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Underwater Wireless Communication Using Fault Management Techniques

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Abstract: Utilization of electromagnetic waves for under-water communication is very difficult, because of huge attenuations of the electric and magnetic field, so for the under-water channel the best answer is acoustic wave communication. Acoustics waves travels easily in sea water, which shows strong salinity conductivity. But still it has certain limitations such as fluctuations due to environmental characteristics etc, so in order to overcome these limitations here we use BPSK and FSK modulation techniques together with LBC in the underwater acoustic channel. Linear Block Codes are mainly used for checking errors while transmitting the signal.

Keywords: Management Techniques, Wireless Communication, Underwater Channel, Transmitted Signal.

INTRODUCTION

Wireless communication technology is one of the supreme achievements in modern science. Using wireless technology, the huge world is reduced to small ball. For past decades, researchers focused to design a method for wireless information transmission under water.

The major wireless communication system uses electromagnetic waves to transmit and receive information. But the important property of electromagnetic waves is that it can propagate only for short distances. If electromagnetic wave is used under water, its range and effectiveness is reduced due to large attenuation of electric and magnetic field. Hence, acoustic waves are the single solution for underwater communication, as it can pass through so much. Even though, the acoustic wave range is favorable for under water communication channel, still it possess many problems in designing acoustic based transmission system due to following limitations.

1. Acoustic waves are absorbed by sea water which confines the distance that the sound can cover and also causes attenuation.
2. Low velocity of sound propagates roughly 1,500 m/s.
3. Severe multi path reflected on sea bottom and surface which causes delayed echoes and interference.
4. Portion of signal is masked by noise in sea.
5. Heterogeneous characteristics of underwater channel affect the transmitted signal.

For the good performance of underwater communication, there should be:

1. The signal that is used should perform well with environmental conditions.

PROBLEMS IN UNDERWATER CHANNEL

The bottom of sea and sea surface are the two interfaces in the underwater channel. Because of these interfaces, acoustic waves find several paths due to reflection. These paths are the replicas of main signal or spatial field of stable interferences.

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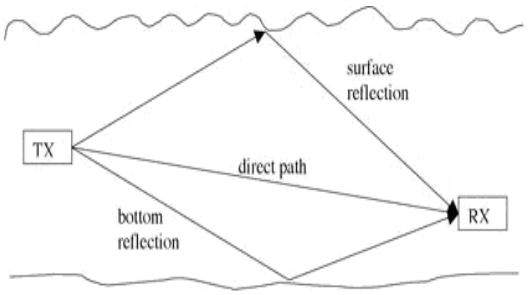

Fig.1: Multipath of transmitted Signal

Spreading Loss

This loss leads to reduction of signal. Thus spreading loss is given by

SL=20log(R+aR)

Where a→ absorption coefficient.

Multiple Paths

Numerous paths arise during signal transmission from source to destination by different durations and different durations along different paths. Numerous alternate paths are varied depending upon the medium and topographic factors.

Low Speed

This is mainly due to short delays which are induced by the speed of light (300,000m/s). But in under water, delays are much more important since propagation velocity of acoustic signals is considerably slow compared to the speed of light thus creating echoes and reverberation effects.

Doppler Effect

One more problem in under water acoustic wave is Doppler shift which is a change in obvious frequency after broadcast.

MODULATION TECHNIQUES

As already mentioned, under water communication system has to use the acoustic signal that can hold data smoothly. These acoustic waves are not dissimilar from electromagnetic wave which is used in radio transmission, but the difference lies in surrounding under water environment for example noise, propagation, transducer types.

Several other parameters used in digital communication link. The most important parameters are SNR, BER, Eb/No.

SNR- Signal to Noise Ratio

BER

It describes the behavior of digital communication link and our dependency on it. In our simulation

SIMULATION RESULTS

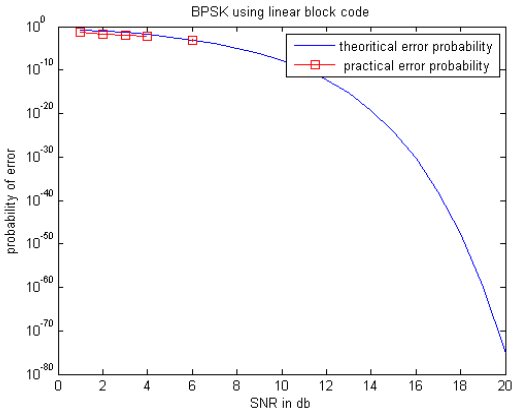

Fig.2: Simulation result of BPSK using LBC

BPSK Using LBC

We have used a generator matrix in BPSK modulation technique by using LBC. By simulating in the MATLAB we obtain the following result.

FSK Using LBC

Here the generator matrix is used in FSK modulation technique by using LBC. By simulating in the MATLAB we obtain the following result.

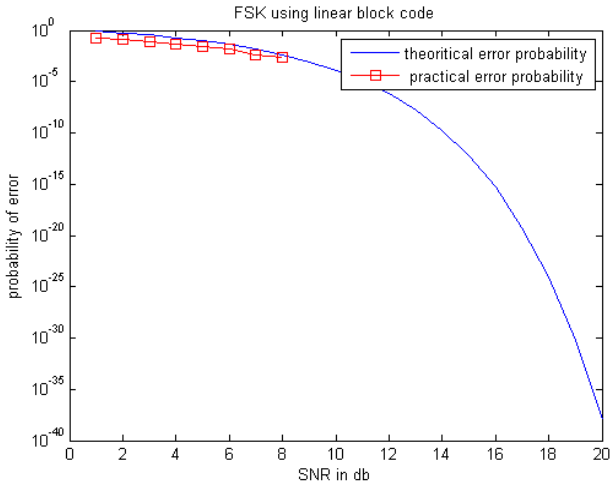

Fig. 3: Simulation result of FSK using LBC

Generation of Convolution Code

In general K N- bits stages are in shift register. Through shift register the input data is shifted generally by K-bits at a time.

CONCLUSION

From the above results we conclude that the probability of error has been reduced. Theoretical and practical error probability remains moreover same. So this technique can be applied to underwater communication channel where acoustic wavers are used. But in future this technique can be modified.

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