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Chaos Scrambling Based Image Transfer Over OFDM

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Abstract

This research generate different types of attractor signal based on chaotic modulation and it transmit over OFDM, which improves the security of signal and speed of signal. In this approach some changes in properties of chaotic signal which makes the covered signal in channel look like a noise. Finally compare the output image with transmitting image and proposed scheme is highly secure for data transmission and reduction of eavesdropper

Keywords—chaotic modulation; attractor; OFDM.

Introduction

Wireless communication plays a vital role in modern world for communicate each other [5]. But in that lots of drawback are there like eavesdropper, so many possible ways are there to reduce that problem. But in this paper we chose a method named as chaos based transmission.

Main aim of this chaos communication is to provide security. Chaos communication is based on Chaos theory. In initial condition chaos systems are highly sensitive in nature like as butterfly effect. Small differences in initial conditions produce widely indeterminate outcomes for such dynamical systems [9]. Concept of using chaotic signal have been published in several articles, since Pecora and Carroll [1] showed synchronize chaotic systems was possible. Although the performance of traditional modulation techniques only demonstrated when comparable to chaotic modulations schemes over mobile channels has not been demonstrated, nowadays so many research activity in uses of Chaos in communications [2].Recently, Luengo et al [3] have presented a paper for technique of digital transmission of information that conjugates the use of chaos with (orthogonal frequency division multiplex) OFDM

Other study also used in project for improve security and to maximize the availability bandwidth frequency in physical layer and increasing data rate speed. Chang was introduced OFDM in 1966 and used in high traffic demand on wireless systems standard as IEEE 802.11 standard [4]. It is a technique used to transmit data for reduction of inter symbol interference (ISI).

Main purpose of this is used to increase speed during transmission over multipath channel. Principle of OFDM is break a large bandwidth signal and it converts in to separate small sub carrier using IFFT in modulation and FFT in demodulation process [7]. By dividing total bandwidth in to different sub bandwidth multiple access scheme is achieved by distributing sub channel between user.

Chaos

An attractor is very sensitive to the system for initial condition. It is a set of numerical condition. If small change made in initial condition means it brings dramatically changes in its output.

Let t be a time and let f(t,a) be a function determines the dynamics of system, and also explain particles are on one dimension. If a=(x,y) denotes phase particles are on two dimension where x is particle position and y is velocity of particle in phase and that expression is explained on below equation.

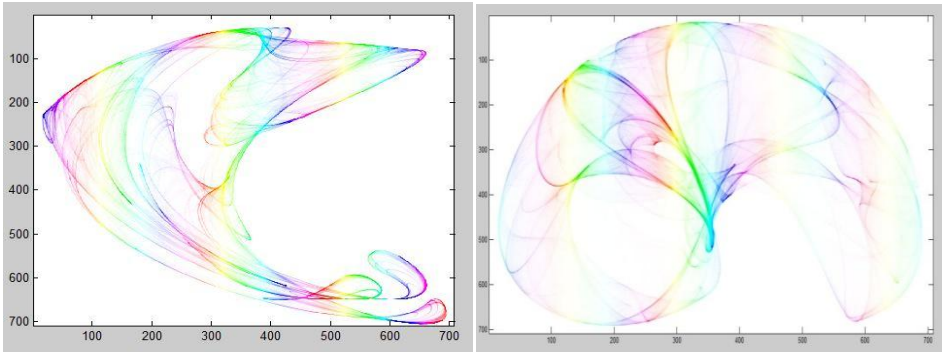
$$f(t(u,v)) = (u+tv,v) \tag{1}$$

So many types of attractor are produce based on the equation below two equations are one type of attractor named as peterdejong attractor

$$U = \sin (p^* y) - \cos (q * x) \tag{2}$$

$$V = \sin (r^* x) - \cos (s * y) \tag{3}$$

Let random point u,v are considered and semi-transparent pixel are plotted for calculated U, V point. Again we apply U,V value to find out the next point, and so try for different iterations. Vary the value of p,q,r,s to wildly produce different output, below diagram are different output based on p,q,r,s fig.1 contain two chaotic image based on four different values of p,q,r,s. No one can predict the chaotic image because some change make in input gives very large variation in its output. Like these so many types of attractor have been produce with different equation.



