# High-Speed Antenna Selection for Underwater Cognitive Radio Wireless Sensor Networks

**S. Sankar Ganesh and S. Rajaprakash**

**Abstract** The underwater acoustic sensor network (UCASN) is used to monitor amphibian climate. The submerged hubs request for continual and ceaseless inspection. The submerged hubs are placed at various depths to stimulate the information transmission from the water depth sensor to floats hub. Regardless, the submerged organization has limited organizational assets. For example, battery, data transfer capacity and helpless in portability, heat-graphic conditions and spread postponement. The resulting delay and heat-graphic condition drags out the packet node's preparation and delays network operation. Deferred network activity increases hub battery usage and overhead. As a result, a bio-powered Dolphin Swarm Optimization Algorithm (DSA) is executed to find the optimal receiving wire for information transmission. DSA selects the ideal radio wire for information correspondence by assessing affirmation parcel obtained for the information sent through accessible receiving wires. The DSA was recreated in NS2-Aquasim climate and test bed to assess its presentation. The DSA improved information possess unwavering quality.

**Keywords** UCASN · Thermographic condition · DSA · SST

## 1 Introduction

The upper sea partners on a surface level by constraining the wind, heat, and new water by the extended calm sea, where this warmth and new water are separated and released through time and on a global scale. The surface layer consists of a higher blended layer influenced by the climate and a profoundly separated zone underneath the blended layer. The surface layer may be exposed to air sooner or later; the water is mostly legally exposed inside the blended layer. As a result, they reflect that the vertical structure of surface layer does not change rapidly to drive the climate but rather evolves due to earlier constraints. These driving occasions may have happened either locally in the area, or distantly at different areas and moved by sea flows. This

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upper ocean vertical design portrays the traits of upper-ocean vertical construction and discusses what impacts and how looks after them. We show numerous instances of shapes fluctuation by environmental compelling. This upper-ocean vertical design portrays the traits of upper-ocean vertical construction. These upward constructions can be taken by the assortment.

Author proposed the mechanism of the multiple input and multiple output (MIMO) communication for underwater cooperative/distributed. It is used to apply the techniques for attractive induction and mixture acoustic. Attractive induction used to tackle the synchronization problem for inter node, and reduce the errors and time of synchronization [1]. Authors discuss about the communication for MIMO; and it is used to analyze the underwater visible light imaging for spatial correlation; and studied about the performance of bit error rate and capacity with the help of MIMO [2]. They have proposed the orthogonal frequency division multiplexing (OFDM) system. The results are compared with the performance of OFDM with repetition coding, MIMO, and Alamouti [3]. They studied about the survey about the previous research work for MIMO with OFDM and proposed the underwater acoustic. This communication still not have perfect algorithm from the research view [4]. The Authors have studied and proposed a communication method for underwater MIMO. The results are compared with the same receiver type, which doesnt use the joint sparse mechanism [5]. The proposed algorithm is power allocation, and it is used to minimize the spatial modulations and bit error rate, and investigate the performance of the MIMO for underwater wireless optical and combined with both flag dual-amplitude pulse position and spatial modulations [6]. Author discusses about the system for multi-carrier and coded MIMO in communication of the underwater. It is used to detect the minimum mean square rate and zero forcing, and compare the performances [7]. They analyzed the On–Off keying module system with underwater wireless optical communication, and it is used to find the absent and present for MIMO, MISO, SIMO, and SISO [8]. Author genetic program used to design the controller of the MIMO with the help of underwater vehicles, and provide the robust UUV operation and stable UUV operation [9]. They mainly discuss about the underwater vehicle and to find the problem of the ideal perturbation signal, and considered the two signals like multi-level pseudorandom and random noise, and compared the performance for different signals [10]. Authors investigate about the theorems 1 and 2. These theorems are used to evaluate with the help of simulation by using remotely operated vehicle and compare the performances [11]. They detect the targets by using underwater acoustic waveguide with the help of MIMO model [12]. Author mainly focuses MIMO and proposed method is reducing the time complexity and space complexity from the receiver [13]. Author mainly investigates about the MIO technology. This technology used to brought the data rate gain for communication of UWV and compare the performance between SIMO and MIMO for data rate gain [14]. The proposed scheme is MIMO OFDM for communication of UWV. This scheme transmission has two modulations like QPSK and 16QAM and compares the performance [15].

