development displaying through the sink as shown in Fig. The sink may compare with the task boss hub through Web or Satellite. This sensor hub indicated WINS is made in, where a passed on framework and Web access is given to the sensor hubs, controls, and processors. Since the sensor hubs are in broad number, the WINS frameworks misuse this short detachment between sensor hubs to give multi skip correspondence and limit power usage.

Later quite a while have additionally observed a quickly developing trend towards the utilization of sensor networks in submerged situations, i.e., building Underwater Wireless Sensor Networks (UWSNs). Wireless submerged networking is the empowering innovation for ocean applications. Submerged sensor network comprises of a variable number of sensors and vehicles that are sent to perform collective monitoring assignments over a given zone. To accomplish this target, sensors and vehicles self-organize in a self-sufficient network which can adjust to the qualities of the ocean condition. Submerged networks can be portrayed by their spatial inclusion and by the thickness of nodes. As a rising region, submerged wireless sensor network has pulled in quickly developing interests in most recent quite a while. From one viewpoint, UWSNs empower a wide scope of sea-going applications, for example, oceanographic data collection, pollution monitoring, offshore exploration, disaster prevention and tactical surveillance applications, ocean sampling network, submarine detection, disaster prevention, and so on. Then again, the unfavorable submerged conditions present grand challenges for productive communication and networking. In submerged situations, because of water retention, radio doesn't function admirably.

2. LITERATURE SURVEY

Routing Protocols

The routing is the essential assignment of network layer used to decide the course from source to objective. The network layer is the chairman that tells how the messages are steered inside the networks. In Underwater WSN; routing is not quite the same as the earthly WSN due restricted measure of transfer speed, hub portability for sea current and start to finish delay in data packet transmission. In this way, so as to hold the network together, there is a need to build up the routing methodologies. The plan of routing protocol for UWSN is worried about sparing vitality and hub portability in the long haul non-time basic applications. The analysts have put forth various attempts to create productive routing protocol while thinking about the interesting attributes of underwater network. There are mostly three classes in particular that decide the way:

1. Proactive Routing Protocols (Table Driven):

The center capacity of this protocol is to keep up the routing table containing all routing information to discover courses from hub to hub. This protocol diminishes message dormancy brought by routing revelation. The proactive routing protocol initially produces a sign on predefined course to set up the course. All nodes update course information in their routing table. The protocol builds up the course in light of the fact that each time topology is changed because of connection disappointment and hub disappointment in underwater wireless sensor networks. In UWSN, memory and vitality are primary motivations to keep away from the proactive routing protocol in UWSN.

2. Reactive Routing Protocols:

In reactive routing protocol, nodes start the course discovering measure when a course is expected to objective. When course is set up, it is kept up by routing table and is stayed in routing table until it is required. This protocol

is more suitable for dynamic conditions. This protocol is generally utilized by source started by flooding strategy. This outcomes an expansion in message inertness unsuitable for UWSNs.

3. Geographic Routing Protocols:

Source to objective way is set up in geographic protocol by controlling location information. In this situation, source hub chooses next forwarder hub that depends on the location information of neighbor hub. In the underwater conditions, it is trying to achieve a precise location information because of the hub development in water current.

1. Zhenghao Xi, Xiu Kan, Le Cao, Huaping Liu, Gunasekaran Manogaran, George Mastorakis, Constandinos and X. Mavromoustakis (2019) proposed the MAC protocol and location algorithm of wireless sensor networks. This paper presents the typical underwater MAC protocol, and separates the joined incorporated situating algorithm and dispersed situating algorithm in detail for the current underwater arranging estimation. An underwater multi-channel MAC protocol with mix arranging is proposed. The sensibility issue and triple covered terminal issue of underwater multi-channel MAC protocol design are dismembered. Taking into account a single handset and underwater arranging data, an underwater multi-channel MAC protocol is arranged. By deferring the transmission of CTS packages for some time, the fairness issue is facilitated; by checking out the channel use clarification sent by various nodes and checking the utilization of the information sub channel, the correct channel assurance and use data is gained, and the triple covered terminal issue is lit up. The back-off part of the control sub channel is destitute somewhere near the discrete Markov chain model, and the network throughput calculation explanation is given reliant on this.

