NANOSCHEMES WITH CONFIGURATED STRUCTURES

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The contradictions between specialization and universality can be eliminated by developing nanoschemas with configured structures (NSKS), the algorithms of which can be changed at the request of the developer of specific computer equipment, ie by creating arithmetic-logic circuits with programmable logic.

The development of the theory and practice of the majority principle is currently an urgent problem, because the nanoelectronic design of computer systems with configured structures significantly reduces their cost and greatly simplifies the stage of automated systems design. One programmable nanoscheme replaces from 30 to 150 integrated circuits of average degree of integration.

The main goal is to create multi-element functional subsystems, when one module combines a large number of logical elements into a single functional node, designed to implement complex logical functions. Such subsystems must meet the following basic requirements:
- have a minimum number of external links;
- have hardware compatibility;
- if possible, use the same type of cells;
- have the property of building, ie have a flexible structure.

As a high-speed cell for the construction of majority adaptive systems can be used NSKS, which consists of three universal majority elements (UME), appropriately interconnected (Fig. 1). Information (x_3, x_2, x_1, x_0) and programmable (r_2, r_1, r_0) signals are fed to the NSKS inputs.

With the help of a seven-input NSKS of this type, you can implement all the combinational functions of two, three and four arguments, including the functions of sum, difference, transfer and borrowing, the sequence of functions of one, two and three memory elements, and some functions of five, six and seven arguments. The peculiarity of NSKS is that you can change the program of its logical capabilities and connections, which allows you to use it to build majority adaptive systems [1,2].

NSKS is a functionally complete device, as it includes functionally complete UME. Synthesis of majority systems based on NSKS is carried out in the following order:

1. Given or received Boolean functions are represented in the majority basis.

2. The obtained majority function is minimized.

3. The structural scheme of the set subsystem is realized taking into account possibilities of NSKS and the set quantity of inputs.
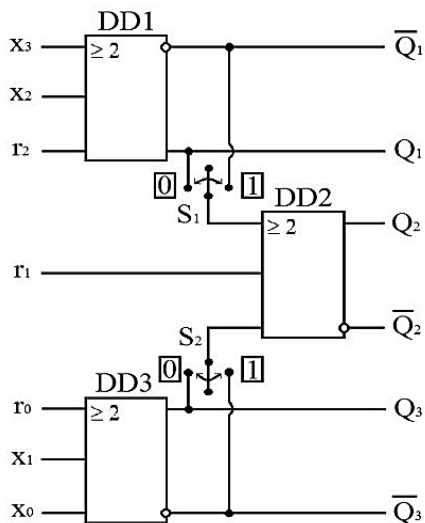
Fig. 1. Block diagram of the universal NSKS

In the next decade, the semiconductor components of the BIS will reach quantum technological constraints and will not be able to meet the growing demands of computer efficiency. Therefore, new nanotechnologies are being actively developed that would provide significantly higher efficiency. One of such developments is one-electron quantum cellular automata of the terahertz range and systems with programmable logic created on their basis. As proved above, such devices will provide the implementation of a complete system of logic functions for both combinational and sequential arithmetic-logic computing devices of ultrahigh speed.

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