THE METHOD OF AUXILIARY PARAMETRIC SENSITIVITY OF ACTUATING OBJECTS IN CONTROL SYSTEM

Sergiy Kostiuchko, Vasil Tchaban
Lviv Polytechnic National University, S. Bandery Str., 12, Lviv, 79013, UKRAINE, E-mail: siriussk@mail.ua

In this article are analyzed and systematized the existing study methods of parametric sensitivity of actuating object of computer control system. The algorithms are based on common mathematical tools to analyze the parametric sensitivity of the studied devices. It is made by using the parametric sensitivity auxiliary model.

Calculation of the parametric sensitivity of actuating object of computer control system is the final stage of problem of analyse, which is building a bridge to the problem of synthesis. Stages of calculation of transient and steady-state processes and determination of the static stability of derived steady-state processes precede this stage. To solve the complete problem of analysis is proposed a common algorithm that is based on the general theory of nonlinear differential equations. Two-point boundary value problem is solved on the basis of ordinary differential equations of the electromechanical state.

Firstly it was necessary to construct a mathematical model of the device. This model is made on the basis of monodrama matrix and simulation of transient and steady-state process, and on investigated steady-state parametric sensitivity at the same time.

To show the real possibilities of the proposed method of constructing a mathematical model of electrical device parametric sensitivity was chosen executive electromechanical device in which there are:

– non-linearity, caused by movement and saturation magnetic circuit;
– Physical processes of different nature are interacting;
– Coefficients of the differential equations depend of time;
– There are available variables with different frequencies in the steady-state.

This device is asynchronous electric motor.

Based on the general theory of nonlinear differential equations, as an example of three-phase induction motor, for the first time were developed mathematical models of investigation of parametric sensitivity of these devices.

Differential equations of parametric sensitivity are linear and it eliminates the need to construct a Newton's iteration. As a result, we obtain the final solution in first iteration.

Keywords – control systems, parametric sensitivity, actuating component.