2. Gang Zhao, Yaxu Li and Lina Zhang (2019) proposed SSEEP: State-Switchable Energy-Conserving Routing Protocol for Heterogeneous Wireless Sensor Networks. Along these lines, this paper proposes an improved clustering protocol with data transmission status switchable, which can be used in heterogeneous sensor networks. cluster heads channel the obvious data and start information transmission connection, and a while later send information to the sink when the data power evident outperforms as far as possible. Something different, cluster heads record the got information and continue tolerating information sent by the accompanying round of cluster nodes. The creators fortunately found in the generation results that the network lifetime is drawn out a couple of times than the protocol of LEACH.

3. Nadeem Javaid, Hammad Maqsood, Abdul Wadood, Iftikhar Azim Niaz, Ahmad Almogren, Atif Alamri, and Manzoor Ilahi (2017) proposed two routing protocols are (I) an AUV based hub localization conspire (MobiL-AUV) and (ii) a helpful routing protocol (CO-MobiL) for limit the localization and upgrade the network throughput with productive vitality utilization. MobiL-AUV is proposed for the limitation of the network. At the present time, flexible AUVs are sent and furnished with GPS and go about as reference nodes. With the help of these reference nodes, all the typical sensor nodes in the network are limited. It achieved almost low restriction mix-up and high network incorporation considering less detachment between portable AUVs and nodes. On the other hand, CO-MobiL is acquainted with utilize the restriction done by the MobiLAUV. At this moment, network is parceled into two areas that restricted the information load and reduced the imperativeness use of sensor nodes passed on near the sink. The usage of MRC as different assortment technique updated the network throughput, in any case, to the detriment of essentialness.

4. Yishan Su , Yongpeng Zuo, Zhigang Jin , and Xiaomei Fu (2019) proposed an OFDMA-based Subcarriers Pregrouping MAC protocol called OSPG-MAC for underwater acoustic wireless sensor networks. The essential component of OSPG-MAC is the undertaking of subcarriers to neighboring nodes as subchannels containing sets of fixed subcarriers. This licenses concurrent transmission between neighboring nodes while keeping up a key good ways from impacts. Box our proposed subchannel portion plot, OSPG-MAC can murder the covered terminal and revealed terminal issues that are knowledgeable about most other UAWSN MAC protocols. To expand the supreme throughput on the relating subchannels, a piece and force distribution algorithm for the protocol, named OSPG-MAC, which unites the advantages of the water-filling and rapacious algorithms, is proposed. Te key idea of the OSPG-MAC algorithm is to assess the discrete assessments of the force and throughput on each subcarrier through one accentuation by a water-filling algorithm and subsequently figure the particular discrete assessments of the force and throughput on each subcarrier by an avaricious algorithm. Differentiated and the conventional eager algorithm, which determines the assessments of the force and throughput from zero direct, the computational multifaceted nature of their algorithm.

5. Fang Zhu and Junfang Wei (2018) proposed an Energy Efficient Routing Protocol Based on Layers and Unequal Clusters in Underwater Wireless Sensor Networks. At this moment, impediment free routing protocol, named imperativeness capable routing protocol reliant on layers and inconsistent clusters (EERBLC) is proposed. EERBLC protocol involves three phases: layer and inconsistent cluster plan, transmission routing, upkeep and update of clusters. In the chief stage, the watching an area under the water is secluded into layers, the nodes in a comparative layer are clustered. For modifying imperativeness of the whole organization and keeping up a vital good ways from the "hotspot" issue, a novel inconsistent clustering technique subject to layers for UWSNs is proposed, in which another calculation methodology for inconsistent cluster size is displayed. Meanwhile, another cluster head decision instrument reliant on essentialness evening out and degree is given. In the transmission stage, EERBLC protocol proposes a novel next forwarder decision methodology reliant on the sending extent and the waiting imperativeness. In the third stage, Intra and bury cluster invigorating technique is presented.

