IDENTIFICATION OF DYNAMIC SYSTEMS IN THE TIME DOMAIN

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The task of the dynamic system identification which means the formation of a model based on the test data has been considered and is considered urgent as soon as it is deemed next to impossible to form adequate models for complicated systems just for theoretical reason. One of widely applied identification methods, so far, is the Prony method [1]. The Prony method is a method for identification of dynamic systems within a time domain where test data are presented as a linear combination of exponential functions. In the process of work there has been an algorithm implemented, as described in [1], by way of the program in Delphi, which enables to calculate the exponent parameter's values using the specified source data:

$$x[n] = \sum_{k=1}^{N} A_k e^{(\alpha_k + 2\pi i f_k)(n-1)T + i\theta_k}$$

Both input and output data may be presented as diagrams where the greater N is the more accurate the derived result versus the input data is.

After having generated the sequence of values sets for modal parameters it is necessary to filter the derived data. Some part of functions should be cut off so that the model is simplified. For instance, some functions either with a comparatively small amplitude or big damping ratio may be withdrawn.

Later the derived results are written down in a report for a user to be able to chose an appropriate result if it is close enough to the source data and coincides with the model sequence (number N).

This method may be applied in order to identify any system where such models are used while the models themselves are used for forecasting, optimization, etc. Modal parameters values may be used, as an example, for carrying out technical systems' diagnostics. Besides, this method may be helpful for examining the complicated systems with qualitative transitions.

Literature

1. *Marple S.L. – Digital Spectral Analysis with applications: Translation from English – M.: Mir, 1990. – 584 с., ил.*