

AN ANALYSIS OF THE METHODS OF DECOMPOSING THE FUNCTION INTO A FOURIER SERIES

An analysis of the advantages and disadvantages of the methods of decomposing the function into a Fourier series showed the expediency of replacing the integral expression with a linear and parabolic spline, and the choice of method will be influenced by such factors as the speed of data processing on a computer and the possibility of working in real time.

For an example of the work of Fourier analysis, consider the change of an arbitrary oscillatory process, the graph of which is shown in Fig. 1.

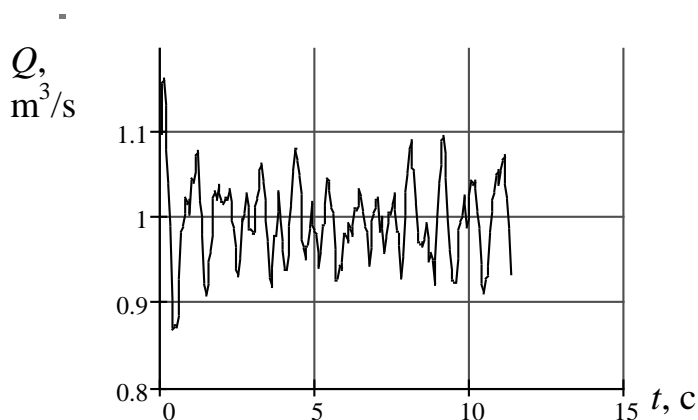


Fig. 1. Arbitrary oscillatory process

As a result of expanding the function into a Fourier series, the linear spline is determined by the polynomial shown in Fig. 2.

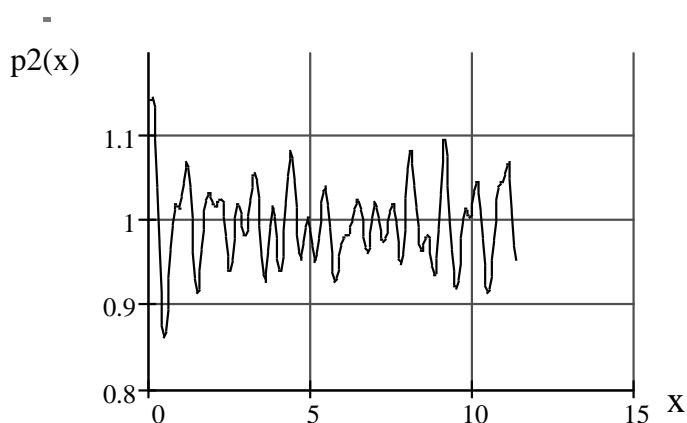


Fig. 2. Restoration of function

Spectral analysis of the studied parameter is shown in fig. 3, where the circular frequency $\omega_n = \pi \cdot n / L$ [rad/s].

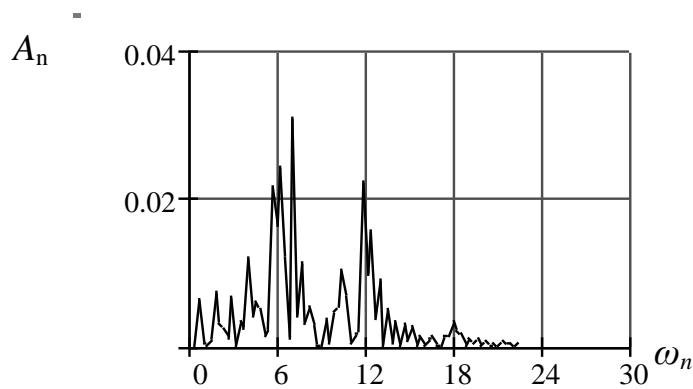


Fig. 3. Amplitude-frequency characteristic

The obtained spectral analysis allows to determine the carrier frequencies of process oscillations. In our case, a conclusion can be drawn from the spectral analysis: the physical parameter pulsates with frequencies of the order of 6 and 12 rad/s.

As a result of the conducted research, it was established:

- when conducting many studies, the values of the amplitudes and carrier frequencies of the fluctuations of the mode parameters determine the characteristics of the aggregates and the technological process, and the methods of determining the amplitudes and frequencies need further improvement;
- the most accurate expansion into the Fourier series is expansion using linear and parabolic splines, the difference between which in terms of accuracy is insignificant, which gives reason to replace the integrand with a linear spline due to lower operational costs;
- the simplicity of the linear spline algorithm makes it possible to write programs in Pascal, C++, etc., which contributes to their introduction into the automated process of measuring and controlling parameters during field studies and further processing.