SECTION 5. Innovative technologies in science.

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DISCRETE MODELING OF COMPLEX MANUFACTURING SYSTEMS

***Abstract**: Described a method for producing model of the production system in the form of finite machine and iterative chains. Considered are the main points, concerned with overcoming the restrictions, for the representation of the latter in terms the genetic algorithm.*

***Key words**: Discrete modeling, complex manufacturing systems, modeling complex manufacturing systems*

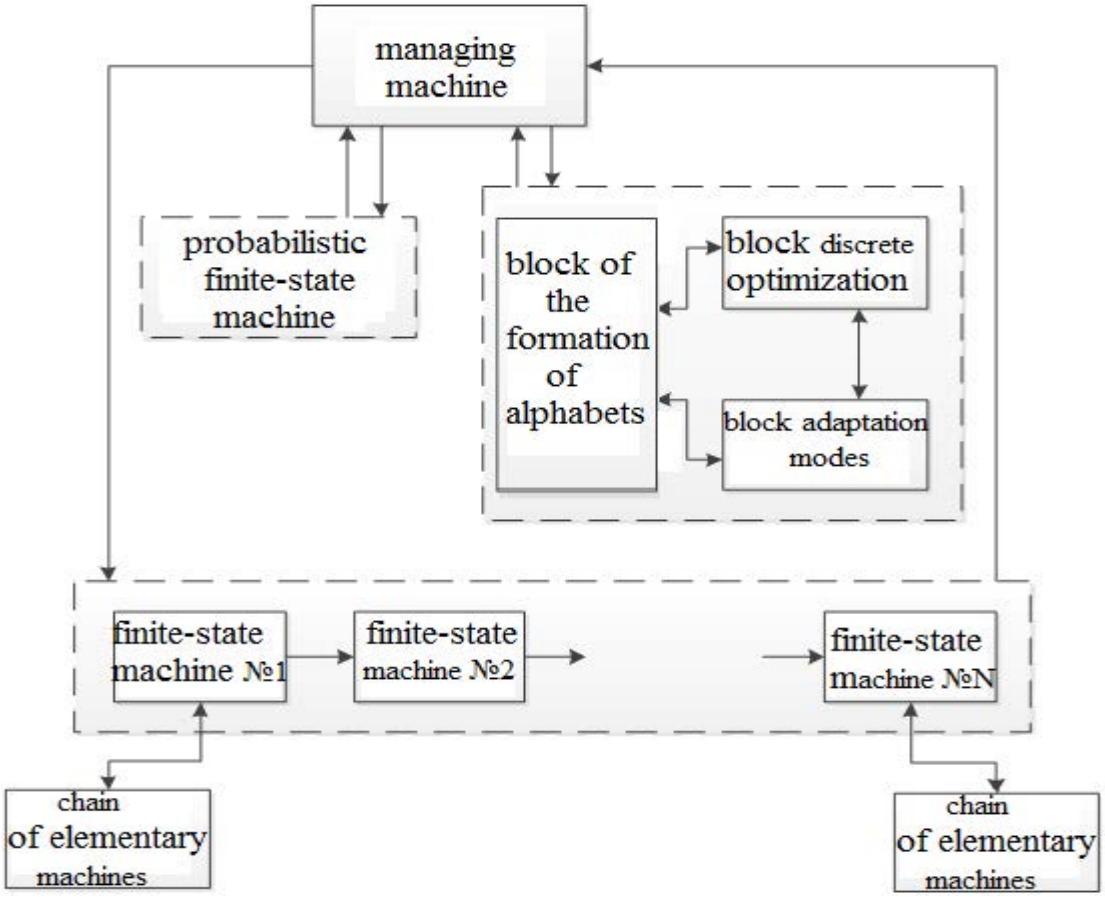
Production system characterized by complex spatial structure and multistage processing, can represented as a hierarchy of cells, in which each cell correspond to a concrete stage of processing, technological aggregate or operation. . In this approach, all processes of production are describing in the form of inputs, States and outputs the characteristics of the raw materials, technological parameters and properties of the finish products. It is convenient for visual modeling of technologies of preprocessing of all types of products on retrospective, current and expert information about the values of the quantities and management of indicators of system[1;2;3;4;5].

