

IMPROVEMENT OF THE SIMOYU PARAMETRIC IDENTIFICATION METHOD OF DYNAMIC SYSTEMS MODELS

German E.E., Krasnikov I.L.

*National technical university
«Kharkiv polytechnic institute»,
Kharkiv*

Analysis of control systems is one of the most important stages in the construction of qualitative systems. In most cases, the analysis of such systems is reduced to the description of individual elements of the system by mathematical models, i.e. his identification. At the same time, approaches to the process of determining mathematical models of system elements can be different.

One of the approaches to defining a mathematical model is the analytical definition of process or object model by its physical properties. However, this is possible only in those cases when the processes are studied in detail and have simple functional dependencies, which are subsequently easily reproduced by computer technology (both computers and controllers).

Most of the processes, especially in the chemical industry, are either complex or generally «black box». Therefore, the analytical method for determining the models of processes and objects is not relevant. As an alternative approach experimental methods of model definition are used. They consist in the fact that based on the experimental data in the form of the values of the input and output signals of the object, the mapping (functional dependence) between them is determined by various mathematical methods.

One method that makes it possible to determine the relationship between the input and output of the process is the Simoyu parametric identification method of dynamic systems models [1]. The method is based on the fact that any investigated object or process can be described by a linear differential equation with constant coefficients, that is, the object model can be represented as a dimensionless transfer function with constant coefficients.

This method has worked well under real-world conditions. At the same time, it has two significant drawbacks: the method is applicable only for objects and processes without a transport delay, and the period for obtaining dynamic characteristics must be constant.

The paper proposes an improved parametric identification Simoyu method, which determines, in addition to the transfer function parameters, the delay time, with considering the discretization of the dynamic characteristics. Also, a function module was developed in the MATLAB language, which implements the improved method.

References:

1. Математичне моделювання об'єктів керування хімічних і фармацевтичних виробництв : навч. посібник / І.Л. Красніков [та ін.] ; ред. А.К. Бабіченко. – Харків: ТОВ «С.А.М.», 2015. – 224 с.