## 2 Methodology

The proposed methodology is Dolphin Optimization Algorithm. This method is mainly focused on hunting behavior of dolphins. This dolphin has been used to search the environment location, generate sounds like shape, direction, and distance of prey and shown in Tables 1 and 2.

**Table 1** Optimal Dolphin solution

| Optimal Dolphin solution |
|---|
| $\text{Dol}_i = [X_1, X_2, X_3, \ldots, X_D]^{\text{T}}$ (1)<br>where "$i = 1, 2, \ldots, N$," '$N$' addresses several radio wires present in the hub for information correspondence, '$i$' addresses the distinctive ideal choice of receiving wire for various water segment |
| $DK_i = \text{Dol}_i - K_i, i = 1, 2, \ldots, N$(2)<br>where $K_i$ addresses numerous arrangements accessible to an issue |
| $DKL_i = L_i - K_i, i = 1, 2, \ldots, N$(3)<br>where $L_i$ represents Boolean |
| $X_{\text{ot}} = \text{Dol}_i + V_j t$(4)<br>$E_{ijt} = \text{Fitness}(X_{\text{ot}})$(5)<br>where $V_j$ addresses the arbitrary information transmission through various receiving wires, $t$ addresses time taken to accomplish ideal arrangement, and the wellness capacity of ideal radio wire for information transmission |
| $L_i = X_{iab}$(6)<br>where $L_i$ is the initial data transmission |
| $\text{Fitness}(K_i) > \text{Fitness}\big(K_j\big)$(7)<br>where $K_i$ and $K_j$ are evaluating the fitness function and the fruitful information transmission from source hub to objective hub |

**Table 2** Algorithm

| Step 1: The 50% of available antennas used to send the data from source to destination node |
|---|
| Step 2: To determine the most successful data pack from destination node for data reception pack rate |
| Step 3: To calculate vector of the distance between neighborhood ideal and ideal arrangement |
| Step 4: The 100% of antenna used to build search span and communicate information |
| Step 5: To calculate the ideal receiving wire for information correspondence |

## 3 Result and Discussion

The determination of reception apparatus for MIMO correspondence was re-enacted in NS2—network test system. Table 3 gives the organization boundaries of NS2. The exhibition of DOA assess for various number of receiving wires. At first, the receiving wire pooling starts with 25% of all out number of reception apparatuses. The pooling of receiving wire in steps limits calculation over-burden at the transmitter. The best receiving wire for information transfer is selected based on the bit blunder declared by the receiver hub. The transmitter reception device delivers a 1500-byte query information bundle. The touch blunder pace of information bundle increases because of sea thermographic properties, for example, water thickness, consistency and electrical conductivity. The adjustment in water thickness happens at various water sections, for example, Mesopelagic, Bathypelagic, and Abyssopelagic cause higher piece mistake rate because of water flow as per profundity. Moreover, the information transmission speed at shallow water is higher and as the profundity increases, the information transmission speed decreases significantly by leveraging spread postponement and touch mistake rate. Figure 1 shows the touch mistake rate variety for various reception apparatus choice. The information communicated through reception apparatus is selected by DOA from all out mix of radio wire, which causes negligible piece mistake rate contrasted with receiving wire mix selected from lower mix of reception apparatuses. The spot mistake rate is low for receiving wire selected from complete radio wires due to the reception apparatus positioning from affirmation bundles.

The bit error rate is low for radio wire chosen from all receiving wire mixes because of the decrease in charge bundle transmission and preparing among source and objective hub as in Fig. 2. The control bundle transmission works through the extended network, which will help in attaining the expected packet transmission. The receiving wire chosen from under 90% of all-out radio wires have higher SNR due to under intermingling on optimal radio wire by DSA. The source of the intermingling is a lack of space in the distance vector between the obtained perfect radio wire and the neighborhood arrangement reception wire. The optimal radio wire for information transmission is determined by the receiving wire determination from 100% of all-out radio wire.

