Performance Evaluation of DS-CDMA System based Orthogonal Chaotic Vectors over Rayleigh Fading Channel

Abstract

Spreading codes with low cross-correlation values are needed to suppress the effect of multiple access interference (MAI). The chaotic system can be used to generate very large number of sequences due to its sensitive property to initial conditions but due to the quasi-orthogonal nature of chaotic sequences the MAI between active users is generated which leads to degrade the performance of the system. Another type of chaotic sequences with zero values of cross-correlation called orthogonal chaotic vectors (OCVs) are generated by using logistic map and the basic idea of Gram-Schmidt ortho-normalization process. In this paper, performance of OCVs in DS-CDMA system for transmission data for different active users over different channels (Rayleigh Flat fading channel and Rayleigh Frequency selective channel) is given. Simulation results show that the DS-CDMA based on OCVs gives better BER performance than other systems. The results also show that the system based on OCVs has the same BER performance regardless of the number of users under the effect of flat fading channel. While at BER=$10^{-3}$, number of active users =8 and spread factor 160 there is about 6dB performance difference between the system based on OCVs and system based on Non-OCVs under the effect of time invariant frequency selective fading channel and this difference is decreased to 1dB when spread factor is 320.
References

- Ward C. and David K., "Linear Algebra: Theory and Applications", 1st. India
edition, Jones and Bartlett publishers, 2010.


**Index Terms**

Computer Science  Communications

**Keywords**

Orthogonal chaotic vectors  Non-Orthogonal chaotic vectors

Gram-Schmidt ortho-normalization process

Fading channel.