6. Abdulkadir Celik, Nasir Saeed, Basem Shihada, Tareq Y. Al-Naffouri, and Mohamed-Slim Alouini (2019) proposed a circulated Sector-based Opportunistic Routing (SectOR) protocol. Not in the slightest degree like the standard routing systems which unicast bundles to a unique hand-off, keen routing (OR) spotlights on a ton of candidate moves by using the convey thought of the UOWC channel. Or of course is especially sensible for UOWNs as the association accessibility can be upset viably on account of the underwater channel weaknesses (e.g., pointing botches, misalignment, unevenness, etc.) and sea creatures experiencing the handsets' view. In such cases, OR improves the package movement extent as the likelihood of having in any occasion one powerful group gathering is much higher than that in standard unicast routing. Subordinate upon the display depiction of a single bob associate, they get separation progress (DP) and foreseen (DP) estimations to evaluate the wellbeing of a candidate set (CS) and arrange the people from a CS. Since rateøerror and rangeøbeamwidth tradeoffs yield particular contender set good assortments, they develop an up-and-comer assurance and prioritization (CSPA) algorithm to find the ideal part framed consideration area by separating the conceivable request space. Also, a cross variety acoustic/optic coordination framework

is considered to dodge duplicate transmission of the exchanges.

7. Ziaur Rahman, Fazirulhisyam Hashim, Mohd Fadlee A. Rasid, Mohamed Othman (2018) proposed a various leveled confinement conspire, and based on that they planned a novel anycast, beneficiary based artful and geographical routing protocol for UWSN. Nodes are confined with the help of trilateration and TOA, and node region information close by its extra imperativeness is used to find the best available sending node in a closer proximity to the objective. Thusly extraordinary short and dynamic connections are united to send data to the sink. They mulled over, the effects of the channel characteristics on through and through deferral, essentialness capability, and package transport extent with various node thickness. Wide multiplications were performed to survey the introduction of the proposed scheme interestingly with some current related routing protocols. Recreation shows that TORA extends network lifetime by improving essentialness adequacy, manufactures pack transport extent while lessens through and through deferment and spread deviation factor.

8. Mehr Yahya Durrani, Rehan Tariq, Farhan Aadi, Muazzam Maqsood, Yunyoung Nam and Khan Muhammad (2019) proposed a routing protocol named adaptive node clustering technique for shrewd sea underwater sensor organization (SOSNET). The embodiment of the proposed routing protocol, SOSNET, is disengaging the UWSN into different clusters and working up a fruitful novel clustering plan for assurance of a cluster head at risk for coordination with sink nodes. The decision of the cluster head will depend upon open imperativeness in a sensor node. At the point when the essentialness of a cluster head lessens from a given edge, another cluster head is picked through a political race segment. SOSNET uses a moth fire enhancer (MFO) based framework for picking a near ideal number of clusters required for routing. MFO is a bio spurred improvement technique, which thinks about the advancement of moths towards light. The SOSNET algorithm is differentiated and other bio inspired algorithms, for instance, thorough learning molecule swarm optimization (CLPSO), insect province optimization (ACO), and dark wolf optimization (GWO). All of these algorithms are used for routing upgrade. The introduction estimations used for this assessment are transmission extent of nodes, node thickness, and system size. These boundaries are moved during the reenactment, and the results exhibit that SOSNET performed better than various algorithms.

