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GAME THEORY BADED CHANNEL ESTIMATION BY OFDM SYSTEM IN UNDERWATER ACOUSTIC COMMUNICATION USING DNN CLASSIFIERS

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ABSTRACT:

Underwater optical communication techniques have played the most important role in the exploration of oceans and other aquatic environments. Underwater acoustic (UWA) communication faces a lot of hurdles such as environmental characteristics, variety of noises, temperature, pressure, salinity, etc which makes the UWA channel unique. UWA channel modeling is the most demanding task due to its time-varying property and double dispersion property resulting in severe multipath spread and time variation due to sparsity. In proposed DNN-based methods and the methodology of their usage for channel estimation in UWA-OFDM systems. In this Acoustics system increasing receiver data accuracy by estimating channel bandwidth, delay ,cyclic duration, number of sub carries ,pilot sequence and to minimize the bit error rate by using upgraded game theory algorithm SPCGT.

Keywords: Underwater Optical Communication,Spatial Partitioning with Coalitional Game Theory algorithm, DNN

I.INTRODUCTION

Orthogonal frequency division multiplexing(OFDM) provides a promising modulation technique for underwater acoustic(UWA) communication system. It is indispensable to obtain channel state information for channel estimation to handle the various channel distortions and interference. UWA environment places higher requirements and greater challenges to achieve high-efficiency and reliable transmissions for wireless communication. More recently, the orthogonal frequency division multiplexing (OFDM) technique has been adopted to UWA communications, due to its excellent performance in resisting inter symbol interference (ISI) and reducing multi path fading. The channel bandwidth into a large number of orthogonal narrowband sub carriers, such that each individual subcarrier which occupies only a small bandwidth can be modulated with a conventional modulation scheme at a low data rate, maintaining the total data rates equal to a single carrier system with the same bandwidth .This guard features of OFDM systems with high- speed transmission and high spectrum efficiency for wireless communication over UWA multi path channels. Channel estimation is critical to the performance of UWA-OFDM systems . Since the transmission signal is generally distorted by the channel characteristics when through multi path channels, the channel impulse response (CIR) must be estimated to recover the transmitted signal coherently at the receiver. To this end, some pilot symbols are usually sent together with the data subcarriers to obtain the CIR for channel estimation, where the pilot symbols are also prior known to the receiver with the help of these pilot channel estimation techniques, can then be utilized to evaluate the significant information of CIR for UWA-OFDM systems. Due to narrow band Sub carriers in OFDM system sparsity may occur ,to resolve this issue our proposed SPCGT utilized to avoid delay.

II.LITERATURE SURVEY

Underwater acoustic (UWA) communication,we propose a wavelet filter bank system as the extension of orthogonal frequency- division multiplexing system.We exploit the conventional structure of a UWA channel and formulate the pilot-assistated channel estimation as sparse recovery problem.Then we investigate the restricted isometry property of the measurement matrix via eigenvalue analysis and gershgorin circle theorem. The sparse recovery problem is proven to satisfy the restricted isometry property.Moreover,we also propose a low-complexity, complex-field homotopy algorithms for sparse channel estimation, regarding the fact that the channel taps of each path are usually complex valued in practice.Simulation results show that wavelet filter bank system achieves more accurate UWA channel estimation performance than the orthagonal frequency division multiplexing system under the same conditions of bandwidth, duration,data rate and channel profile.The proposed complex homotopy algorithms outperforms orthogonal matching pursuit(OMP) and stage wise OMP in both systems,whereas its computational complexity is similar to OMP.

III.EXISTING SYSTEM

They introduce the DNN solution to solve the problem of channel estimation in UWA OFDM system where the BELLHOP ray model is applied to simulate the UWA communication environment for increasing reliability and accuracy of the experiments.They proposed two DNN models with different architecture employing a novel training strategy for channel estimation. They perform extensive experiment on the proposed DNN models to compare and analyse the result with conventional LS,MMSE and BPNN channel estimation methods.DNN based methods and methodology for there usage for channel estimation in UWA OFDM system. The experimental result demonstrate that the proposed methods outperform LS,BPNN algorithms and are comparable to the MMSE algorithms respect to BER and NMSE.

