Research Article

Optimal Delay and Lifetime Aware Depth Based Routing for Underwater Optical Wireless Sensor Networks

Meenu Rani & Poonam Singal
Research Scholar, Department of Electronics & Communication Engineering, Deenbandhu Chhotu Ram University of Science and Technology, Murthal, 131039, Haryana, India

Article History: Received: 11 January 2021; Revised: 12 February 2021; Accepted: 27 March 2021; Published online: 4 June 2021

Abstract: Underwater optical wireless sensor network (UOWSN) is an emerging technology in the wireless sensor network that has been used for different applications are natural catastrophe advance warning devices, tracking biodiversity, oil boiling and government surveillance. Although electromagnetic or optical waves could be used for communicating submerged, for realistic UOWSN such approaches are not necessary. The electromagnetic transmission via liquid ammonia promotes only at large distances with lower frequencies because of signal integrity. UOWSN faces several issues like restricted bandwidth, increased propagation delay, irregular node mobility which affects the routing behaviours in such environment. We suggest an effective mechanism on distance dependent routing (ODLDR) lag and lifespan in this article for UOWSN. First, we introduce group partitioning algorithm for cluster formation that reduce the use of resources of network. Second, an efficient priority based scheduling algorithm proposed for trust computation, which finalize the CH and routing path. The simulation results show that the effectiveness of proposed ODLDR protocol package delivery rate, tracking reliability, side-to-end lag, transmission and service life in terms of resource usage.

Key words: Channel (CH), Network Lifetime, Underwater Wireless Sensor Network, Optimal Delay and Lifetime Aware Depth Routing Protocol (ODLDR).

1. Introduction

Undersea modelling, surveying and supervising are presently were using electronically or with affordable hard-to-water automobiles or internal instruments for environmental science, safety and environmental activities [1]. The network adapters can be used for submarine applications, including ocean and earth's surface supervising and various military, ecological and industrial uses. The sensor nodes in the UOWSN networks [2][3] surround a specific area of the sea, in order to detect those characteristics, and to warn the onshore data center in front of its surface of the water. The detector knot contact one another in order to determine and then use the routes that are best with regard to a certain choice when relaying data packets from below to the surface of the water. The UOWSN routing protocol [4][5] selects these routes to provide reliable and successful packets of data to the ground endpoint.

In the interests of marine networks, the need to monitor the big part of the sea-based world has increased rapidly. There are some basic differences, including noise and attenuation, propagation delays and bandwidth dependency and speed power transmission. The connection around acoustic modem energy usage in different modes [6] differs from the addition of their satellite radio colleagues which also has an effect on the layout of power-efficient procedures. These guidelines are testing in a percentage of corresponding network circumstances and show that they exceed other important routing techniques significantly and provide almost appropriate overall energy paths consumption. SZODAR is pragmatic, decentralized software which can find routing across shadow zones [7]. The building of network security protocols for UOWSNs is difficult because of the particular features of the underwater sensor network including high latency, low processing power and high power consumption. An efficient energy and life-sensitive integrated Q-learning routing (QELAR) protocol focused on reinforcing education [8]. It promotes common MAC protocols and aims to extend system life through transmission of residual power from sensor nodes. While investigating the development of a standard for aquatic interaction, they have up to date adopted the standard comprehensive approach initially developed for mobile networks, a boundary-layer model allows for efficiency improvements[9]. A cross-layer interaction approach is built to effectively use the acoustic channel with limited bandwidth to improve the end-to-end application performance. Highly skilled coordination functions are implemented in a cross-layer unit.E-PULRP for underwater sensor networks (UWSN) is used with energy efficient on the fly routing protocol, where the communication parameters are chosen in order to achieve energy optimization [10].

With the exclusion of route tables, localizing and configuration techniques, E-PULRP is simple, effective and thus can be used for UOWSN even very easily. A dynamic routing to address these problems in submerged wireless sensor channels is established [11].A transmitting node generator is used to classify the detectors that need to forward packets to the target, and the elimination of the transmitting tree which prevents excessive distribution of transmitted packets. A distributed UOWSN dynamic routing based on the local knowledge as well as the present device node area is used [12]. Flexibility of network caused by water movements is a problem but the suggested protocol is easy to manage. A mobicast, known as a phone geocast, has two-dimensional (2-D) UOWSN problems which are intended to resolve this whole problem and reduce the sensor nodes ' energy usage while enhancing data collection[13]. In a 3-D submerged atmosphere, all submerged sensor nodes are randomly distributed to create three-D UOWSN.A Void-Aware Pressure Routing (VAPR) protocol employing sequence number, hop count and depth information embedded in periodic beacons to configure next-hop path and to construct a directional trail to the nearest sonobuoy [14].Sometimes in the existence of voids, a duplicitous path transmission system could be successfully carried out. A timely primary concern redirection mechanism and the use of the downstream flood prevention node table and a loan-based upgrade system is being used to prevent the energy consumption due to repeated forwarding table notifications[15].This method is comparable to a generic submerged acoustic sensor network (UASN) dynamic routing. An effective routing protocol for side-to-end lag, labeled the Diagonal and Vertical UOWSN (DVRP) routing protocol[16]. The saving-energy of sensor nodes is being deliberated by DVRP to extend the network lifetime. It is found that DVRP has better performance than other existing delay efficient routing protocols, in term of end-to-end delays, energy consumption, and data delivery ratios. Depth-based routing (DSDBR), power-sensitive delay-based deep-based routing (DSEEDBR), and the evolutionary pause-sensitive flexibility of messaging nodes using DSAMCTD procedures will be used for strength-based forwarding schemes [17]. The methods propose late-efficient Corner-to-end preference and early prone keeping influences delays are decreased as system performance is reduced scaly. The energy consumption in a multifunctional UOWSN multi-hop estimates an ideal power-efficient dynamic routing for deepwater scenario [18]. OR protocols is used for UWSNs and also classified the OR protocols in different categories [19]. When examining existing UOWSN dynamic routing, current procedures were categorized in two classifications on the basis of a path policy maker [20].

2. Related Works

Geethu et al[21] described an evaluation model that calculates overall energy production for deep sea scenarios in a UASN dual-hop based on both the heavy reliance of the broadband of the submarine acoustic channel throughout the transmitter range and propagation characteristics. They have extracted an analytical solution for ideal hop duration that reduces overall network power consumption. They also suggested a power-efficient routing protocol, based on appropriate hop range analysis.

Ilyas et al [22] addressed an efficient energy UOWSN filtering scheme supported by AUV. The MILP design for efficient data gathering was introduced with minimum energy usage. We deal with the issues of low data availability, power gap problems and high energy usage. Strengthen the energy consumption of Small Member Endpoints with GNs. Simulation tests has shown that in terms of information processing and power consumption, the protocol functions well during extreme oceanic environments, as contrasted to AEERP.

Darehshoorzadeh et al [23] suggested an OR method in choosing several locations for packet filtering nominee to use the broadcasting nature of broadband Routing protocol networks. In OR, various preferences were used to transmit the message to the endpoint dependent on connection speeds. OR mainly aims to merge weak points and create a strong digital connection to create a reliable signal. UOWSN uses acoustic networks that have lower frequency and greater intervals than radio stations.

Zenia et al [24] requested a power-efficient and trustworthy MAC and UOWSN dynamic routing report. The fundamental design elements of UOWSN are energy and dependability even though the device operates submerged signal node as well as has lower capacity and high propagation delay resulting in loss of huge packet volumes in deepwater communication systems. Several experiments also tackled these problems with the goal of enhancing the UOWSN's and QoS.

Chao Li et al [25] analyzed the path of both the information streams in strength-based routing database was examined as well as the packages are redirected to superficial nodes from deep nodes and the path to sink node is suggested. Directive transfers of packets in UASNs can lead to load imbalances. Inspired by such an issue, we suggest to use the intensity, angle, and hops to enhance driving ability a depth based transmission programming dataset that prioritize key networks. DBR-MAC is an avaricious procedure aimed at maximizing honesty efficiency. An adaptive depth backoff algorithm is implemented for the prevention of traffic congestion at key nodes. Comprehensive experiments show that the methods suggested enhance the flow, time and energy performance of equality.

Rani et al [26] approach suggested for power-efficient usage splitting the entire system into post-regions and each thread-region as a group. For data gathering and distribution, a CH is responsible of each sub area to next bottom area, in which the cluster assistant coaches transmit data. RN's function with the usual nodes in each small sub-region to wirelessly transmit to the CHs. They was using the locations-free interaction on the basis of hop counting and trust of the nodes as compared to our earlier work (ME-CBCCP).

Ghoreyshi et al [27] investigated the state of both the quality of UOWSN's vacuum handling methods was examined. They addressed the complex characteristics of void interaction on the ground and deepwater, and addressed the unique problems in UOWSN's design of void management strategies. The key technologies were then implemented to develop effective void treatment strategies. They grouped the existing vacuum-handling approaches into two major categories of strategies based on the location and complexity in order to facilitate comparing different techniques.