9. Mukhtiar Ahmed, Mazleena Salleh & M.Ibrahim Channa (2018) proposed Clustered-Based Energy Efficient Routing (CBE2R) protocol. CBE2R controls the node adaptability and hauls out the battery force of nodes by dividing the water significance into seven amounts of layers from top to seabed. CBE2R draws out the battery power through inconceivable static messenger nodes which are sent from sea surface to seabed on different layers. Clustered-based routing instrument with most raised weighted an impetus for data sending relies upon seabed to base layer messenger nodes through standard nodes. Base layer messenger nodes assembles the information from regular nodes and advances to surface sink nodes by most outrageous power levels (p1, p2, … .., pn-1) through dispatch nodes which are sent in different layers. For execution examination the NS2.30 with AquaSim is used. The generation delayed consequences of CBE2R are differentiated and essentialness capable REEP, EMGGR, and DRP. From propagation results it is seen that the display CBE2R is higher than REEP, EMGGR, and DRP.

10. R.Vithiya , G.Sharmila , S.Karthika, (2018) improved the show of LOARP, AODV and DSR routing shows. This assessment

relies upon the packet delivery ratio, start to finish deferral and throughput. The preliminary outcomes show that by growing the quantity of nodes, portability and control overhead. In this paper, a low overhead routing protocol is proposed and its display is contrasted and the two most popular protocols (AODV and DSR) in the responsive class. The outcome shows that LOARP performs better than two protocols to the extent throughput, packet delivery ratio, all the way postponement and control overhead. In order to improve the presentation of LOARP, distinctive protocol should be researched. The proposed routing protocol performs course disclosure and course upkeep stage which endeavors to restrict the organization data and packet sway. A low overhead routing protocol lessens the routing overhead by having a cheaper course uphold system than the current protocol. So the display of proposed routing protocol is thought about and two most existing routing v, accordingly assessed similarly as organization throughput, packet delivery ratio, normal start to finish

postponement and control overhead. The creators will use the NS2.34 test framework for separating the routing protocol.

11. Abrar S. Alhazmi, Abdellatif I. Moustafa, and Fahd M. AlDosari (2018) presents a novel technique that was proposed based on the LEACH protocol. This proposed arrangement means to improve the vitality capability of Le Ac H protocol and modifying it to UWSNs. As a matter of fact, this work expands this protocol using the restriction thought and TDMA arranging. This paper proposed another commercial stage that comprises of a Cluster Formation measure and a Clustering cycle. A recreation circumstance was proposed using MATLAB to survey the introduction. Recreation results demonstrated that the proposed approach beat standard LEACH protocol as it further diminished the overall vitality utilization of the organization on typical by over 30%. UWSNs can be described as a ton of micromechanical sensors that can identify, figure, and wirelessly pass on among themselves.

Author Name	Proposed Method	Advantages	Disadvantages
Zhenghao Xi, Xiu Kan, Le Cao, Huaping Liu, Gunasekaran Manogaran, George Mastorakis, Constandinos and X. Mavromoustakis (2019)	Proposed the MAC protocol and location algorithm of wireless sensor networks.	It can enough improve the tolerability list and suitably improve the throughput of the organization.	Need careful synchronization information, the amount of conveyor channels that can be cultivated is obliged.
Gang Zhao, Yaxu Li and Lina Zhang (2019)	Proposed SSEEP: State-Switchable Energy-Conserving Routing Protocol for Heterogeneous Wireless Sensor Networks	Moreover, this technique has mind boggling adaptability	It needn't bother with any pre-set area data of nodes. so it is appropriate for huge scope networks.
Nadeem Javaid, Hammad Maqsood, Abdul Wadood, Iftikhar Azim Niaz, Ahmad Almogren, Atif Alamri, and Manzoor Ilahi (2017)	Proposed two routing protocols are (I) an AUV based node localization conspire (MobiL-AUV) and (ii) a helpful routing protocol (CO-	MobiL-AUV performs better similarly as organization incorporation and impediment accomplishment extent than MobiL and UDB. CO-MobiL beat its idea about existing plans (ACE-SingleRetransmission and	Huge separation between typical nodes and reference nodes achieving limitation goof.