IV.PROBLEM STATEMENT

In existing system least square method doesn't having channel state information. In Minimum mean square method computational complexity is very high and bit error rate is also comparatively high.In previous method we have sparse common sparsity problem and pilot over head to over come this problem we move on to our proposed Spatial Partitioning with Coalitional Game Theory.

V.PROPOSED SYSTEM

In our proposed system we are going to combine SPCGT channel estimation algorithms with deep neural network back propagation for accurate estimation and tracking of channel state information(CSI) are required for receiver design and channel capacity analysis in an under water environment .It includes a journey of channel estimation from time varying UWA multi path ,model towards the estimation of a multi path underwater channel in MIMO-OFDM. The study conducted about channel coherence time measurement with the utilization of experimental data.The analysis of result state that the sparse path arrival time is stable with relative delay .To improve the performance of channel estimation sparse structure and temporal correlation matrix where utilized.To overcome sparsity of channel in OFDM block SPCGT with DNN approach was utilized.

BLOCK DIAGRAM

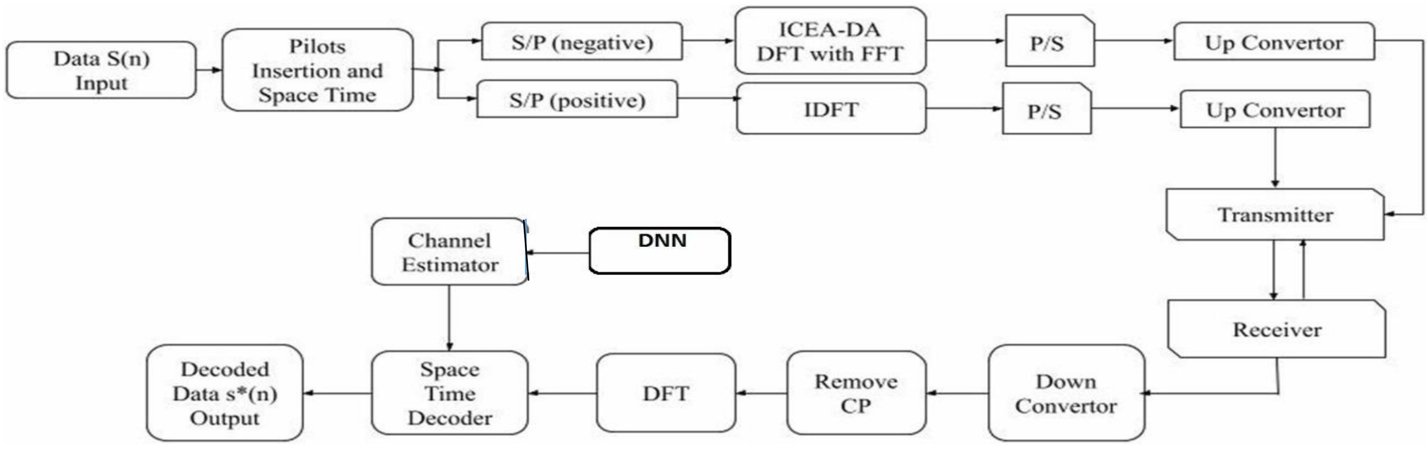

FIG 5.1: SPCGT COMBINE WITH DNN BLOCK DIAGRAM

MODULES

- SPCGT IN OFDM MIMO SYSTEM
- DNN(Deep Network Network)

