The generator of cyclic signals for problems of testing of information systems

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Abstract – **In this paper the basic approaches to creation of the program generator of cyclic signals are considered.**

Keywords – **Cyclic signals, cyclic functional relation, generator of cyclic signals, parametrical identification.**

I. INTRODUCTION

At development of computer information systems of the analysis and processing of cyclic signals, in particular systems of automated computer biomedical and technical diagnostics, an actual scientific and technical problem is creation of a program and hardware-software means of a generating of cyclic signals.

II. BASIC PART

In the report program realisation of the generator of cyclic signals which will give the chance to realise check of functioning of an intellectual part (a decision making subsystem) in modern systems of the analysis of oscillating appearances is considered.

Work of the generator of cyclic signals is based on use of mathematical model of exposition of oscillations in the form of the cyclic functional relation [1]. According to work [2], within the limits of two base approaches to shaping of cyclic signals, generator block diagrammes (Figs. 1 and 2) are developed.

The first approach to generating of cyclic signals consists in shaping of the cyclic functional relation with a variable rhythm from isomorphic to it of the functional relation with a constant rhythm and is described by expression:

$$f(t') = f(y(t)) = f_T(t) \in \Psi,\ t \in W,\ t' \in W \qquad (1)$$

The second approach ensures shaping of the cyclic functional relation from sequence of base cycles and is based on performance of procedure of parametrical identification:

$$\begin{aligned} p_k\left\langle\left\{\left(t_{0j}, g_{m_j}(t_{0j})\right),\ j=\overline{1,k}\right\}\right\rangle &= p_k\left\langle\left\{\left(y(t_{0j}, m_j), f(y(t_{0j}, m_j))\right),\ j=\overline{1,k}\right\}\right\rangle = \\ &= p_k\left\langle\left\{\left(y(t_{0j}, m_j+n), f(y(t_{0j}, m_j+n))\right),\ j=\overline{1,k}\right\}\right\rangle = \\ &= p_k\left\langle\left\{\left(t_{0j}, g_{m_j+n}(t_{0j})\right),\ j=\overline{1,k}\right\}\right\rangle \in A_k,\ k=\overline{1,K},\ m_j, n \in Z,\ t_{0j} \in W_{c_0}, \end{aligned} \qquad (2)$$

The necessary cyclic functional relation which is described by the Eq. (3) will be outcome of use of the second approach:

$$\begin{aligned} Q &= \bigcup_{m\in Z} Q_{c_m} = \bigcup_{m\in Z}\left\{\left(t_m, f(t_m)\right),\ t_m \in W_{c_m}\right\} = \\ &= \bigcup_{m\in Z} G_{y_m(t_0)}\left[\left\{\left(t_0, g_m(t_0)\right),\ t_0 \in W_{c_0}\right\}\right] = \bigcup_{m\in Z}\left\{\left(y_m(t_0), g_m(t_0)\right),\ t_0 \in W_{c_0}\right\} \end{aligned} \qquad (3)$$

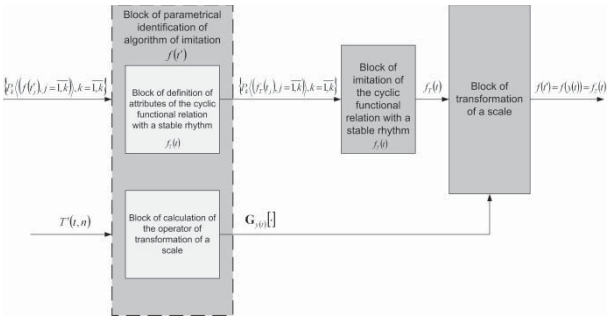

Fig.1 Block diagramme of the generator of the cyclic signals for the first generating method

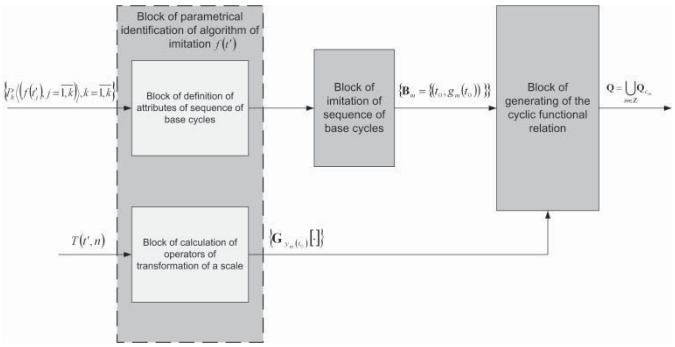

Fig.2 Block diagramme of the generator of the cyclic signals for the second generating method

The used approaches give the chance to realise generating of a wide class of cyclic signals, in particular: cyclic numerical functions, cyclic white noise with different aspects of distributions, casual processes with independent cyclic increments, linear cyclic casual processes, cyclic Markov casual processes.

III. CONCLUSION

The report is devoted a problem of creation of the program generator of cyclic signals in which basis the mathematical model of a signal in the form of the cyclic functional relation.

REFERENCES

[1] С. Лупенко “Циклічне функціональне відношення як основа математичного формалізму теорії моделювання та аналізу циклічних сигналів”. Вісник Тернопільського державного технічного університету. — 2007. — Т. 12, № 3. — С. 183–195.

[2] С. А. Лупенко, Н. Р. Дем’янчук, А. С. Сверстюк “Концептуально–методологічні основи імітаційного моделювання циклічних сигналів на ЕОМ із використанням їх моделі у вигляді циклічного функціонального відношення”. Вимірювальна та обчислювальна техніка в технологічних процесах. — Хмельницький : Навчальна книга. — 2008. — № 2. — С. 101–111.

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