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PERFORMANCE ANALYSIS AND OPTIMIZATION DESIGN OF THE CHAOTIC SEQUENCE USED AS SPREAD-SPECTRUM SEQUENCE IN APPLICATION

**Abstract**

Now, spread spectrum technology is more and more widely used in space communication and navigation etc. As security threat increasing, space communication needs high security spread spectrum sequences. As a kind of high security nonlinear sequences, chaotic sequences can be used as a high security spread spectrum sequences, but also need do some optimization design. This article takes Logistic chaos mapping for example. Firstly, we analyze the performance of chaotic sequences with binary, including the PN sequences balance, correlation performance, run-length characteristics, security and multiple user access performance, which is in the condition of different quantization precision, quantitative threshold, fractal parameters and the initial value. The results show that chaotic sequences with randomness in the individual and deterministic in statistics. In other words, with fixed fractal parameters, a single chaotic sequences generated by different initial value is random and nonlinear, but the statistic characteristics of each performance of chaotic sequences generated by different initial value is stable, and minimal correlation with the initial value. The results accord with the conclusion of chaos "certain non-linear process" in theory. This conclusion provides the foundation for chaotic sequences to be used as PN sequences. On the one hand, it makes the chaotic sequences with different initial conditions have stable PN sequences performance; On the other hand, through random initial value, it can enhance its anti-interference ability. Then, based on the above results, according to different index requirements of PN sequences balance, correlation properties, run-length characteristics, security and multiple user access performance, quantitative threshold and fractal parameters of chaotic sequences were optimized. There will be parameters clan of different chaotic sequences mapping function matching different index requirements of performance. User can choose function parameters according to different kinds of needs. This paper could provide support for application, where chaotic sequences used as spread spectrum sequences, in space communication.