Rahman et al [28] suggested EECOR protocol will decide the redirection relay set for the very first time by means of the centralized beacon text from the ground sink based on the local data on the length and topology of the system. The EECOR procedure. The FLRS method can then be used to pick from the forwarded relay system the best relay node based on ECR and PDP for each relay node. The holding period on every forwarded node is also taken into account to avoid collisions and retransmissions between sensor nodes during delivery of samples to the ground drain. Visualization outcomes in Aqua-sim have been conducted on an NS-2 undersea simulator, and the findings assessed show that the EECOR Mechanism is a better alternative than the DBR, FDBR, VBF, and HH-VBR protocols, with regard to the average package delivery, median right side-to-bottom time, and average power usage, as well as the network life cycle.

Faheem et al [29] QERP was suggested for improving energy data transfer reliability and delay for UOWSN-based submerged implementations in actual-time. Through QERP, the highly stable little clustering method is implemented to coordinate sensor nodes for even distribution of energy and information traffic across the channel in a linked pyramid. In the event of a failure of a path node, its routing table and simple dynamic power modifications allow an adequate next hop relay node to be found avoiding the loss of communication.

Ahmed et al [30] problems are concentrated throughout the development of protocol-based dynamic routing. We also clarified problems related to the network dynamic routing implemented from sources, table activities and data aggregation. It also includes the implementation of sensor nodes, the dynamic topology framework, the path exploration system and the procedure data transfer processes.

Wang et al [31] assumed that energy-conscious and crater-avoidable routing (EAVARP) method proposed EAVARP encompasses the process of laying and data gathering. The condensed shells are formed across the sinknote during most of the textural process and sensor nodes are spread over various shells. Sink node performs routine organizational tasks to make sure the topology remains unchanged and in realtime. This applies EAVARP to the complex environment of the system. The data containers are transmitted via the Opportunity Directional Transmitting Strategy (ODFS) based on various concentration shells during most of the catalogue phase even though voids exist.

Zhigang Jin et al [32] suggested the DST EBOR procedure, which offers the reference cores with a way of choosing the appropriate next hop in the context of several metrics. The reference node considers PDP, ETD and remaining electricity as 3 meters to obtain compensation for packet distribution ratios, energy consumption and end-to-end delays by choosing each communication with a complex next hop.

Yishan Su et al [33] derived to extend the lifetime of the network in UASNs, suggest the DQELR (Dep Q-Network Power and Latency-Aware Routing Protocol). A Deep Q-Network algorithm is implemented at DQELR for global optimum connectivity choices, using both off-political and on-political approaches. Based on the power and distance conditions of nodes in various phases of interaction, nodes with the highest Q-value can be chosen as transmission systems which take power and latency into account. The overload system reduction is further created by the combination of the broadcasting and unicast interaction frameworks.

3. Problem Identification and System Model

In this section, we described the problem of underwater mobile detector systems and also designed the proposed model of the system.

3.1. Problem Identification and Solution

Patil et al. [34] proposed a stochastic model for the performance evaluation of DBR, which is numerically tractable. Specific, four performance metrics were taken into account: hop distribution; the likelihood for packet delivery; the intended energy use; and the intended end-to-end delay. The design has been tested in accordance with probabilistic regression projections with the average performance indexes produced by its application. By a numerical example, it is found that their model can be used to assess the impact of various network configuration parameters (e.g., the transmission power and the scaling factor δ defined by DBR) on these indices. Our research has shown that the amount of hops along the route can significantly influence procedure efficiency. UOWSNs were suggested with an acceptable delay and lifelong aware depth (ODLDR) routing protocol. Highlighting the major contributions:

- The methodology for reformatting cluster forming group is implemented to minimize the energy consumption of the system.
- An effective priority-based scheduling methodology was suggested for confidence calculation, which finalizes the CH and mapping route.
- Eventually, the proposed ODLDR Framework is introduced in the Network Simulator (NS2) tool. In view of placement reliability, side-to-end delay, energy use and system life, packets transmission ratio, and throughput the existing government-of - the art strategies are contrasted to efficiency.

3.2 Network Model of Proposed ODLDR Protocol

Figure 1 displays the computational model for our proposed network topology. The network involves a ground station, main client networks and face members of the group. Base Center is used to collect secondary user nodes data. During an event where interest (for instance, inundation, earthquakes... etc) the sensor nodes used are not uniform and mobile, the data must be productively and reliably transmitted by the BS. Both clusters have a CH node that gathers both data in its own group from many other nodes. The CHs can only access the neighbouring CHs node explicitly. The compute nodes then send data to the transmitter. The transmitter will eventually sends a signal to the target.

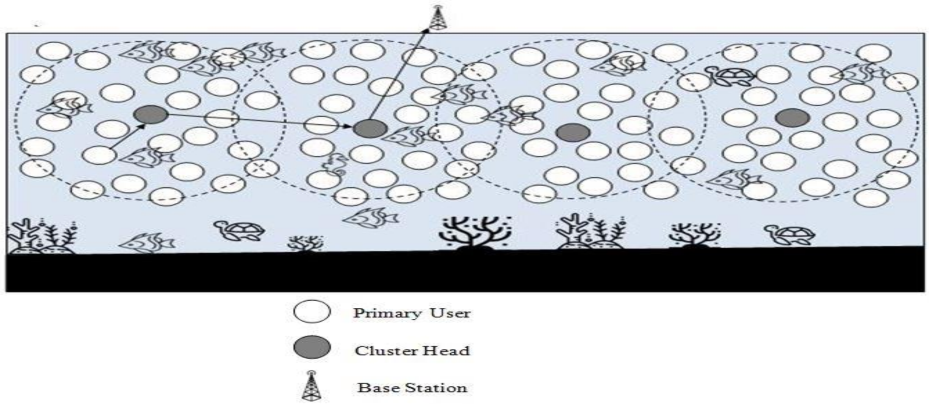


Figure 1: System Model for Our Proposed Work.

4. Optimal Delay and Lifetime Aware Depth Based Routing (ODLDR) Protocol

The solution proposed includes two equations like the algorithm of group division and an appropriate preference algorithm of planning. Swarm algorithm is mentioned for the creation of clusters in paragraph 4.1, and CH and routing travel confidence calculations in paragraph 4.2 are addressed.

4.1 Clustering using Group Partitioning Algorithm

The groupings are commonly referred to as remaining nodes or single nodes and can detect and communicate the signified data to the ground station through an optimal route to reach the transmitter. In each node configuration these remaining nodes tend to differ, which contributes in a medium energy of all sensor nodes being maintained. Clustering is performing better than most other transmission systems, although its efficiency is still impaired by the inappropriate creation of clusters. Many of the clusters are not part of the cluster in this specific time slot during cluster creation through membership. It is generally called the excess node but for each cluster structure these nodes can vary accidentally. However, such nodes might become part of any group and also be a head of every cluster. However these remaining nodes can still detect and relay useful information either directly to the Ground station or to the Ground station by identifying the closest neighbour. These leftover nodes send several power messages predicting the nearest neighbour to pass on his data. Swarm-based clustering method with reduced residual node formation aims at overcoming residual or individual node formation in the creation of a cluster. In terms of consistency, rate, sensor node power, and distance between sensor nodes, swarm Optimisation grouping takes place to minimize the composition of the remaining node by comparison to the exercise quality.

Inferred from the traditional swarm optimization algorithm is the suggested community segmenting dataset. A method centred on furious error checking clustering and electron-swarm modelling is used in the cluster head choice of dynamic topology control [35]. Fuzzy clustering algorithm is used for the initial clustering of geographical sensor nodes where a sensor node is part of a certain likelihood cluster and the amount of original clusters is counted and addressed.

To order to reduce the workload of the cluster head, each cluster head has a supporting node, called the Cluster Assistant (CA)[36] node. Clustering is achieved by swarm optimisation until all nodes are part of the group. This removes the structure of individual nodes which leads to a relatively improved web life.

The random population-based optimization technique may be linked to as Swarm Optimization (SO). SO is created from social behaviour influenced by fish schooling or bird flocking, that is a method in imitating behaviour of bird flocks to a specific non-linear simulation issue. The feature specialization theory is derived from a certain wave is devised

Swarm Optimisation can be called a mathematical method that maximizes a problem by using a number of iterations that aim to improve a response for a defined measurement or task in terms of the quality. Swarm optimizes the solution based on the candidate population in the search area in general in accordance with both the mathematical formula over particles velocity and location the speed of each particle is modified with current particle speed and its previous best and best location locally during each replication. It can be used to measure speed and location of the object. This requires electron swarm.

Every electron usually holds a search space position. The fitness of each particle that rotates in the space of the quest at a specific speed generally demonstrates the value of its location. The speed of each particle is largely affected by its best position in the search area to date and neighbourhood positions should prove the adequate solution. The swarm will eventually reach the optimum positions.