A b

Fig.1 (a) Chaotic image based on value of p=2.01 q=-2.53 r=1.61 s=-0.33 (b) Chaotic image based on value of p=1.4 q=-2.3 r=2.4 s=-2.1

Proposed OFDM

Block of diagram of OFDM as shown below in diagram, it explained given input is first modulate and then perform inverse fast Fourier transform function for converts higher bandwidth channel in to lower bandwidth sub channel and then encoding process is takes place. After that signal is transmitted on channel that contain some noises like AWGN. In receiver part process is vice versa of transmitter side.

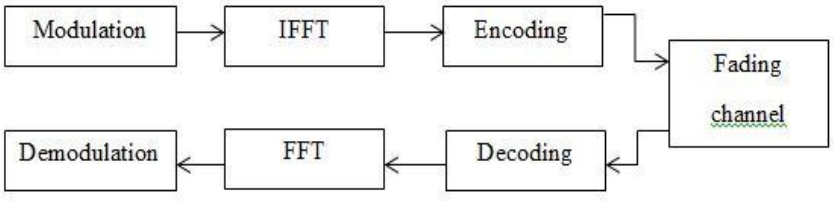


Fig.2 Block diagram of OFDM

Based on idea of OFDM chaotic image is transmitting on it because of increasing the speed. Based on that firstly we want to generate chaotic image based on equation and value of p, q, r, s. and then transmit that image over OFDM fig.3 explain the overall idea of this paper. First chaos image was generate then it modulate for transmit long distance [8]. Then it transmits over OFDM channel for security purpose and for multipath transmission. In the receiver use same technique in reverse order to get original chaos image.

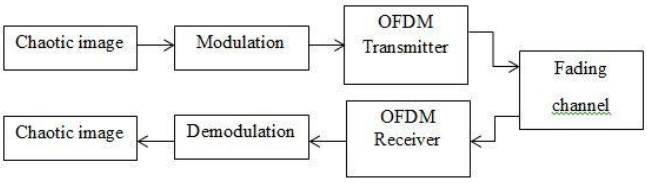


Fig.3. Block diagram of Chaotic transmission on OFDM

Simulation Results

Chaotic image is generated based on peterdejong equation and it transmit over channel with out OFDM technique means retrieving of original signal was not possible due to noise like Rayleigh fading. So we want to transmits over OFDM and plot the signal response during transmitter and receiver. Different attractor image produce different response during transmission. Fig.4&5 results are two different set of attractor based on simulation result [6].

First chaos image was generated then calculate plot value. Use that plot value to convert color image in to binary image for simulation purpose and then output is given as input of OFDM model and get the plot for transmit and received image, it contains some error due to channel noise like Rayleigh fading [10] and finally we retrieve the original from received signal.

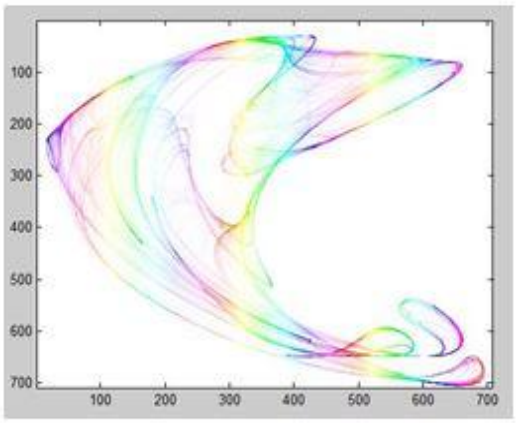


Fig.4 (a)

