# *Proposed algorithm to overcome Multipath fading & ISI for underwater communication*

Dr. P N Sudha
Prof. &Head ECE department,
K.S.I.T.
Bangalore, India
pnsudha@gmail.com

***Abstract*— The underwater communication is very important mode of communication but the main drawbacks are due to multipath fading and ISI. The proposed algorithm mainly aims at minimizing the both multipath fading using the channel coding technique to improve S/N ratio and equalization technique to minimize the ISI**

**Keywords—ISI; S/N; Turbo code; multipath fading**

## I. INTRODUCTION

The underwater communication is used both for military purpose and also for commercial purpose. The design concept of underwater varies with respect to the landline communication has the underwater has high frequency attenuation and multipath spreading. To design a communication link for a under water system we need to know the characteristic of the channel. In the view of communication theory the underwater communication is more complex compared land. For landline communication we prefer to use electromagnetic signal but for these electromagnetic signal will be highly distorted because of ISI hence we prefer to use acoustic signals for underwater communication.

In underwater communication the spreading losses increases either with increase in frequency or with the increase in distance [1]. In the proposed paper minimize the losses due to spreading of the signal in water using the acoustic sensors. The acoustic sensor nodes are used in to collect various data related to pollution monitoring, to prevent disaster, to assist navigation and for surveillance purpose [2].The main requirement of these nodes is to have the self configuration capability by exchanging their where about with the neighboring nodes .This characteristic of the acoustic nodes is used in this proposed method by designing underwater acoustic sensor network between the transmitter and the receiver.

## II. ACOUSTIC SENSOR NODES

The main drawback of underwater communication is due to spreading of the signal when transmitted through the water. Because of this S/N ration of the received signal will be very small and continuously varies with time. Hence to overcome this drawback we propose an algorithm using the acoustic nodes placed between the transmitter and the receiver and these acoustic nodes are numbered. These nodes are designed to forward the received data to the next node in the forward direction in first-in first-out fashion
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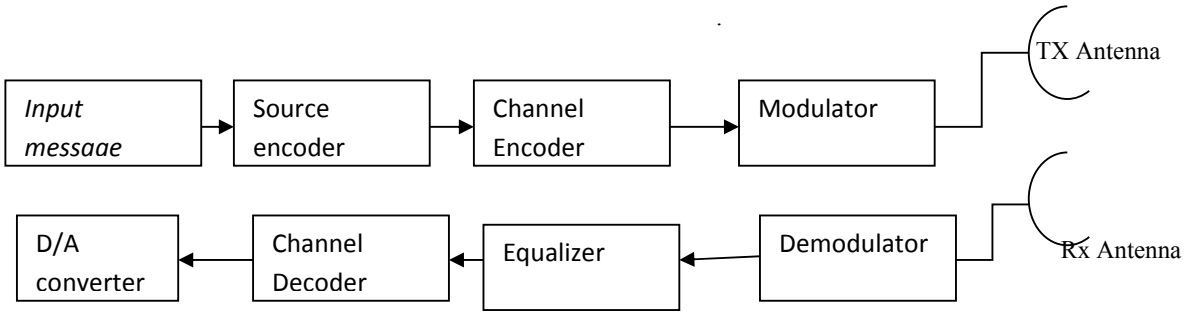


Fig: Block diagram of communication system

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## III. PROPOSED METHODOLOGY

The information obtained is digitized passed through the channel coder [8, 10]. The information data is channel coded using turbo coding technique. The turbo coding technique is used in this algorithm to overcome the random errors like multi -path fading and additive noise that occurs in the underwater channel [3]. The use of turbo improves the S/N ration of the received data.

The channel coded data is packetized into low data rate. Each packet is designed with a counter in it. The output of the channel encoder is modulated using CDMA technique. The CDMA technique is used as it further minimizes the effect of the noise.

These packets are further transmitted from source to destination by passing through randomly placed acoustic sensor nodes. All the nodes are numbered. As the packet passes through the node the counter count is incremented.

At the receiver the received signal is demodulated using demodulator and the obtained packet is given to the equalizer.

In the proposed algorithm equalization is done using the bit stuffing algorithm to minimize the ISI. The main purpose of using the equalizer block in the algorithm is to nullify the signal spreading effect due to propagation delay by stuffing bits. If the count present on the packet is high, it indicates that the packet has travelled longer distance to reach the destination hence is stuffed with smaller number of bits else if the count value on the packet is less such a packets are stuffed with more number of stuffing bits.

The block diagram of the proposed algorithm for underwater communication is as shown in the block diagram above.

## IV RESULTS FROM THE EQUALIZER:

| Counter value on the packet | Stuffing bits to be added | Net delay |
|---|---|---|
| 2[1micro second/count] | 20 bits[1 micro second/bit] | 22micro seconds |
| 10 [1micro second/count] | 12 bits[1 micro second/bit] | 22micro seconds |
| 5[1micro second/count] | 17bits[1 micro second/bit] | 22micro seconds |

Here the net delay in receiving the packets is maintained constant by varying the number of stuffed bits.

## V CONCLUSION

The proposed algorithm is designed to reduced effect of multipath fading and ISI by using channel coding technique and bit stuffing technique.


## *Acknowledgment*

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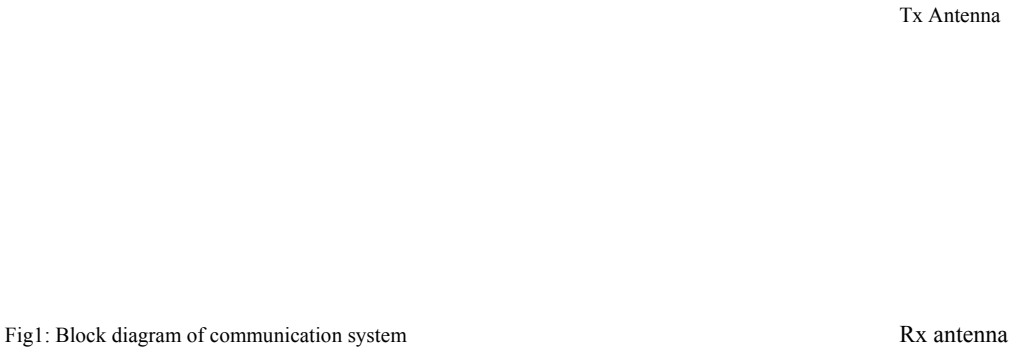


Fig1: Block diagram of communication system

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|---|---|---|---|
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