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Performance Enhancement of Antenna System in Below Deck Environment

Naval Kishorand M. and Neelaveni Ammal

ABSTRACT

In the Below Deck environment, there is the main problem of signal detection in the close door and in the open door. In the close door, the signal comes negligible but in the open door signal comes very less. So for increasing the signal capacity of wi-fi and in the mobile in Below-deck environment have to increase the capacity by using the different Antenna system and compare between them that which Antenna system is preferable for the below deck environment.

Keyword: single-input-single-output(SISO),multiple-input-multiple-output(MIMO),orthogonal frequency division multiplexing (OFDM)

I. INTRODUCTION

In the Below Deck, a very challenging environment is the wireless network for the communication. Due to the ISI(inter symbol interference) the electromagnetic signal affected during the signal transmission in the Below Deck environment. There are so many existing system which uses multi-antenna so the signal cannot be often affected by ISI. In both the metallic construction and coupled compartments the multi antenna system can transmit signals from one place to another. The proposed system is using OFDM with multi antenna system. In the wireless network the channel capacity and channel reliability can be improved by the OFDM. The existing system uses narrowband communication systems which is affected by ISI. The paper evaluates the performance of multi antenna system with single antenna system in the below deck environment. SNR are first determined and then measured.

II. SYSTEM MODEL

The system model are SISO System model ,andMIMO System model

(A) Siso System Model

The SISO is single input single output means it is that type of antenna technology for wireless communication in which one antenna is used for transmitter and one antenna is used for the receiver.

The applicationsof SISOsystem model aremissiles, spacecraft, and aircraft.

(B) MIMO System Model

MIMO isone type of system model in which more than one antenna is used in both transmitter and receiver side. MIMO is used to provide improvement in both channel robustness as well as channel throughput. The MIMO is used for wire line communication.

The advantage of MIMO are: When need in limited bandwidth channels trying to achieve high data throughput to overcome the detrimental effects of multipath and fading multiple antenna configurations can be used, MIMO technology is used for superior data rates, ranges, and reliability, MIMO system is more flexible for the communication system.

III. LAYER (ALAMOUTI, MRC, IID, SM)

(A) Alamouti scheme

Alamouti scheme is a simple transmit diversity scheme suitable for two transmit antennas.For achieving the transmit diversity one of the simple and effective means is space-time block code. To enable the transmission copies of a data stream across a number of antennas and to exploit the various received version of the data to improve the data transfer.

(B) Maximal ratio combining (MRC)

There are so many techniques which are known to combine the signals from multiple diversity branches. Maximal ratio combining is also a technique to combine the signals in which each signal branch is multiplied by a weight factor that is proportional to the signal amplitude. In the MRC the gain of each channel is made proportional to the RMS signal level and inversely proportional to the mean square noise level in that channel. MRC is the optimum combiner for independent AWGN channels. MRC can restore a signal to its original shape.

(C) Independent identically distributed (IID)

The IID is the random variable of sequence or other collection in probability and statistics theory if each random variables has the same probability distribution as the other and all are mutually independent.

(D) Spatial multiplexing (SM)

For the transmission there are so many techniques are used in MIMO wireless communication in that techniques spatial multiplexing is also a technique which is used in MIMO wireless communication to transmit independent and separately encoded data signals. For encoding,the spatial multiplexing is used as the two approach one is open loop approach and the another is close loop approach. If the transmitter is equipped with antennas and the receiver has antennas, the spatial multiplexing order is;

$$Ns = \min (Nt, Nr)$$

In the open loop approach, the input-output relationship is;

$$Y = Hx = n$$

Y = output signal of open loop, x=input signal of open loop, and n= noise present in the open loop

In the close loop approach, the input-output relationship is;

$$Y = Hw_2 + n$$

Y = output signal of close loop, s=input signal of close loop, and n= noise signal present in the close loop

IV. PERFORMANCE METRICS

By using the Shannon channel capacity the estimation of the performance of the OFDM systems with MIMO techniques can be done. The Shannon channel capacity gives data transmission with less bit error and transmission from the one antenna to another antenna is measured in bps/Hz. For flat fading channel capacity is;

$$C = \log_2 \left(1 + \frac{P_{T_x |h|^2}}{N_0} \right)$$

Here c is the capacity, PTx is the transmit power, No is the noise power in the channel, and h is the complexchannel gain

V. SIMULATION SCENARIOS

By using MATLAB software the channel capacity of each physical layers of both the antenna transmitter and receiver are simulated. For the simulation analysis of the 1x1 single input and the single output, Maximal Ratio combining and Alamouti space-time block coding are taken in the Below-Deck environment with the metallic construction and the coupled sections.