Take a situation in which an arbitrary flock of birds finds food in a town and only one foodstuff in that place is searched. No bird understands where the food is in the area, but the insects know how far the food is in any instalment series. What is at stake here is a good approach to find the foodstuff, and the solution is to search for the bird nearest to the food product.

Let (A, B) be the sensor area and r be the sensor node area. The sample sensor network is displayed in Fig.2. The cluster with radius r is divided into smaller sections. Let (a, b) be the cluster co-ordinates in a detecting area.

The maximum NC clusters can be estimated on the basis of the entire network surface and cluster volume.

$$NC = {}^{AB}/_{ab} \tag{1}$$

In which, AB shall be the array region of both the system and ab. You could write the value of a = b = t, equation.1 as,

$$NC = {}^{AB}/_{t^2} \tag{2}$$

From the right angled triangle shown in **Fig.2**, the value of r can be written as,

$$r = {}^{t}/_{\sqrt{2}} \tag{3}$$

So the total number of clusters formed can be given as,

$$NC = {}^{AB}/_{2r^2} \tag{4}$$

That's for the edge. For the upper boundary area also the same value is measured. The number of clusters forming in the upper limit as, 4 is used to measure

$$NC = \left\{\left({}^{AB}/_{ab}\right) + \left({}^{A}/_{a}\right) + \left({}^{B}/_{b}\right)\right\} \tag{5}$$

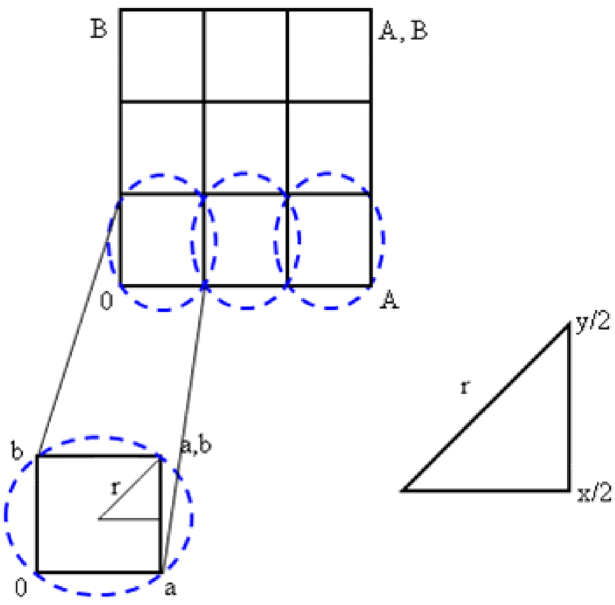


Figure 2: Clusters in Wireless Sensor Network.

If a=b=t, & A=B, t=r$\sqrt{2}$, the above equation becomes,

$$NC = \left\{{}^{\left(A^2 + 2\sqrt{2}a^*r\right)}/_{2r^2}\right\} \tag{6}$$

The average number of clusters formed in a network can be calculated using the lower bound eqn. 4 respectively as,

$$NC_{average} = \left\{{}^{\left(A^2 + 2\sqrt{2}a^*r\right)}/_{2r^2}\right\} \tag{7}$$

The basic station transmits a response called the data set order message to all sensor nodes of the system when the nodes are installed in the detecting region to gather information for the node. This sends the response message info compilation to the base station containing:

- Position or location of the sensor node, A=(a,b)
- Velocity of the node V=(v_1,v_2), where v1 is the average velocity of the sensor node and v2 is the current velocity.
- Energy of the sensor node is denoted by E.

The transmitter maintains and updates the quality of the location, momentum and power. The transmitter then produces grouping sensor nodes. The composition of the cluster is done by optimizing the colony. Each node is supposed to be a molecule in the wireless network of sensors here. Efficient clustering avoids the development of individual nodes. This can happen by enabling each node to find the closest neighbour beyond its network and cluster range. Equally, all WSN nodes are permitted to form clusters. The consequence is that all the modules are part of any cluster. The same process repeats until all modules become part of any web cluster. It is projected that each component will have an estimated future value.

Let us take into consideration a sampling space and activate the nodes or particles. The amount of molecules in sample space shall be the N={1, 2, and 3, n}. Parts are created by taking two variables into account, which include

- Position (a, b) and
- Velocity (v1, v2)

The fitness value is calculated for choosing a cluster particle depends on the following three factors namely,

- Energy of the particle or node E_N
- Sensors with in a radio range from a particular particle (p)
- Distance of those particles within the radio range from a particular particle (p)

The fitness value of each molecule as mentioned above shall take account of the formation of the cluster. The WSN scenario is illustrated in Fig.2. It is clear that a cluster head exists for each cluster. The cluster head is one where more nodes in its radio range are visible. The head of the cluster is commonly called the particle of the group.

4.2 Trust Computation using Efficient Priority Based Scheduling Algorithm

The energy consumption is extracted from the basic energy method, which takes account of the energy needs of both transmitters and receivers. Bluetooth node energy consumption depends on the amount of data to be transmitted and the speed. The energy consumption in an node is commensurate to a square distance (D2) if the propagation distance (D), otherwise it is proportionate to (D2), is smaller than the minimum distance (Do). Total energy usage for each transmitting node in the system and n bit information packets

$$E_{total} = Energy(n,d) + Energy(n) \quad (8)$$

Where FFE (n,d) and FRE (n) are energy consumption of transmitting and receiving node.

$$Forwardenergy(n,d) = \begin{cases} n \times E_{electrical} + n \times \varepsilon_{fs} \times D^2; & ifD < D_0 \\ n \times E_{electrical} + n \times \varepsilon_{mp} \times D^2; & ifD \geq D_0 \end{cases} \quad (9)$$

$$Backwardenergy(n) = n \times E_{electrical} \quad (10)$$

When the energy dissipation is per bit of E electric for the power transmission or transmitter loop, the energy amplification for the space design (μF) and multi-track device (μF) depend on the transmitter amplification specification.. The energy usage is accountable for the considered assaults.

Distance and transmitting energy are the measures of the transmitted signal strength when a Frame / forward power packet (n, d) sends data signal control nodes obtained with range D, which is express able as follows;

$$RSS = \frac{Forwardenergy(n,d)}{4\pi D_i^2} + T_{a,a_1/a_2} \quad (11)$$

Based on existing signal, the range and relative speed accurately determine the velocities. The test points that satisfy the constrain but no such points, may be chosen. Approximate the real obtained signal force of the nodes is used by common reference points. The relative velocity of the following moving nodes is determined by Fig. 3. EQN can be used to receive Di1; Di2 and Di3. 11, and the range adjusted is determined as follows from the laws of cosines:

$$D_{i1}^2 = D_{i2}^2 + a_1 a_2^2 - 2D_{i2} \cdot a_1 a_2 \cdot \cos(\alpha) \quad (12)$$

$$D_{i3}^2 = D_{i3}^2 + a_1 a_2^2 - 2D_{i2} \cdot a_1 a_2 \cdot \cos(\beta) \quad (13)$$

The current vertex place and can be shifted to a1 and a2 in two stages. $\cos(\alpha) = -\cos(\beta)$Find and just above formula to measure velocity(v)

$$2a_1 a_2^2 = D_{i1}^2 + D_{i3}^2 - 2D_{i2}^2$$

$$v = \sqrt{\frac{2(D_{i1}^2 + D_{i3}^2 - 2D_{i2}^2)}{2\Delta t}} \quad (14)$$

Movable node length from current status as to transfer position a1 or a2 is expressed as the distance $T_{a,a_1/a_2}$ has divided the speed of the network and can be accomplished throughout the following way:

$$T_{a,a_1/a_2} = \frac{R \cdot sin\vartheta}{sin\beta \cdot v} \quad (15)$$

$$T_{a,a_1/a_2} = \frac{\Delta t \cdot R \cdot sin\vartheta}{sin\beta\sqrt{\frac{(D_{i1}^2 + D_{i3}^2 + 2D_{i2}^2)}{2}}} \quad (16)$$

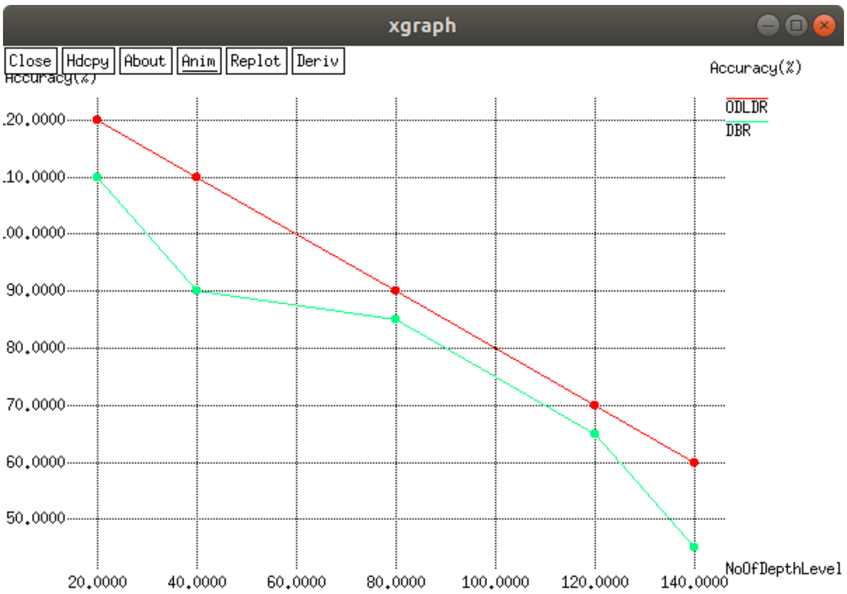
5. Performance Analysis

The proposed ODLDR protocol is implemented using the system simulator (NS2). Different test conditions with various numbers of nodes evaluate the efficiency of the dynamic routing.

