CYCLIC LINEAR RANDOM PROCESS AS A MATHEMATICAL MODEL OF TEST OSCILLATING SIGNALS IN DIAGNOSTICS, AUTHENTICATION AND PREDICTION OF INFORMATION SYSTEMS

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The study is concerned with solving the actual scientific problem of developing mathematical models of a wide class of cyclic signals, which takes into account more subtle regularities of spatio-temporal patterns of simulated signals that should have a common, universal nature and, as a result of the generation algorithm parametrical identification means availability, would provide the ability to manage morphological characteristics and properties of cyclic rhythm simulated signals that are necessary in the design and testing of information systems of different nature and purpose (infocommunication, information-measuring and diagnostic information systems).

To achieve study purpose it was necessary to solve the following tasks: to set the conditions to be met by the kernel and probabilistic characteristics of linear stochastic process generated process to be cyclic random process, to give the definition of cyclic linear random process which combines the properties of a linear stochastic process and cyclic random process, allowing the extension of using the constructive approach to the description of cyclic signals in the theory of linear stochastic processes and their generalized mathematical model as a linear periodic random process, and also to give the specific examples of cyclic linear stochastic processes.

The object of the study in this paper is the simulation of cyclic signals using the theory of linear stochastic processes and theory of cyclic random processes. The subject of the study is a mathematical model of a broad class of cyclic signals, taking into account their repetitive nature, stochasticity, variability of fluctuations rate and is suitable for the tasks of simulation modelling on a computer or on a specialized hardware and software cyclic signals generator. In this paper for the first time the cyclic linear random process is defined which combines the properties of linear and cyclic stochastic process. This enhances the possibilities of cyclic signals description in the theory of linear stochastic processes and their generalized mathematical model known as a linear periodic random process. Linear cyclic stochastic process is characterized by ample opportunities for its use as a mathematical model of testing oscillatory signals in the problems of training and testing of information systems for cardiac diagnostic decision-making, information systems, biometric person authentication, and econometric information systems for decision-making on the basis of predicted data. The conditions to be met by the kernel were discussed and probabilistic characteristics of linear stochastic process generated process to be a random cyclic process. Examples of cyclic linear modelling of random processes with factorized kernel were presented.

Keywords – information systems, cyclic test, linear cyclic stochastic process, mathematical model, the function of rhythm, factorized core