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MODELING AND CALCULATION OF NONLINEAR DISCRETE SYSTEMS BASED ON DYNAMIC GRAPH

Aziza Kadirova[1], Delovar Kadirova[2], Dilorom Ubaydullayeva[3]

[1]Center for Strategic Innovations and Informatization
Tashkent State Technical University, Tashkent, Uzbekistan
aziza.kaa@innovation.uz

[2]Faculty of Energy
Tashkent State Technical University, Tashkent, Uzbekistan
delovar.kadirova194@gmail.com

[3]Bukhara branch of the Tashkent Institute of Irrigation and Agricultural Mechanization Engineers, Bukhara, Uzbekistan
bizi-84@mail.ru

Abstract. The article discusses the modeling features of nonlinear discrete control systems via dynamic graph models. The distinctive feature of the proposed approach is that samplers in complex systems are considered not only as sources of signal sampling but also as sources of discretization of the system structure as a whole. This peculiarity allows us to divide a complex system into a set of simpler, dynamically interacting subsystems or structural states. The application of this approach allows one to overcome difficulties associated with various modes of the operation of samplers, with the presence of nonlinear elements in the system, with the presence of delay, and other factors of complexity.

Keywords. Discrete-time system, Multivariable system, Nonlinearity, Structural state, Dynamic graph model.

AMS (MOS) subject classification: 93B24. 93B52. 93C10.

1 Introduction

The article proposed for consideration is an introductory part of our research on the calculation, analysis and synthesis of the various complexity discrete control systems using dynamic graph models: single-variable and multivariable systems, stationary and non-stationary systems, systems with nonstandard sampling (with cyclic frequency, finite pulse width, multirate sampling), nonlinear systems, systems with delay, etc.

We first proposed and applied the dynamic graph models to the calculation of discrete systems in 1978. Today, using this method, we can calculate not only discrete but also hybrid systems, and impulsive systems with various types of signal modulation. The bulk of our papers were published in