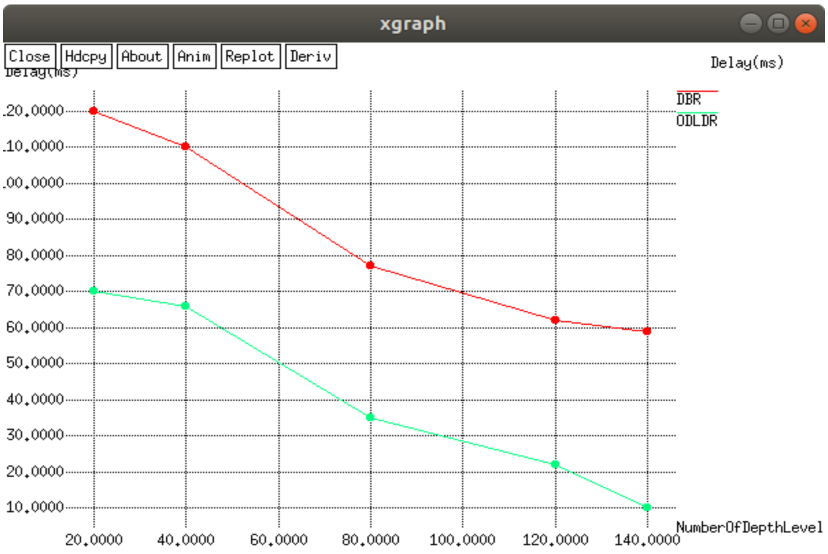
UOWSNs propose a protocol for the optimum delay and lifetime of conscious profundity-based routing (ODLDR). First, it introduces group algorithm dividing for cluster structure that reduces the network's energy usage. Furthermore, the proposed efficient priorities algorithm for trust calculation, which finalizes the CH and route path, is implemented. The simulator results indicate the usefulness in energy usage, packet transmission speed, positioning accuracy, side-to-end lag, and bandwidth and service life of the proposed ODLDR protocols.

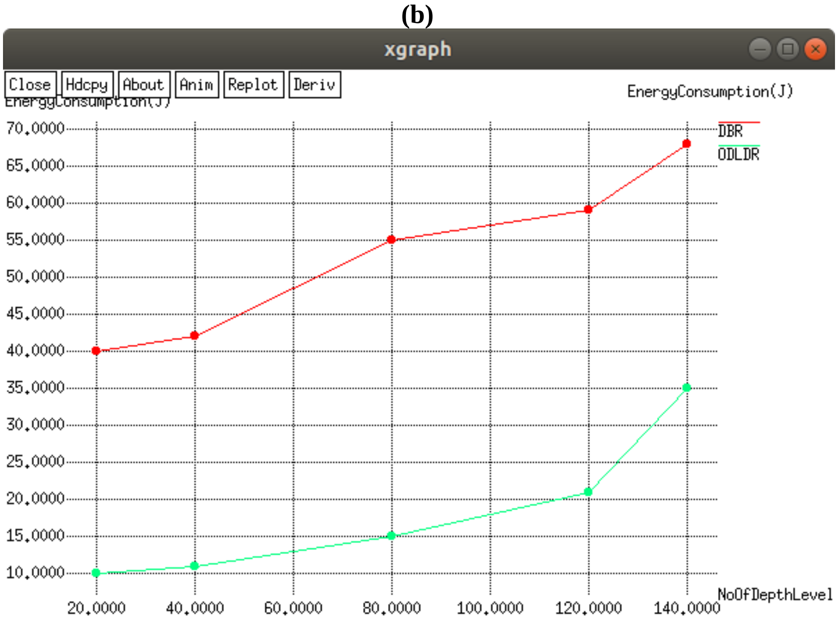
5.1. Performance Analysis of Number of Depth Level

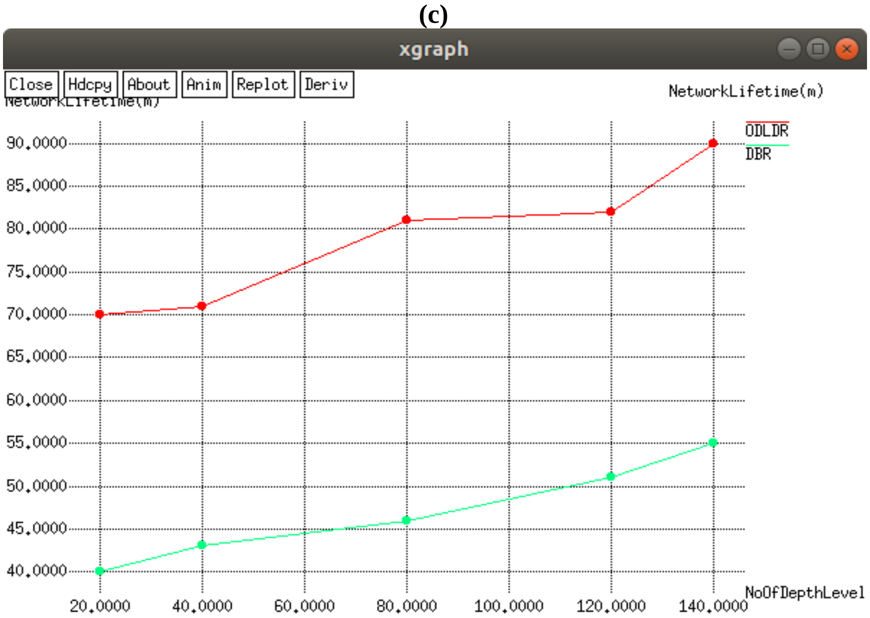
The result of proposed and existing algorithms is compared in this section to 6 per formative metric ties: accuracy of positioning, side-to-end delay, energy usage, lifetime of the network, packet delivery and performance ratios and shown in Fig.3 (a-f). The depths are randomly set between 20 and 140. Precise protocols were increased from 100% to 120%, shown in Fig.3(a). The precise application is also showed. Compared with the previous one, our ODLDR algorithm reduced a delay. Delays were reduced by 42 percent from 20 to 140 depth nodes and the findings shown in Fig.3(b). When compared to the previous guidelines, energy consumption decreased to 75 percent as well as the result was shown in figure 3 (c). We will optimize network life using 20 to 140 depth nodes in our proposed system and in comparison with previous methods. Our template quality assessment was 75% shown in Figure 3 (d). We used our suggested technologies to raise the packet transmission ratio to 20 percent and the results shown at Fig. 3 (e) in the previous method. In compared to the previous method we have maximized output with our proposed model. A 20 to 140 depth nodes quality analysis again from 8,000 to 9000 was presented and results can be found in Fig.3 (f).

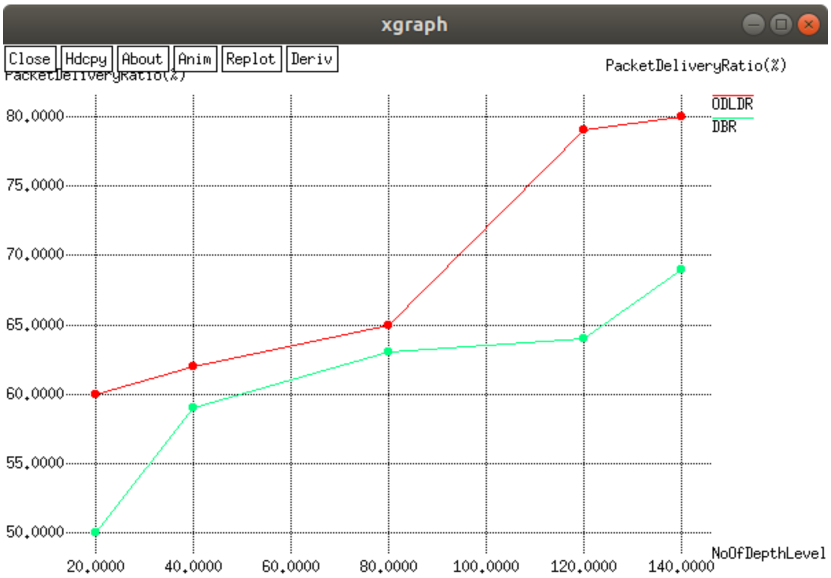


(a)