	MobiL).	ACEDoubleRetransmission) to the extent throughput and essentialness usage .	
Yishan Su , Yongpeng Zuo, Zhigang Jin , and Xiaomei Fu (2019)	Proposed an OFDMA-based Subcarriers Pregrouping MAC protocol called OSPG-MAC for underwater acoustic wireless sensor networks.	This can in like manner find the most extraordinary assessment of the full scale throughput, is immensely decreased.	The OFDMA signal has a clatter like plentifulness with an uncommonly gigantic exceptional range, in this way it requires RF power speakers with a high top to average power extent.
Fang Zhu and Junfang Wei (2018)	Proposed an Energy Efficient Routing Protocol Based on Layers and Unequal Clusters in Underwater Wireless Sensor Networks.	Tooth Zhu and Junfang Wei (2018) The EERBLC can reasonably change the essentialness use, draw out the organization lifetime. It increase the proportion of data transmission differentiated and DBR and EEDBR protocols.	The proposed EERBLC has low reliability.
Abdulkadir Celik, Nasir Saeed, Basem Shihada, Tareq Y. Al-Naffouri, and Mohamed-Slim Alouini (2019)	Proposed an appropriated Sector-based Opportunistic Routing (SectOR) protocol.	SectOR protocol can perform far better than an ideal unicast routing protocol in especially related UOWNs.	Infrastructure or administrations conveyed could be more costly.
Ziaur Rahman, Fazirulhisyam Hashim, Mohd Fadlee A. Rasid, Mohamed Othman (2018)	Proposed a progressive localization conspire, and based on that they planned a novel anycast, recipient based entrepreneurial and geographical routing protocol for UWSN.	The proposed routing protocol expands network lifetime by improving essentialness efficiency and bundle transport extent while diminishing all the way deferral and spread deviation factor	It can't find the ideal courses and forward data through these courses to the sink node.
Mehr Yahya Durrani, Rehan Tariq, Farhan Aadi, Muazzam Maqsood, Yunyoung Nam and Khan Muhammad (2019)	Proposed a routing protocol named versatile node grouping technique for shrewd sea underwater sensor organization (SOSNET).	SOSNET is an ideal plan that can be grasped for routing in the said networks. It gives a near ideal number of clusters required for routing, and this finally results in reducing the routing cost similarly as the safeguarding of imperativeness in the nodes.	Complicated and relatively resolute in light of inconceivability to imagine and assess all specific occasions that could impact the future action.
Mukhtiar Ahmed, Mazleena Salleh &	Proposed Clustered-Based	CBE2R controls the node adaptability through obliged	CBE2R the routing tables are not used

M.Ibrahim Channa (2018)	Energy Efficient Routing (CBE2R) protocol.	great ways from layer_7 to seabed source node. CBE2R defers the battery force of basic nodes through use of ground-breaking messenger nodes.	considering the way that it depends upon most vital weighted characteristics.
R.Vithiya , G.Sharmila , S.Karthika, (2018)	Improved the presentation of LOARP, AODV and DSR routing conventions	The routing protocol that can receive the assortment of underwater conditions over a period so which fulfills the underwater standards as well.	The very low information may emerge difficult issue in channel. It requires solid synchronization however it difficult to accomplish in underwater.
Abrar S. Alhazmi, Abdellatif I. Moustafa, and Fahd M. AlDosari (2018)	present a novel technique that was proposed based on the LEACH protocol.	It can be seen that the general energy is fundamentally diminished when utilizing our proposed change in correlation with the traditional LEACH. The idea of bunching with localization is utilized to limit the energy consumption.	Load balance between the distinctive CHs inside the organization isn't ordinarily accomplished.

CONCLUSION

WSN are a broadly relevant, major rising innovation. They bring an entire host of novel exploration challenges relating to energy productivity, robustness, scalability, self-configuration, and so forth. These difficulties must be handled at various levels through various protocols and components. It's a fascinating intricate, new innovation. The UWSN routing protocols are contemplated and assessed identified with the organization condition and quality estimates, for example, the start to finish delay, dynamic organization geography, energy utilization and packet delivery ratio. The benefits and bad marks of each routing protocol are additionally featured. Heaps of exploration still to be finished existing fractional arrangements offers a lot of trust later on, yet much work stays to be finished.

