INFORMATIONAL RESOURCE OF CYCLE SIGNALS PHASE CHARACTERISTICS

Kuts Yurii Vasil'ovych, Shcherbak L.M.
Institute of technical thermophysics NAN Ukrayiyny, Kyiv
Tel.: +380444532864, e-mail: y.kuts@ukr.net

The purpose of the work. Generalization of methods of using phase characteristics, which are determined for a wide class of cyclic processes, in order to more fully take into account their information resource in various subject areas.

Results. The phase characteristic is an informative source for obtaining data on the flow of cyclic processes of different physical nature. It can also be used to study non-cyclic variables, for example, the distance *D,* subject to the application of a phase-shifting form $\varphi=KD(\mathrm{mod}\,2\pi)$, where φ is phase shift of signals, K is the dimensional coefficient.

The methodology for obtaining and analyzing the phase characteristics of signals (PCS) according to the process data is based on the combination of the discrete Hilbert transform of signals, which allows to obtain the PCS and methods of their statistical processing. The starting point for such an analysis is the implementation of the cyclic process in the form of a function $u(t)$, the argument of which is often time $t >> T$, where T is the average period of the process. The initial processing is subject to a discrete sequence $u[j],\ j \in N$, which is obtained from $u(t)$.

The Hilbert discrete transformation is applied to this sequence and obtains a discrete PCS $\Phi[j]$ and a difference of discrete phase characteristics $\varphi[j]=\Phi[j]-\Phi_0[j],\ j=\overline{1,J}$, where $\Phi_0[j]$ is the discrete phase characteristic of the reference signal.

The discrete PCS information resource is used in various subject domains to evaluate the circular mean angle, dispersion and median, the length of the resulting vector, the characteristic function, and other numerical characteristics.

The paper examines examples of the use of discrete PCS for evaluating current and averaged over a range of values $\varphi[j]$, frequency and period of harmonic signals in a mixture with Gaussian noise according to the linear sequence $\Phi[j]$ trend, the signal-to-noise ratio by the selective characteristic function of the sequence $\varphi[j]$, the circular dispersion, etc.

Conclusions. 1. The use of PCS in combination with statistical methods for its processing allows to obtain new solutions to traditional problems of detecting signals and measure physical quantities under noise conditions for a wide range of physical processes.

2. Practical efficiency and widespread use of PCS is due to the use of 2π measure, which can be reproduced by means of computing equipment with arbitrarily high accuracy.