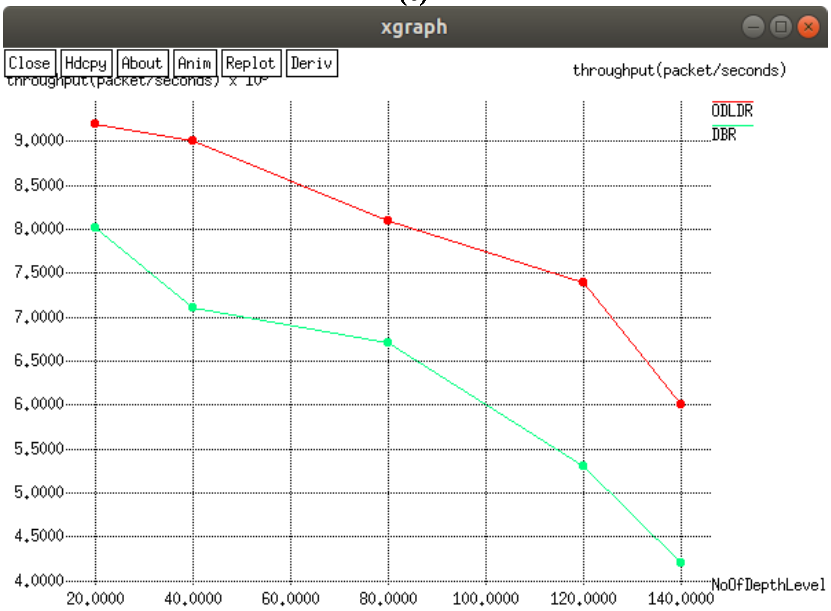

xgraph
Close
Hdcpy
About
Anim
Replot
Deriv
Delay(ms)
DBR
ODLDR
NumberOfDepthLevel
(b)


xgraph
Close
Hdcpy
About
Anim
Replot
Deriv
EnergyConsumption(J)
DBR
ODLDR
NoOfDepthLevel
(c)


xgraph
Close
Hdcpy
About
Anim
Replot
Deriv
NetworkLifetime(m)
ODLDR
DBR
NoOfDepthLevel
(d)



(e)

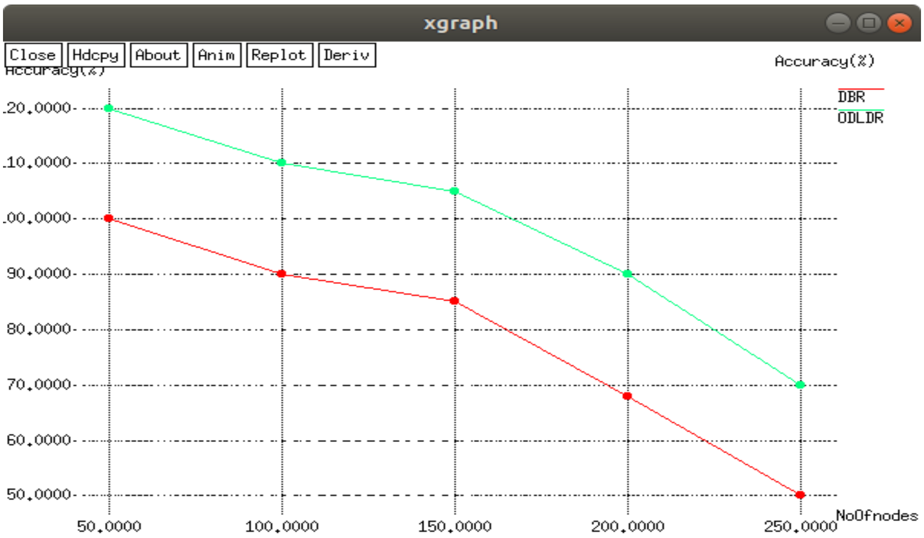


(f)

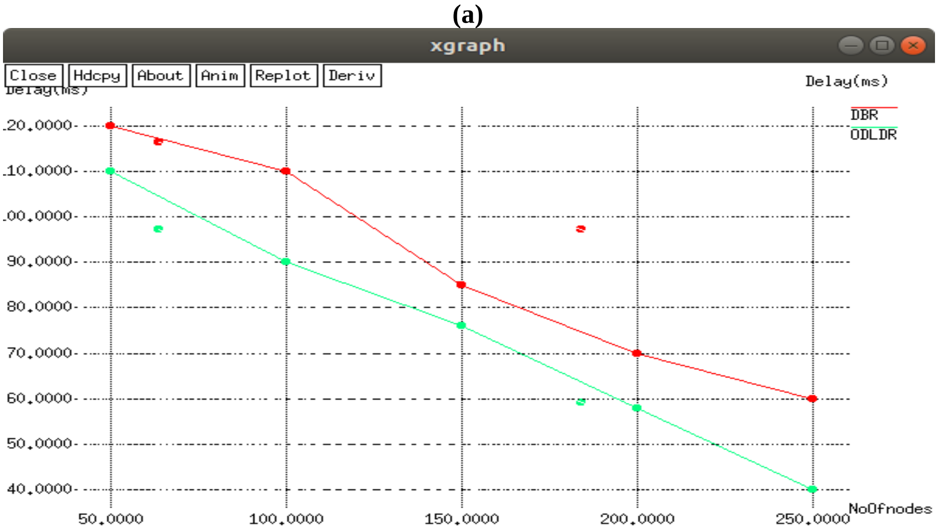
Figure 3: Number of Depth Level Performance Analysis of (a) Positioning Accuracy, (b) End-to-End Delay, (c) Energy Consumption, (d) Network Lifetime, (e) Packet Delivery Ratio, and (f) Throughput.

5.2 Performance Analysis of Number of Nodes

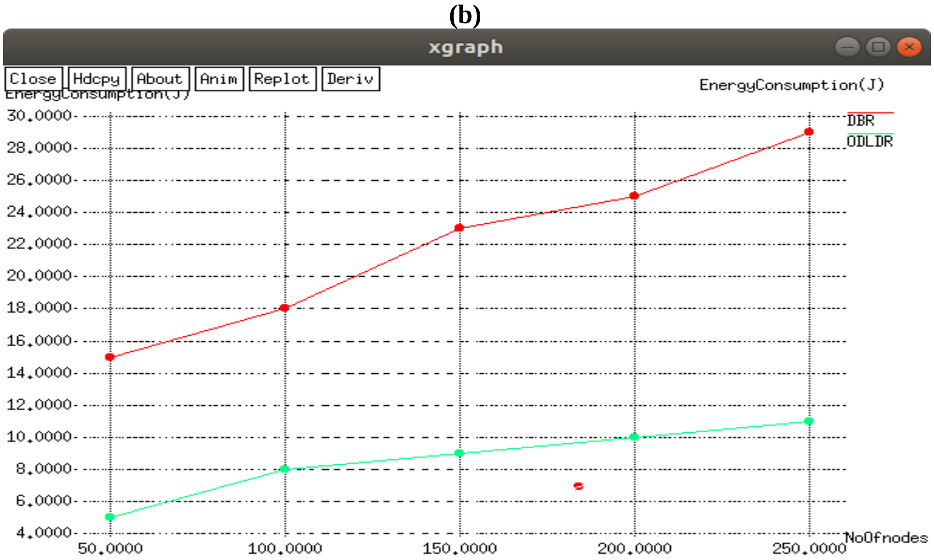
The scenario uses this result to evaluate the node number in ODLDR results, which introduces a series of experiments aimed at comparing DBR with the nodes number. The amount of branches in the experiments is different each case to 50, 100, 150, 200 and 250. The result of suggested and current algorithms with six performance measures is: location precision, delay from one end to next, power consumption, channel life, packet transmission ratio and output and shown in Fig.4 (a-f).The nodes are randomly set between 50 and 250. The reliability of the suggested routing protocol was increased to 20% and shown in Fig.4(a). Compared to the previous one, our ODLDR algorithm reduced a delay. Delays are reduced to 8% displays between 50 and 250 networks and results. Fig. 4(b).Compared to the previous protocol, energy usage decreased to 67 percent and the result was shown in figure 4(c). By using about 50 to 250 Nodes, our suggested model and the previous approach will optimize network life. Our template quality assessment was 6% shown in Fig.4(d).We used our proposed technique to improve delivery ratios of the packet to 37%, with results shown in Fig.4 (e), in previous guidelines, we have a higher loss in packet shipping ratio. Compared with the previous protocol, we increased performance through our proposed model. Fig. 4 (f) again presents the performance assessment of 50 to 250 nodes between 9,000 and 10,500 and the outcomes.


xgraph
Close Hdcpy About Anim Replot Deriv
Accuracy(%)
DBR
ODLDR
20.0000
10.0000
00.0000
90.0000
80.0000
70.0000
60.0000
50.0000
50.0000
100.0000
150.0000
200.0000
250.0000
NoOfnodes

