Application of Nonlinear Stochastic Differential Systems for Data Protection in Audio and Graphics Files

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Data protection in audio and graphics files is one of the significant problems in information security area. This problem is usually solved with cryptographic methods in computer systems, but new solutions are still being searched for. Application of nonlinear stochastic differential systems (SDSs) is one of such new methods [1].

The essence of the method is following: audio data (or pixel codes for graphics file) are entered as a parameter of nonlinear SDS and the corresponding output signal of the SDS is used instead of the audio data (or pixel codes), and that protects the latter.

The proposed method is considered for nonlinear SDS, which behavior is described by the following nonlinear stochastic differential equation (SDE) [1, 2]:

$$\ddot{x} + b_1\dot{x} + b_2|\dot{x}|\dot{x} + c_1 x + c_3(t)x^3 = n(t), \tag{1}$$

where $n(t)$ – Gaussian white noise with intensity N_0, $c_3(t)$ – parameter, by means of which normalized audio data (or normalized pixel codes for graphics file) are entered.

Based on numerical solution of SDE (1), x values are calculated upon the ordinates of the normalized audio signal (or normalized pixel codes) entered by means of coefficient c_3, are normalized and are written to the audio or graphics file instead of the corresponding ordinates of the original audio signal (or pixel codes).

The ordinates of the original audio signal (or pixel codes) are restored in reverse order.

1. S.B. Prykhodko, *Information Processing Systems* **84**, 75 (2010) (in Ukrainian).
2. S. Prykhodko, K. Basin, in *"TCSET'2012" Conference Proceedings*, February 21-24, 2012, Lviv-Slavske, Ukraine, 425 (2012).