VI. RESULTS

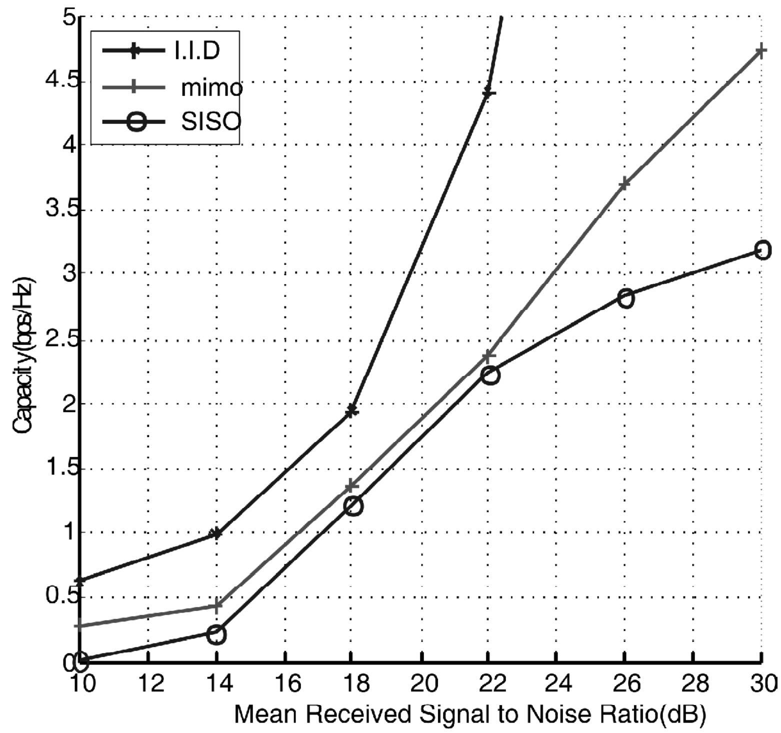

Figure 1: Capacity for physical layers averaged across IID,MOMO, and SISO between the transmitter and receiver

There are three graphs in the above Fig. 1. In the figure in x-axis shows capacity(bps/Hz) and in Y-axis shows, Mean received signal to noise ratio in dB. The 1st graph is of SISO.SISO means single input single output due to only one transmitter antenna and receiver the SISO graph showing that it is not reaching saturation point. The 2nd graph is of MIMO, MIMO means multi-input and multi-output so due to more than transmitter antenna and receiver antenna the MIMO graph is showing that it is reaching saturation point so in this the signal detection capability is more than the SISO and from others. The 3rd graph is of IID. The IID graph is showing that it is also not reaching to saturation point but the signal detection capability is better than SISO.

There are three graphs in the above Fig. 2. In the figure in x-axis shows capacity (bps/Hz) and in Y-axis shows, Mean received signal to noise ratio in dB.The 1st graph in the fig.2 is of MRC.MRC means maximal ratio combining. There is already discussed MRC in the above. The 2nd graph is of Alamouti scheme.Both the graph are not reaching to saturation point but here showing that MRC has better signal detection capability in the below-deck environment than Alamouti scheme.

VII. CONCLUSION

By the simulation analysis results gives the multi-antenna system which can improve communication performance over single-antenna system in the below-deck environment and in the coupled compartments.

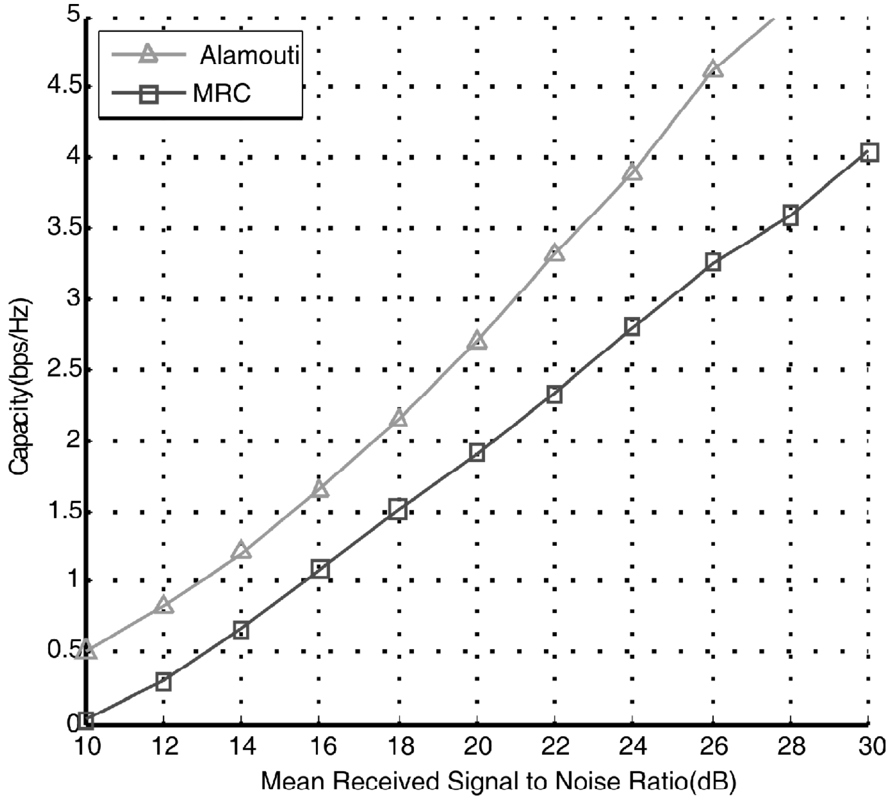

Figure 2: Capacity for physical layers averaged across Alamouti and MRC between the transmitter and receiver

MIMO system should be used in the Below-deck environments over SISO, IID, Alamouti, and MRC system. So the multi-antenna system can be used in a below-deck environment over single antenna system.

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