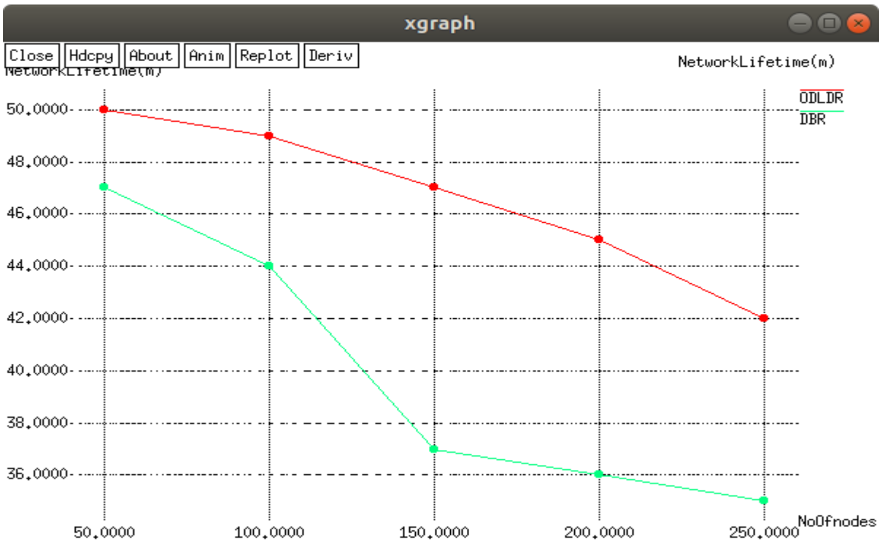
(a)


xgraph
Close Hdcpy About Anim Replot Deriv
Delay(ms)
DBR
ODLDR
20.0000
10.0000
00.0000
90.0000
80.0000
70.0000
60.0000
50.0000
40.0000
50.0000
100.0000
150.0000
200.0000
250.0000
NoOfnodes

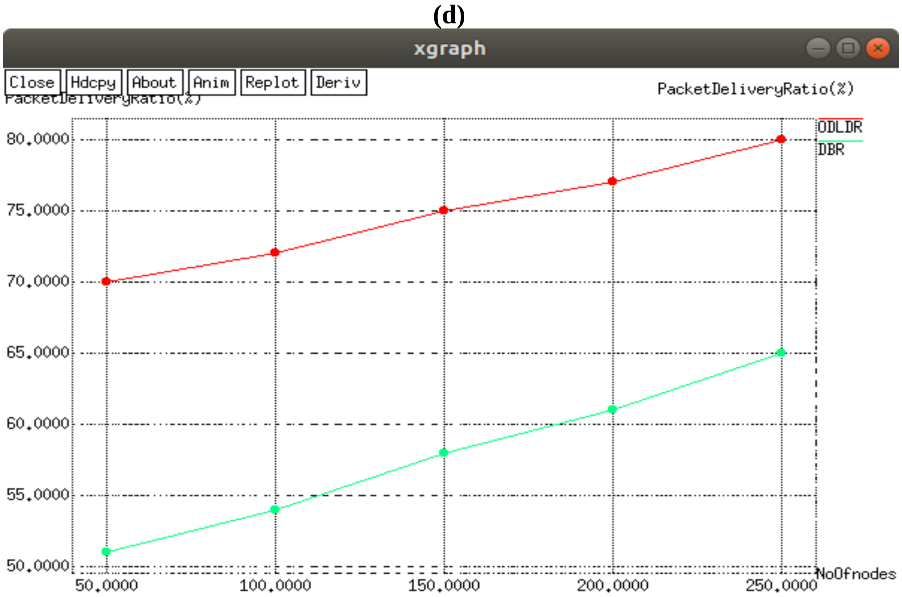
(b)


xgraph
Close Hdcpy About Anim Replot Deriv
EnergyConsumption(J)
DBR
ODLDR
30.0000
28.0000
26.0000
24.0000
22.0000
20.0000
18.0000
16.0000
14.0000
12.0000
10.0000
8.0000
6.0000
4.0000
50.0000
100.0000
150.0000
200.0000
250.0000
NoOfnodes

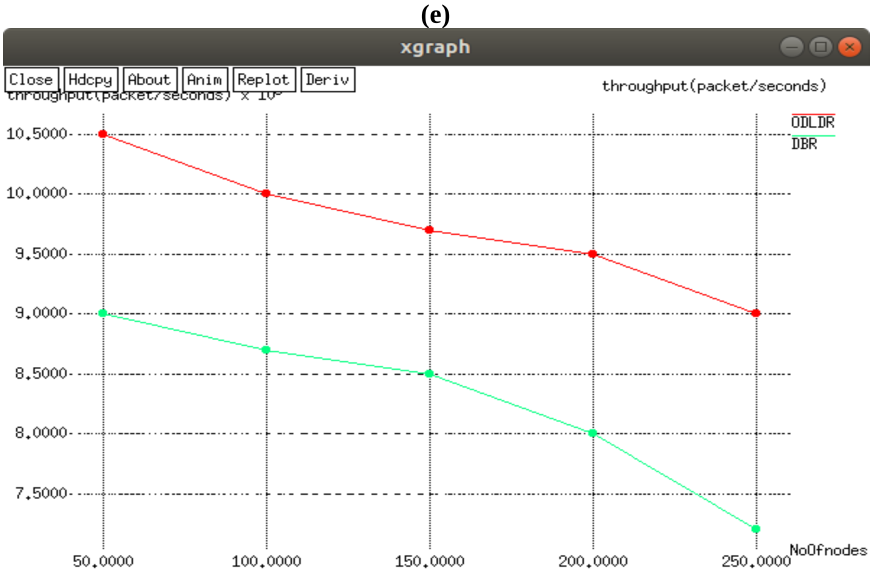
(c)



(d)



(e)

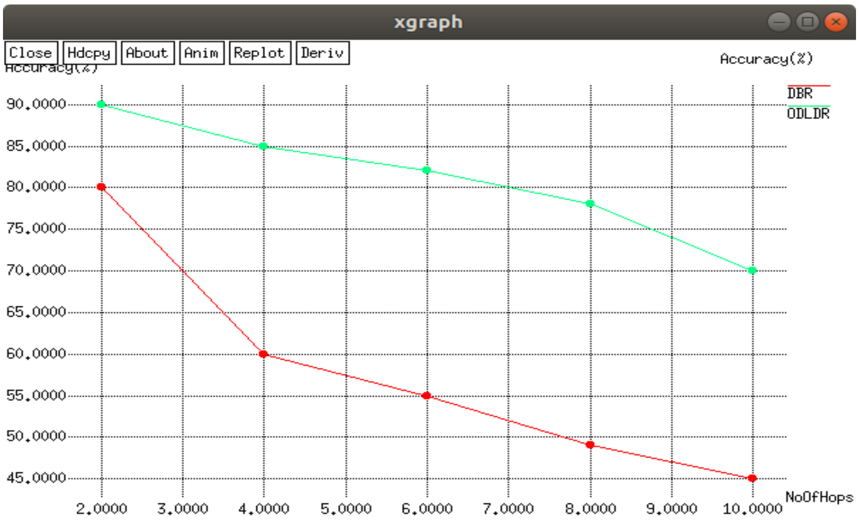


(f)

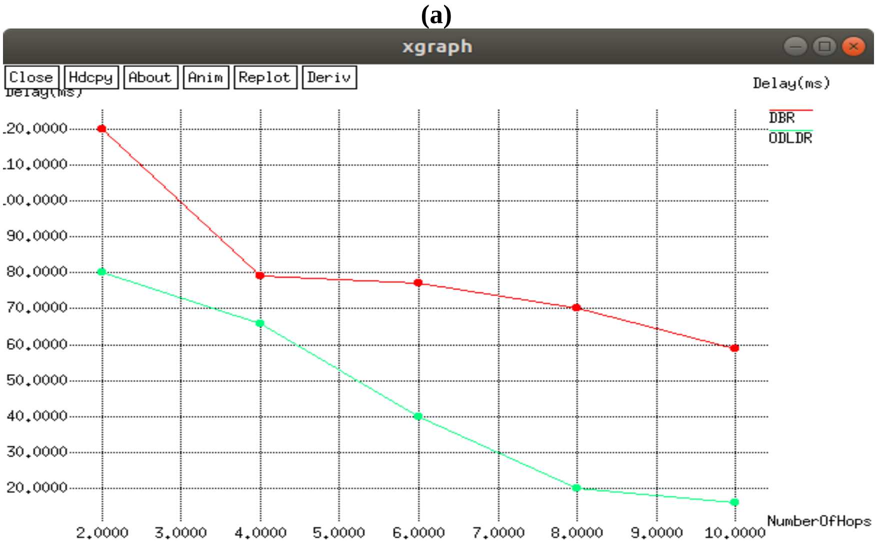
Figure 4: Number of Node Performance Analysis of (a) Positioning Accuracy, (b) End-to-End Delay, (c) Energy Consumption, (d) Network Lifetime, (e) Packet Delivery Ratio, and (f) Throughput

