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PARAMETRIC SYNTHESIS OF INTELLIGENT INFORMATION CONTROL SYSTEMS BY OPTIMISATION METHODS

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Nuclear power plants (NPPs) are characterised by high standards of internal safety and ensure cost-effective power generation in strict compliance with safety and reliability requirements based on the principle of internal self-protection. A key feature of NPP power units is the need to maintain design safety parameters under emergency conditions over long periods of time, which makes it possible to effectively prevent the development of potentially dangerous consequences [1].

The aim of the paper is to consider the peculiarities of direct quality indicators (DQIs) and improved integral quadratic estimates (IQEs) of control systems as criteria of their optimality, as well as to evaluate the possibility of using modern optimisation methods for the synthesis of intelligent information control systems (IICS) based on these indicators.

The quality indicators of the control systems under consideration depend on the parameters of the systems themselves, in particular, on the characteristics of the regulators. These indicators can be expressed in the form of functions of variable parameters defined exclusively in the stability domain of the control system. The problem of system synthesis by the CPC optimisation method involves taking into account several optimality criteria, which are calculated by integrating a system of differential equations (SDE). The optimisation criteria are arranged in order of importance as follows: overshoot, oscillation index and regulation time. The first two criteria are usually constrained, while the third criterion is minimised as a target function. The stability of a system in a transient process can be evaluated based on the values of its state variables. The control time used as the target function, as well as the overshoot and the oscillation index included in the constraint function, are calculated by integrating SED.

The results of the analysis of optimisation methods can be valuable for specialists in the field of energy and automation involved in the improvement of control systems for nuclear power plants, as well as for scientists studying intelligent control systems in energy and industrial processes [2].

References (transliterated):

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