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SYNERGETIC STATE MACHINE

Finite state machines, as a model of behavior of digital units with memory, are studied in all courses on digital circuitry and control systems. These automata describe a causal relationship between inputs (events) and states of an automaton. Automata also describe outputs (actions), as a consequence of their states, separately (Moore machine) or in combination with inputs (Mealy machine). But the automaton model does not describe how and why outputs are the cause of inputs in a closed control system.

The purpose of the work is to simplify the design of the control machine by taking into account the cause and effect relationships in the control machine - control object system.

It is proposed to supplement the “classic” finite state machine with the contours of causal relations through the control object with an indication of the direction of causality. The causality of control is the relation in which the outputs of the final control automaton act on the inputs of the control object (via actuators), which leads to a change in the physical processes in the control object, is recognized by the sensors, and is transformed into the input event of the automaton. Accordingly, the causality of an object is a relation in which the absence of a certain value from the sensor is perceived as another event, which leads to a change in the current state, correction of outputs and, as a consequence, changes the processes in the control object. Examples of such causes: “turning on the furnace led to heating of the object” and “low temperature of the object is the reason for the transition from the state of “cooling” to the state of “heating”. In the description of the automaton, to the existing functions of outputs and transitions, we add a function of the control object that expresses the outputs of the object (and

the events of the machine associated with them) through its inputs (outputs of the control machine). Knowledge of the object's reactions to the applied influences simplifies the design of the control automaton.

The approach, which takes into account both the information and material processes there, is called the “synergetic”. Therefore, the term “synergetic finite state machine” has the right to life.

The proposed model is supposed to be used in the study of self-developing automata.