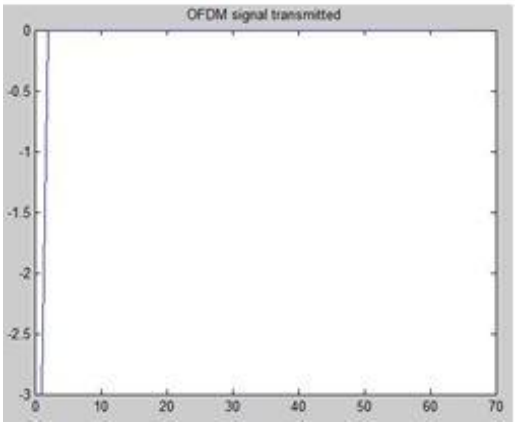


Fig.4 (b)

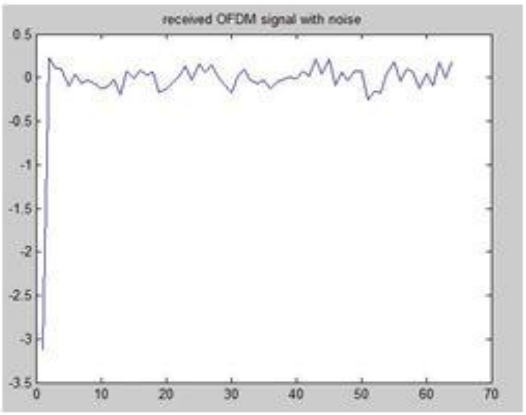


Fig .4(c)

the above three diagram explain the transmission and receiving of chaos image below diagram explain the retrieval of original mage from the received signal.

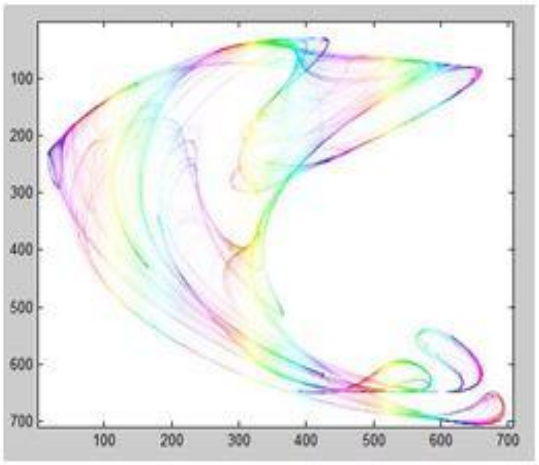
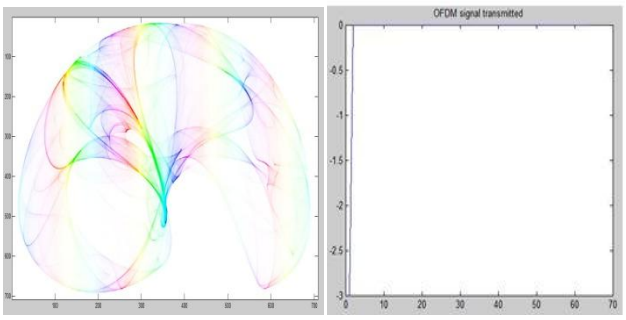
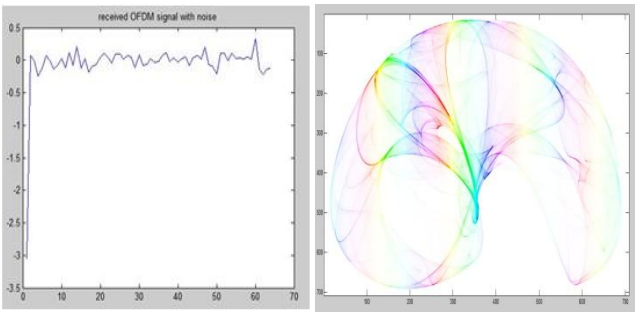


Fig.4(d)

Fig.4. Chaos signal based on value p=2.01 q=-2.53 r=1.61 s=0.33(a) attractor image to be transmitted (b) chaos signal response on OFDM transmitter (C) response of received chaos signal with noise (d) original image retrieve from received signal



(a) (b)



(c) (d)

Fig.5. Chaos signal based on value p=1.4 q=-2.3 r=2.4 s=-2.1

(a) attractor image to be transmitted (b) chaos signal response on OFDM transmitter (C) response of received chaos signal with noise (d) original image retrieve from received signal .

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