**Table 3** Network parameters

| Network parameter | Value |
|---|---|
| Amount of nodes | 100 |
| Area of the total sensor | 1000 m × 1000 m |
| Size of the packet control | 12 |
| Size of the packet data | 30 |
| Nodes of the energy | 5j |
| Range of the communication node | 200 m |
| Speed of the node | 10 m/s |

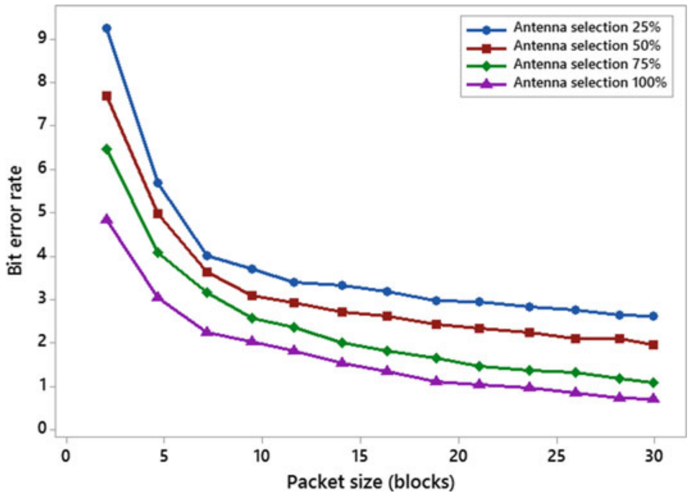


**Fig. 1** Bitter error rate versus packet size

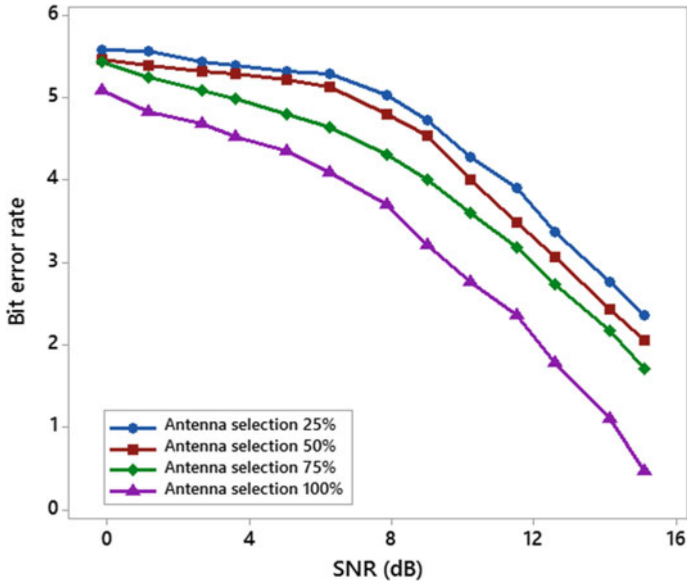


**Fig. 2** Bit Error rate versus SNR

## 4 Conclusion

The detected information of submerged hubs acquire bit mistake due to the sea heat-graphic conditions. The heat-graphic conditions are dynamic at various water segments of sea. The submerged hubs convey at various water sections in order to encourage information correspondence from fixed hubs at lower part of sea in order to float hubs. Be that as it may, due to the dynamic heat-graphic conditions, the touch blunder increment fundamentally causes bundle misfortune and better quality end-to-end delay. Henceforth, a bio-roused DSA was actualized to select the ideal receiving wire for achieving data transmission to improve the information unwavering quality. The DSA has selected the ideal receiving wire with negligible intermingling time, and it provides better information transmission to objective hub. The DSA has performed better as far as PDR, throughput, and energy utilization contrasted with conventional radio wire determination calculations, for example, BAB, Greedy, and Random inquiry.

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