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Performance Analysis of MIMO Based Chaos Communication System

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ABSTARCT: In last few years chaos based digital communication system are widely studied. This is due to the fact that it provides better security compared to the other digital communication systems. The non periodic, non predictability, easy implementation and sensitive initial condition of the chaotic sequences ensures secure communication. Chaos communication system involves many transmitted symbols as the information signal is spread depending upon the chaos map characteristics. Therefore there is a great need to improve the data rate and the MIMO technique is used to increase the data rate and the capacity. Where the capacity depends upon the number of antennas used in the communication system ie. MIMO configuration. Using the Correlation Delay Shift Keying (CDSK) the data sequences are modulated using 2x2, 4x4, 8x8 MIMO systems and the Bit Error Rate (BER) performance is evaluated for Tent map and Boss map using zero forcing detector and the minimum mean square error (MMSE).

1. INTRODUCTION

Chaos communication enables giving security to transmission of data performed through advancements. Chaos communication system is defined by selecting the initial conditions of the equation corresponding to a particular chaos map. Chaos signals are entirely changed if there is even a slight variation in the initial condition which proves the sensitivity towards the initial conditions. Unless the initial condition is known there is no possibility to generate the proper chaotic signals. It is very difficult to anticipate the chaotic signal by the intruder. With the use of chaotic signals the transmitted signal appears to be an interference in the system. Subsequently, it does not attract the attention of the unintended receiver. These attributes makes the security of chaos communication system better than the existing digital communication systems. Due to this included point of interest of security, chaos communication has been widely examined.

A chaotic dynamical system is considered to be a deterministic and uncorrelated system whose behaviour can be predicted for a while and then it appears to be random in nature. The complex dynamic behaviours provided by chaotic systems are utilized to provide a security for the digital communication systems. They have been effectively utilized to different engineering applications, for example, automatic control, signal processing and watermarking.

Since the signals produced from chaotic dynamic systems are similar to the noise signals and are super sensitive to the introductory conditions it is favourable to convey messages with this sort of signals that are wide band and has high communication security. Secure communication with chaos has been produced. These frameworks have a tendency to be more computationally complex than the non- spread communication frameworks. They give invaluable multipath mitigation and multi-client reuse capabilities of the spectrum.

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The project evaluates the performance of bit error rate (BER) in Rayleigh fading channel making use of the correlation delay shift keying technique in chaos communication system. The correlated delay shift keying (CDSK) system is applied on the 2x2, 4x4 and 8x8 MIMO configuration utilizing the zero forcing (ZF) and the minimum mean square error (MMSE) detection techniques. The simulation is carried out for Tent map, Henon map and Boss map.

2. PROBLEM STATEMENT

With the increased application and advantages in the chaos digital communication system, there is a high necessity in order to improve the performance of the system based on the bit error rate and also taking into consideration the security aspects.

3. RELATED WORK

Performance evaluation of DCSK system with chaotic maps

In this paper, the execution in differential chaos shift keying (DCSK) plans utilizing diverse chaos maps, for example, Gauss map, Tent map, Gingerbread man map, and Henon map is studied. As advances of communication system build up, the requirement for information security becomes additionally altogether important. DCSK modulation procedure has points of interest of conventional spread system and framework furthermore gives upgraded information security. The execution with Henon map is superior to the next chaos maps with average spreading components and at sensible SNR levels.

Wireless MIMO systems in fading environments: A stabilizing transmission approach

In this paper, we examine versatile transmission for different info numerous yield (MIMO) receiving wire frameworks with multi-shafts in blurring situations when the channel-state data at both the transmitter and the recipient is accessible. In Rayleigh blurring situations, the transmitter should be equipped for spatiotemporal sub channel choice and force control as Eigen values of channel framework changes. Under requirements of individual bit mistake rate (BER) and most extreme transmit power for every information stream, we embrace the ideal transmit system of minimizing the normal transmit power (ATP), and concentrate looking into the issue where these individual BER limitations are of short term. With the assistance of a request factual consequence of the Eigen values of complex focal Wishart networks, we infer and give shut structure ATP expressions. Because of fleeting BER limitations, versatile transmission taking into account channel Eigen values can keep BER dependability of MIMO framework unaltered practically without blackout, simply living up to expectations in added substance white Gaussian clamor situations. At the point when the greatest transmit force is permitted to be endless, we examine profoundly relationship among the ATP, the quantities of transmit and get radio wires. At last, some numerical results are given to approve the hypothetical investigation and make correlations with the relating versatile transmit plot under long haul BER limitations. Our reproduction results demonstrate that the versatile transmit plan of fleeting is appealing for the future MIMO applications, particularly when a substantial MIMO framework is utilized.

