Chaos-based communication utilizing attractor statistic detection
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During recent decades the communication domain has experienced many developments, from wireline to wireless, from narrow-band to wide-band, from voice communication to data transmission. Meanwhile, several challenges have come along with these developments, such as the lack of sufficient frequency resource, the requirement of high-rate transmissions, the demand of low-cost equipment, and so on.

A research interest hence arises which seeks the possibility of achieving a system employing a simple and low-cost transceiver to transmit data through a wide frequency band with low power density. Furthermore, because of the wireless propagation environment, the transmitted data can be only detected in a non-coherent way.

Several researchers have already worked on this task, such as Kolumban et al. (2007) and Chong et al. (2008). They have proved that chaotic systems is one of the possible solution, because of the wide-band property of chaotic signals and the simplicity of signal generation. As far as non-coherent detection is concerned, differential chaos shift keying (DCSK) of Kolumban et al. (2002) is the most researched; it involves transmitting a reference information part together with a modulated information part, and demodulation is realized by a correlation decoder applied to these two parts. Obviously, transmitted reference (TR) systems, such as DCSK, have a disadvantage in regard to transmission efficiency. An innovative realization of non-coherent detection in chaotic systems which avoids the need for a reference segment is to utilize special chaotic attractors, Xu et al. (2008).

This paper aims at introducing the chaotic cyclic attractor shift keying (CCASK) system, which uses chaotic cyclic attractors (CCA) to modulate information and avoid reference transmission. The detection is realized by observing the special statistics of these attractors. It is proved by analysis and simulation that, under long symbol duration, CCASK using statistical detection, possesses better performance than DCSK through additive white Gaussian noise (AWGN) channels, as well as through multi-path channels.

References