The Modeling Of "Chaotic Synchronous Response" Systems

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Abstract - **This paper is devoted to some method of information transmission systems realization using determined chaotic signals. We have analyzed a nonlinear mixing of data signal method. A "chaotic synchronous response" technique has been used to synchronize the chaotic generators of a transmitter and receiver.**

Keywords – **Chaotic synchronous response, Decomposition, Master system, Slave system, Synchronization.**

I. INTRODUCTION

One of the problems that face the construction of any communication system is the problem of synchronization. We offer one solution of this problem using chaotic synchronization system method that results from the decomposition described below.

II. THE DECOMPOSITION METHOD

As a result of decomposition, a self-oscillating system will form a circle structure, where subsystems form a unique feedback loop. Let us take two such systems. One of the systems we leave unchanged. Thus, this system remains active and we assign it the name master system. In the second circular system the feedback loop is broken resulting in passive non-auto-oscillatory system. Such system is assigned to have the name of slave system.

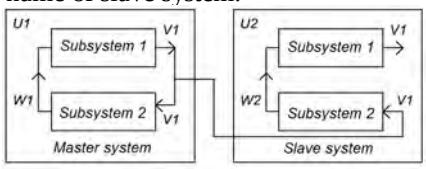


Fig.1 The formation of master – slave pair of systems scheme

Therefore, using the decomposition technique we form a pair of systems "master – slave". In this formation the slave system follows the behavior of the master one in asymptotical way under the monodirectional influence of master system. This effect is called a "chaotic synchronization", but the slave system is not self-oscillating and without any external signal remains in the state of stable equilibrium. So we believe that it will be more appropriate to use the term a "chaotic synchronous response".

III. NONLINEAR MIXING METHOD

The distinctive feature of this method is that a data signal is introduced directly into the feedback loop of Master self-oscillating system. Thus, it is involved to the formation of its output signal (see Fig.2). This nonlinear system "mills up" the data signal, along with its own chaotic signal, therefore this method of data input is neither called additive superposition nor standard modulation.

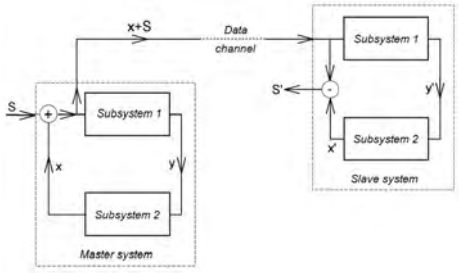
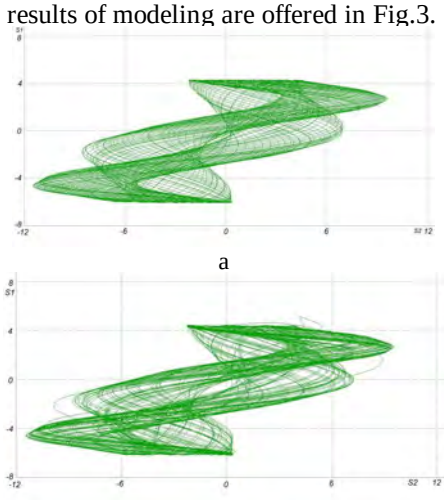


Fig.2 Nonlinear mixing data signal scheme

The process of receiving data signal in the receiver is connected with the use of transformation opposite to the one occurs in the master system.

To investigate the chaotic system generator the software Micro-Cap 9 was used. It enables us to evaluate the behavior of a circuit in different modes, and to assess the stability of its work. The results of modeling are offered in Fig.3.



a

b

Fig.3 a – the attractor of chaotic generator with no mixing data signal; b – the attractor of chaotic generator with mixing data signal

IV. CONCLUSION

The use of decomposition method makes it possible to assume data transfer systems applying chaotic system generators. The described above method of nonlinear mixing data signal with a chaotic signal revealed some disadvantages caused by the parameters identity of transmitter and receiver generators.

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