Design of frequency modulated correlation delay shift keying chaotic communication system

Considering the deficiencies of differential chaos shift keying (DCSK) with terrible secrecy and low information exchange rate, this study outlines and investigates another chaos shift keying digital modulation scheme, frequency modulation chaos differential shift keying (FM-CDSK). The plan has both the benefits of CDSK and FM-DCSK. This study gives the specific hypothetical determination of the rule of modulation and demodulation. The

reproduction examination of information transmission rate and confidentiality confirm that this new plan has more prevalent execution than DCSK and CDSK, and the transmission rate is twice as much as unique shift keying plans. In this paper the new chaos shift keying plan perfectly accomplishes the secure transmission of picture sign. It can be obviously seen that this plan is feasible in advanced technology.

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4. SYSTEM ARCHITECTURE

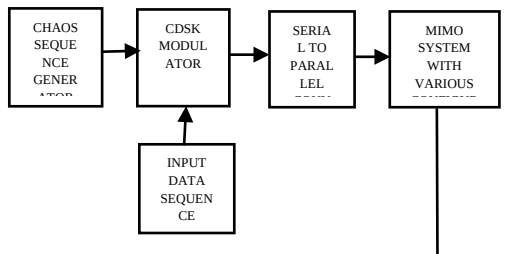

Fig4.1 system architecture

The chaos sequence are generated based upon the respective chaos map equations which characterizes the chaos maps such as the Tent map, Henon map and the Boss map. The resultant chaos sequence is then used to modulate the information sequence by making use of correlation delay shift keying (CDSK) technique. Further the parallel transmission of CDSK modulated sequence is carried over the MIMO system with various antenna configurations.

The information sequence is reconstructed using the MIMO detection algorithms such as the zero forcing (ZF) and the minimum mean square error (MMSE). Lastly, the BER performance is evaluated for 2x2, 4x4 and 8x8 MIMO with zero forcing and minimum mean square error algorithms.

5. DESIGN MODULES

The project includes the following three modules namely:

- Correlation Delay Shift Keying (CDSK) system
- MIMO detection algorithms
- Chaos system and Chaotic maps

6. RESULT

The project evaluates the performance of bit error rate (BER) in Rayleigh fading channel making use of the correlation delay shift keying technique in chaos communication system. The correlated delay shift keying (CDSK) system is applied on the 2x2, 4x4 and 8x8 MIMO configuration utilizing the zero forcing (ZF) and the minimum mean square error (MMSE) detection techniques. The simulation is carried out for Tent map and Boss map successfully. The BER performance for the above system is analysed and it has been seen that boss map performs better in

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reducing BER than tent map. For future implementation we can make use of other equalizers to have much more reduction in BER.

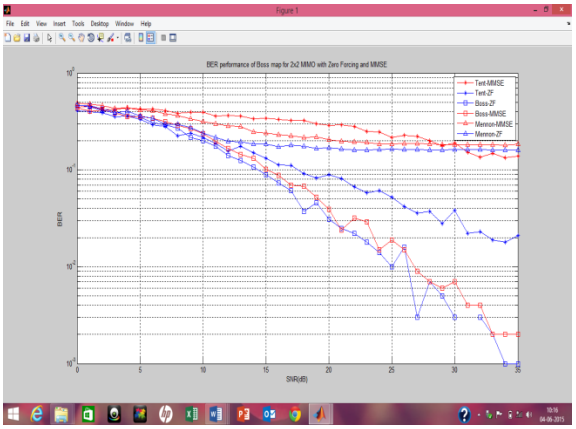

Fig. 2 BER Comparison

7. REFERENCES

[1] Performance evaluation of DCSK system with chaotic maps Information Networking (ICOIN), 2013 International Conference on, pp. 556-559, Jan. 2013

[2] Wireless MIMO systems in fading environments: A stabilizing transmission approach Wireless Communications ,Networking and Mobile Computing(WiCOM), 2012 8th International Conference on, pp. 1-8, Sept. 2012.

[3] Design of frequency modulated correlation delay shift keying chaotic communication system Communications, IET, vol. 5, no. 7, pp. 901-905, May 2011.

[4] Wireless MIMO systems in fading environments: A stabilizing transmission approach Communications, Networking and Mobile Computing (WiCOM), 20128th International Conference on, pp. 1-8, Sept. 2012.

[5] Anti jamming performance of chaos communications system using DCSK and CDSK modulation method 2012The Journal of Korean Institute of Electromagnetic Engineering and Science, vol. 24, no. 4, pp. 417-425, Apr. 2013

[6] On the performance of chaos shift keying in MIMO communications systems, march 2011Wireless Communications and Networking Conference(WCNC),2011IEEE,pp. 1432-1437, March 2011.

[7] Non-coherent correlation-based communication systems choosing different chaotic maps June 2007Proc. IEEE Int. Symp. onCircuits

and Systems, New Orleans, USA, pp. 1433-1436, June 2007.

[8] Performance analysis of correlation based communication schemes utilizing chaos Circuitsand Systems I Fundamental Theory and Applications, IEEE Transactions on, vol. 47, no. 12, pp. 1684-1691, Dec. 2000.