VI. MODULES DESCRIPTION

6.1 SPCGT IN OFDM MIMO SYSTEM

The input signal obtained from MIMO system based on capacity and reliability.Pilot symbols are transmitted over orthogonal transmission medium.Based on orthogonality QAM modulation scheme is applied to each sub carriers.The digitalized signal are demultiplexed using serial to parallel converter.By using IFFT frequency domain signals are converted into time domain signal.By using improved channel estimation algorithms converted signals are partitioned spatially and channel capacity are estimated for each user. By differential evolution used and unused channels are computed.Then it converted to serial data for transmission by using parallel to serial converter (multiplexing).The cyclic prefix is add to each serial data to reduce ISI. Hence the low frequency component is converted to high frequency component using up converter then it transfer to receiver block.In receiver block the transmitted high frequency signal is converted to low frequency signal using down converter in order to simplify the subsequent radio stages.By the removal of cp from each subcarrier noise and cyclic prefix are cancelled each other.After the removal of cp the received signal is demultiplexed.Now the parallel time domain signal is converted to frequency domain signal by DFFT and equalize the gain of the desired signal.The converted signal are multiplexed(p/s).To increase the reliability of the data transmission the space time decoder is used,which decodes the transmission pilot symbols for channel estimation .Then estimated output is transferred to DNN block.

6.2 DNN MODULE

Underwater communication is more complicated in reality due to environment variation accuracy is too low to address this issue DNN is more promising technique.The parameters of the UWA OFDM system and SPCGT with neural networks are used to increase the reliability and accuracy of our experiment.The communication system is connected with an end to end neural network architecture and it is used for signal transmission. Before deployment, the DNN models are trained with received pilot symbols and based on user frequency channel capacity are already programmed .The input signals are received from SPCGT output and the permutation process is performed for signals in hidden layer .The DNN output is compared with SPCGT estimated output and back propagation is performed untill the channel gets error free.Encoding and decoding channel estimation and all other functionality of communication link are embedded in DL block .From DNN output BER rate is reduced at 12 th channel and we achieve exact information by our proposed technique.

VII .RESULT

BIT Error rate performance

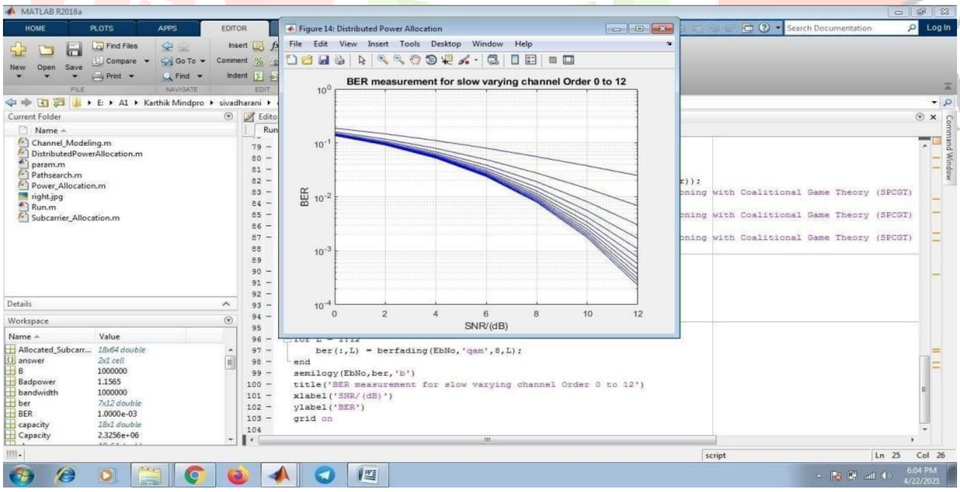

FIGURE 7.1 Bit Error Rate Performance

In the above shown as bit error rate in the channel from 0 to 12 at the **12th** channel the BER values is minimum when compared with other channel. The BER value is $10^{-3.7}$ at the channel no 12. When the BER is minimum the throughput value is maximum during the transmission.