REFERENCES

[1]. Zhenghao Xi, Xiu Kan, Le Cao, Huaping Liu, Gunasekaran Manogaran, George Mastorakis, Constandinos and X. Mavromoustakis (2019), "Research on Underwater Wireless Sensor Network and MAC Protocol and Location Algorithm", **DOI:** 10.1109/ACCESS.2019.2901375, **Electronic ISSN:** 2169-3536, IEEE.

[2]. Gang Zhao, Yaxu Li and Lina Zhang (2019), "SSEEP: State-Switchable Energy-Conserving Routing Protocol for Heterogeneous Wireless Sensor Networks", **DOI:** 10.1109/ICEIEC.2019.8784570, **Electronic ISBN:** 978-1-7281-1190-2.

[3]. Nadeem Javaid, Hammad Maqsood, Abdul Wadood, Iftikhar Azim Niaz, Ahmad Almogren, Atif Alamri, and Manzoor Ilahi (2017), "A Localization Based Cooperative Routing Protocol for Underwater Wireless Sensor Networks", https://doi.org/10.1155/2017/7954175, Hindawi.

[4]. Yishan Su , Yongpeng Zuo, Zhigang Jin , and Xiaomei Fu (2019), "OSPG-MAC: An OFDMA-Based Subcarrier Pregrouping MAC Protocol for Underwater Acoustic Wireless

Sensor Networks", https://doi.org/10.1155/2019/4965231, Article ID 4965231, Hindawi Journal of Sensors.

[5]. Fang Zhu and Junfang Wei (2018), "An Energy Efficient Routing Protocol Based on Layers and Unequal Clusters in Underwater Wireless Sensor Networks", Article ID 5835730, https://doi.org/10.1155/2018/5835730, Hindawi Journal of Sensors.

[6]. Abdulkadir Celik, Nasir Saeed, Basem Shihada, Tareq Y. Al-Naffouri, and Mohamed-Slim Alouini (2019), "SectOR: Sector-Based Opportunistic Routing Protocol for Underwater Optical Wireless Networks", **DOI:** 10.1109/WCNC.2019.8885722, **Electronic ISSN:** 1558-2612, IEEE.

[7]. Ziaur Rahman, Fazirulhisyam Hashim, Mohd Fadlee A. Rasid, Mohamed Othman (2018), "Totally opportunistic routing algorithm (TORA) for underwater wireless sensor network", . https://doi.org/10.1371/journal.pone.0197087, PLOS ONE.

[8]. Mehr Yahya Durrani, Rehan Tariq, Farhan Aadi, Muazzam Maqsood, Yunyoung Nam and Khan Muhammad (2019), "Adaptive Node Clustering Technique for Smart Ocean under Water Sensor Network (SOSNET)", doi: 10.3390/s19051145, Sensors 2019, 19, 1145; doi:10.3390/s19051145.

[9]. Mukhtiar Ahmed, Mazleena Salleh & M.Ibrahim Channa (2018), "CBE2R: Clustered-Based Energy Efficient Routing Protocol for Underwater Wireless Sensor Network", ISSN: 0020-7217 (Print) 1362-3060 (Online), https://doi.org/10.1080/00207217.2018.1494323.

[10]. R.Vithiya , G.Sharmila , S.Karthika, "Enhancing the Performance of Routing Protocol in Underwater Acoustic Sensor Networks". **ISBN:** 978-1-5386-4866-7, DOI: 10.1109/ICSCAN.2018.8541155.

[11]. Abrar S. Alhazmi, Abdellatif I. Moustafa, and Fahd M. AlDosari , "Energy Aware Approach For Underwater Wireless Sensor Networks Scheduling: UMOD_LEACH", ISBN: 978-1-5386-4110-1, DOI: 10.1109/NCG.2018.8593112, IEEE.