5.3 Performance Analysis of Number of Hops

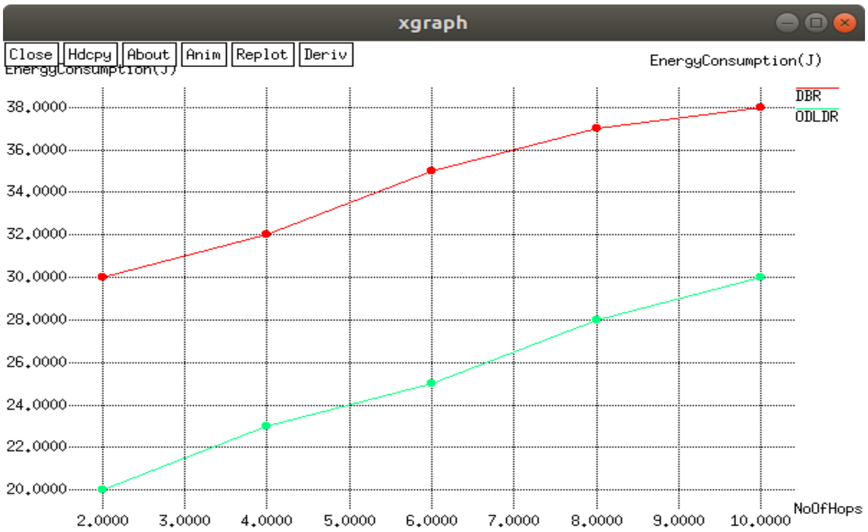
The results of simulations of proposed and current algorithms of six performance indicators are: accuracy of positioning, side-to-end delay, energy usage, lifetime network, distribution ratio and efficiency, as shown in Fig.5(a-f). The amount of hop is set uniformly from 2 to 10. Precise protocols were improved from 80 percent to 90% and outlined in Fig.5(a), both planned and current. In relation to the last one, our ODLDR algorithm increasing the delay. The delays were reduced to 33 percent from two to ten hops and tests were shown in Fig.5 (b). Compared with the previous method, energy consumption has reduced to 33%, showing the result in Figure 5(c). We will optimize service life using 2 to 10 hops using our conceptual model and in comparison to previous system. Our design quality assessment was 25% as shown in Fig.5(d).We used the methodology suggested for increasing the shipping ratio of a packet to 20 percent and the results shown in Fig. 5 (e) in the previous guidelines. Compared with the previous protocol, we increased performance through our proposed method. Fig. 5(f) shows the performance review of 20 to 140 depths nodes again between 8,000 and 9,500.



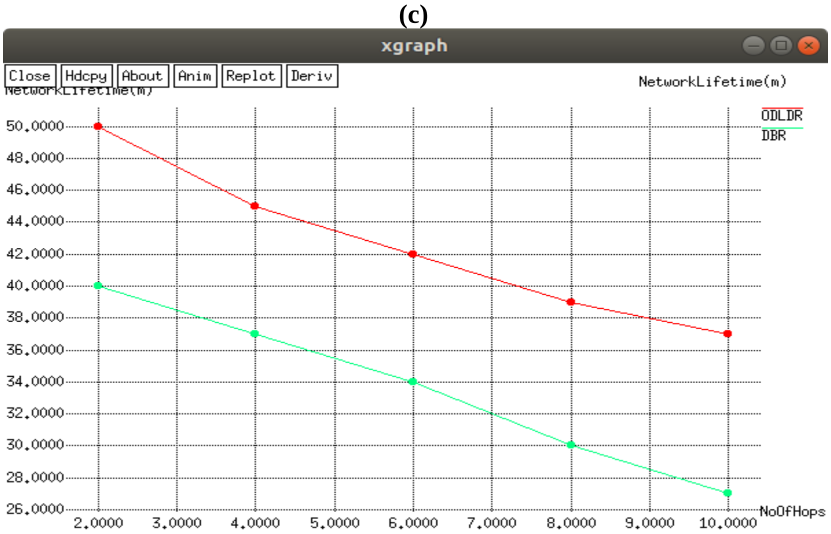
(a)



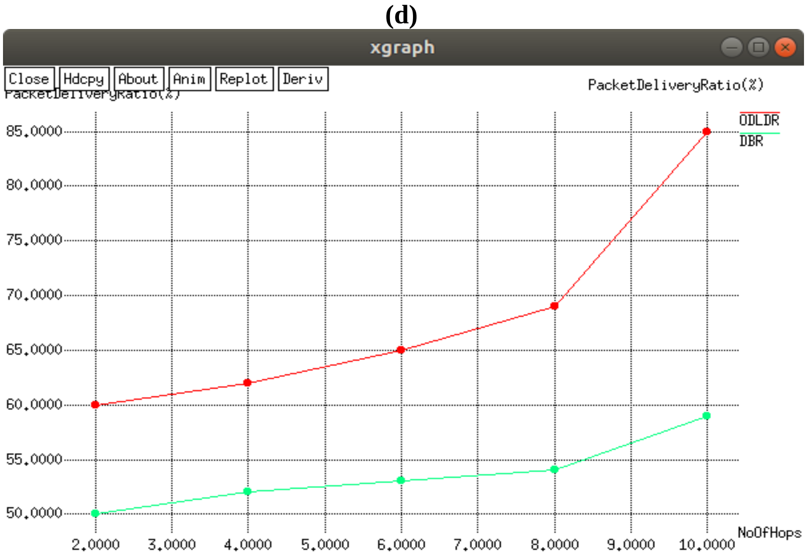
(b)


xgraph
Close Hdcpy About Anim Replot Deriv
EnergyConsumption(J)
DBR
ODLDR
38.0000
36.0000
34.0000
32.0000
30.0000
28.0000
26.0000
24.0000
22.0000
20.0000
2.0000 3.0000 4.0000 5.0000 6.0000 7.0000 8.0000 9.0000 10.0000
NoOfHops

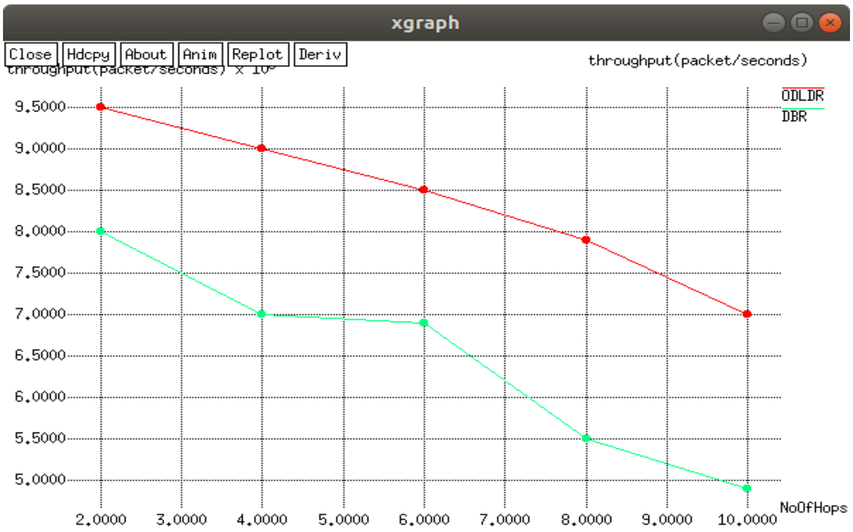
(c)


xgraph
Close Hdcpy About Anim Replot Deriv
NetworkLifetime(m)
ODLDR
DBR
50.0000
48.0000
46.0000
44.0000
42.0000
40.0000
38.0000
36.0000
34.0000
32.0000
30.0000
28.0000
26.0000
2.0000 3.0000 4.0000 5.0000 6.0000 7.0000 8.0000 9.0000 10.0000
NoOfHops

(d)


xgraph
Close Hdcpy About Anim Replot Deriv
PacketDeliveryRatio(%)
ODLDR
DBR
85.0000
80.0000
75.0000
70.0000
65.0000
60.0000
55.0000
50.0000
2.0000 3.0000 4.0000 5.0000 6.0000 7.0000 8.0000 9.0000 10.0000
NoOfHops

(e)



(f)

Figure 5: Number of Hops Performance Analysis of (a) Positioning Accuracy, (b) End-to-End Delay, (c) Energy Consumption, (d) Network Lifetime, (e) Packet Delivery Ratio, and (f) Throughput.

6. Conclusions

In this paper we suggested the combination optimization (ODLDR) algorithm, which maximizes the QoS in data transmission for the mobility-enabled routing of the following connection wireless device protocol. The cluster head node was chosen for the highest energy usage. The methodology proposed is used to meet exact data transfer quality requirements. The ODLDR methodology is a versatile data collection that maximizes network existence. The optimisation algorithm is used for both. The results and quality analyzes demonstrate an adjustment in the proposed ODLDR-algorithm for positioning accuracy, end-to-end delay, energy usage and web life.

