Control of Object with Distributed Parameters

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Abstract. Objects with distributed parameters differ from dynamic objects with distributed parameters by the fact that their mathematical model is much more complex. These models instead differential equations are partial differential equations. These objects are found in a variety of processes in industry, transport, science and technology. Design of control systems for such objects is based on the principle of negative feedback, as well as for objects with distributed parameters, consist in three steps. These steps are the identification of the object, selection of structure of the regulator and the calculation of the parameters for it. Methods of analytical calculation of regulators parameters may be extremely difficult to apply due to the complexity of the object model. Recently, one of the widely used methods of analysis and synthesis of regulators is a numerical optimization. It is carried out in the mathematical modeling of the system [1]. In a series of papers [1-10] a number of measures have been developed to create a target (cost) function to optimize control. These measures allow an effective search for the PID coefficients. At that, recommendations are developed about ways how to modify the cost function to increase the stability margin in the system, to reduce the static error, to reduce overshoot, to eliminate or reduce the reverse overshoot and so on, including resource saving. All these measures have been tried for controller optimization, solving the problem of the control of object with distributed parameters, but the best result is characterized by overshooting about 22%, that for many practical problems may be too large. This paper proposes a new method of control, which is a special modification of a cost function. This method reduced the overshooting to a value of about 11%, which may be preferred for some applications, even despite the fact that the duration of the transient system increased. The proposed method adds an arsenal of techniques of control of complex dynamic objects.

Key words: regulation, delay, object with distributed parameters, control, modeling, simulation

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