Comparison Graph

LS vs SPCGT vs SPCGT COMBINE WITHDNN

(Bit Error Rate performance)

SNR/dB	LS	SPCGT	SPCGT COMBINE WITH DNN
0	0.800	0.486	1
2	0.750	0.1869	0.1
4	0.65	0.0865	0.0398
6	0.53	0.0196	0.0316
8	0.420	0.0068	0.0079
10	0.240	0.0075	0.0019
12	0.150	0.000246	0.000195

Table 7.2 Comparison Bit Error Rate Performance of LS vs SPCGT combine with DNN

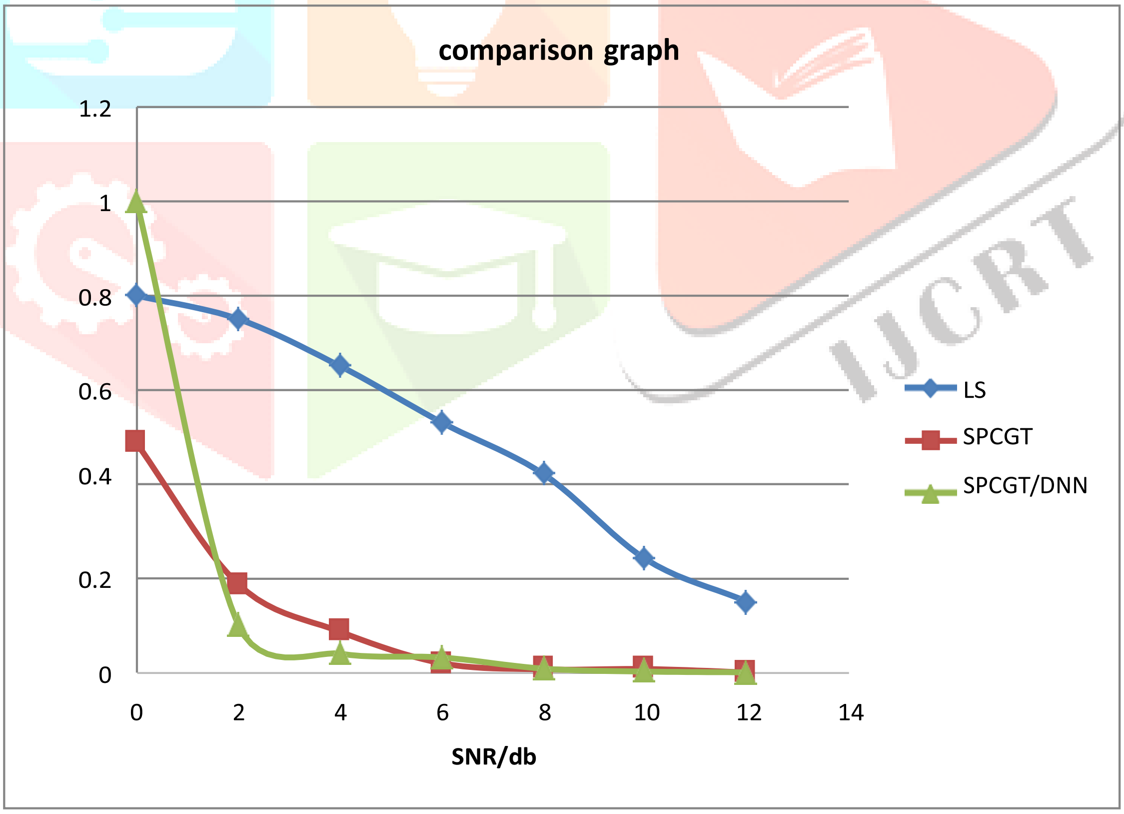

FIGURE 7.3 Bit Error Rate Performance of SPCGT combine with DNN

In this fig 7.3 shown as bit error rate in the channel from 0 to 12.At the 12th channel the BER values in minimum when compared with other channel.The BER values is $10^{-3.7}$ at the channel no 12.When the BER is minimum the throughput value is maximum during the data transmission. In previous LS algorithms have bit error rate of 0.150 and existing SPCGT algorithms have bit error rate of 0.000246, In our proposed SPCGT combine with DNN algorithms reduced bit error rate of 0.000195.

VIII. CONCLUSION

In order to achieve effective channel estimation ,integration of SPCGT with DNN modules are designed. Utilizing modulation scheme of 64 QAM , the performance of the proposed method is better then the previous existing method it demonstrate that our proposed methods have advantages in dealing with the problem of channel estimation in UWA system.In our proposed channel estimation BER reduced at the rate of 0.000195 compared with an existing technique such as LS and SPCGT.

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