Reference

1. Rupali A. Bengal, S.P.Kharde., 2017. A Review on -Implementation of Data Acquisition System onto ARM for Intra Underwater System by using Bluetooth. international journal of advance scientific research and engineering trends, 2(6), pp.21-23.
2. Felemban, E., Shaikh, F.K., Qureshi, U.M., Sheikh, A.A. and Qaisar, S.B., 2015. Underwater sensor network applications: A comprehensive survey. International Journal of Distributed Sensor Networks, 11(11), p.896832.
3. Khan, A., Ali, I., Ghani, A., Khan, N., Alsaqer, M., Rahman, A. and Mahmood, H., 2018. Routing protocols for underwater wireless sensor networks: Taxonomy, research challenges, routing strategies and future directions. Sensors, 18(5), p.1619.
4. Khan, A., Ali, I., Ghani, A., Khan, N., Alsaqer, M., Rahman, A. and Mahmood, H., 2018. Routing protocols for underwater wireless sensor networks: Taxonomy, research challenges, routing strategies and future directions. Sensors, 18(5), p.1619.
5. Ashrafuddin, M., Islam, M.M. and Mamun-or-Rashid, M., 2013. Energy efficient fitness based routing protocol for underwater sensor network. International Journal of Intelligent Systems and Applications, 5(6), pp.61-69.
6. Zorzi, M., Casari, P., Baldo, N. and Harris, A.F., 2008. Energy-efficient routing schemes for underwater acoustic networks. IEEE Journal on Selected Areas in Communications, 26(9), pp.1754-1766.
7. Nguyen, S.T., Cayirci, E., Yan, L. and Rong, C., 2009. A shadow zone aware routing protocol for acoustic underwater sensor networks. IEEE Communications Letters, 13(5), pp.366-368.
8. Hu, T. and Fei, Y., 2010. QELAR: A machine-learning-based adaptive routing protocol for energy-efficient and lifetime-extended underwater sensor networks. IEEE Transactions on Mobile Computing, 9(6), pp.796-809.
9. Pompili, D. and Akyildiz, I.F., 2010. A multimedia cross-layer protocol for underwater acoustic sensor networks. IEEE Transactions on Wireless Communications, 9(9), pp.2924-2933.
10. Gopi, S., Govindan, K., Chander, D., Desai, U.B. and Merchant, S.N., 2010. E-PULRP: Energy optimized path unaware layered routing protocol for underwater sensor networks. IEEE Transactions on Wireless Communications, 9(11), pp.3391-3401.

11. Huang, C.J., Wang, Y.W., Liao, H.H., Lin, C.F., Hu, K.W. and Chang, T.Y., 2011. A power-efficient routing protocol for underwater wireless sensor networks. Applied Soft Computing, 11(2), pp.2348-2355.
12. Ayaz, M., Abdullah, A., Faye, I. and Batira, Y., 2012. An efficient dynamic addressing based routing protocol for underwater wireless sensor networks. Computer Communications, 35(4), pp.475-486.
13. Chen, Y.S. and Lin, Y.W., 2012. Mobicast routing protocol for underwater sensor networks. IEEE Sensors journal, 13(2), pp.737-749.
14. Noh, Y., Lee, U., Wang, P., Choi, B.S.C. and Gerla, M., 2012. VAPR: Void-aware pressure routing for underwater sensor networks. IEEE Transactions on Mobile Computing, 12(5), pp.895-908.
15. Zhang, S., Li, D. and Chen, J., 2013. A link-state based adaptive feedback routing for underwater acoustic sensor networks. IEEE Sensors Journal, 13(11), pp.4402-4412.
16. Ali, T., Jung, L.T. and Faye, I., 2014. Diagonal and vertical routing protocol for underwater wireless sensor network. Procedia-Social and Behavioral Sciences, 129, pp.372-379.
17. Jafri, M.R., Sandhu, M.M., Latif, K., Khan, Z.A., Yasar, A.U.H. and Javaid, N., 2014. Towards delay-sensitive routing in underwater wireless sensor networks. Procedia Computer Science, 37, pp.228-235.
18. Geethu, K.S. and Babu, A.V., 2015. Optimal hop position-based minimum energy routing protocol for underwater acoustic sensor networks. The Journal of Engineering, 2015(5), pp.187-196.
19. Darehshoorzadeh, A. and Boukerche, A., 2015. Underwater sensor networks: A new challenge for opportunistic routing protocols. IEEE Communications Magazine, 53(11), pp.98-107.
20. Han, G., Jiang, J., Bao, N., Wan, L. and Guizani, M., 2015. Routing protocols for underwater wireless sensor networks. IEEE Communications Magazine, 53(11), pp.72-78.
21. Geethu, K.S. and Babu, A.V., 2015. Optimal hop position-based minimum energy routing protocol for underwater acoustic sensor networks. The Journal of Engineering, 2015(5), pp.187-196.
22. Ilyas, N., Alghamdi, T.A., Farooq, M.N., Mehboob, B., Sadiq, A.H., Qasim, U., Khan, Z.A. and Javaid, N., 2015. AEDG: AUV-aided efficient data gathering routing protocol for underwater wireless sensor networks. Procedia Computer Science, 52, pp.568-575.
23. Darehshoorzadeh, A. and Boukerche, A., 2015. Underwater sensor networks: A new challenge for opportunistic routing protocols. IEEE Communications Magazine, 53(11), pp.98-107.
24. Zenia, N.Z., Aseeri, M., Ahmed, M.R., Chowdhury, Z.I. and Kaiser, M.S., 2016. Energy-efficiency and reliability in MAC and routing protocols for underwater wireless sensor network: A survey. Journal of Network and Computer Applications, 71, pp.72-85.
25. Li, C., Xu, Y., Diao, B., Wang, Q. and An, Z., 2016. DBR-MAC: A depth-based routing aware MAC protocol for data collection in underwater acoustic sensor networks. IEEE Sensors Journal, 16(10), pp.3904-3913.
26. Rani, S., Ahmed, S.H., Malhotra, J. and Talwar, R., 2017. Energy efficient chain based routing protocol for underwater wireless sensor networks. Journal of Network and Computer Applications, 92, pp.42-50.
27. Ghoreyshi, S.M., Shahrabi, A. and Boutaleb, T., 2017. Void-handling techniques for routing protocols in underwater sensor networks: Survey and challenges. IEEE Communications Surveys & Tutorials, 19(2), pp.800-827.
28. Rahman, M.A., Lee, Y. and Koo, I., 2017. EECOR: An energy-efficient cooperative opportunistic routing protocol for Underwater acoustic sensor networks. IEEE Access, 5, pp.14119-14132.
29. Faheem, M., Tuna, G. and Gungor, V.C., 2017. QERP: quality-of-service (QoS) aware evolutionary routing protocol for underwater wireless sensor networks. IEEE Systems Journal, 12(3), pp.2066-2073.
30. Ahmed, M., Salleh, M. and Channa, M.I., 2018. Routing protocols based on protocol operations for underwater wireless sensor network: A survey. Egyptian informatics journal, 19(1), pp.57-62.
31. Wang, Z., Han, G., Qin, H., Zhang, S. and Sui, Y., 2018. An energy-aware and void-avoidable routing protocol for underwater sensor networks. IEEE Access, 6, pp.7792-7801.
32. Jin, Z., Ji, Z. and Su, Y., 2018. An Evidence Theory Based Opportunistic Routing Protocol for Underwater Acoustic Sensor Networks. IEEE Access, 6, pp.71038-71047.
33. Su, Y., Fan, R., Fu, X. and Jin, Z., 2019. DQELR: An Adaptive Deep Q-Network-Based Energy-and Latency-Aware Routing Protocol Design for Underwater Acoustic Sensor Networks. IEEE Access, 7, pp.9091-9104.
34. Patil, K., Jafri, M., Fiems, D. and Marin, A., 2019. Stochastic modeling of depth based routing in underwater sensor networks. Ad Hoc Networks, 89, pp.132-141.
35. Ni, Q., Pan, Q., Du, H., Cao, C. and Zhai, Y., 2015. A novel cluster head selection algorithm based on fuzzy clustering and particle swarm optimization. IEEE/ACM transactions on computational biology and bioinformatics, 14(1), pp.76-84.
36. RejinaParvin, J. and Vasanthanayaki, C., 2015. Particle swarm optimization-based clustering by preventing residual nodes in wireless sensor networks. IEEE sensors journal, 15(8), pp.4264-4274.

37. Xu, R., Xu, J. and Wunsch, D.C., 2012. A comparison study of validity indices on swarm-intelligence-based clustering. IEEE Transactions on Systems, Man, and Cybernetics, Part B (Cybernetics), 42(4), pp.1243-1256.