At each stage of processing formed functional block, which can then describe the machines working with discrete information and modifying its internal States only valid points in time (cycles).

In the synthesis of rather complicated machine is desirable break them into separate elementary machines, forming iterative chain or networks, and define the required number of condition for each machine, on the possibility of minimizing the number of transitions and the dimensions of the alphabets. An ordered sequence of machines inbound in the system, characterized by the fact that at least one of the output nodes each of the previous machine is connected to some input node to the next machine.

Alphabets finite and probabilistic machine are formed on the basis of methods of discrete optimization, which are conveniently grouped in a separate eponymous bloc. When changing production conditions to change the alphabets used block adaptation modes of treatment. Using block of the formation allows to choosing the optimal dimension of the alphabets of the investigated magnitude[6;7;8;9].

At the next stage modeled laws of functioning of machines (functions transitions and functions of the outputs), and is given their formal description. To select optimal solutions from a some multitude of alternative solutions are used probabilistic finite-state machines, and for the management of the obtained hierarchy cells formed managing machine that implements the algorithms of functioning, define order of execution of individual operations or procedures. During the process of functioning of the model of production system(Pic.1), managing machine, in accordance with the selected an internal algorithm, produces a sequence signals of management, transmitted functional blocks of the formation of alphabets, discrete optimization and adaptation modes of processing. in order that block managing machine fully implemented the algorithm of functioning, between functional blocks are installed managing connectivity, define of procedure of work functional blocks in the process of governance.



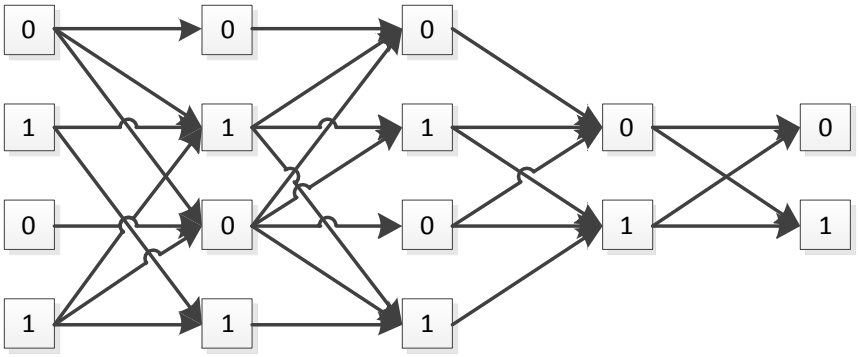
Picture 1- Model of the production systems

For the formation of dimensionality alphabets each input, the technology factor or exit, it is necessary to consider the laws of distribution of the studied magnitude. If the investigated magnitude can be represented in the form of variation series, then the dimension of its alphabet will take values from the corresponding of variation series. in the case, If the magnitude submits to the any distribution law, the alphabet necessary to form thus so that every his letter correspond to one of the values built histograms of the distribution. more way to- split ranges of change of investigated factor into equal plots, however, in this case the probabilities falling into each of them , can vary significantly , i.e. will be received unevenly distributed of alphabet this magnitude (alphabet with different frequency of the appearance of individual components).

At necessity to obtain ranges, he probability of hit in which approximately alike (uniform alphabet), segment of changes researched magnitude is broken down into a number of unequal the length of the intervals[7;10].

For modeling it is possible to use alphabet of magnitudes, consisting from two letters: 0 or 1, true or false etc. In the framework of such a apparatus is convenient to describe any technological trajectory in the form of a polynom Jegalkin. Technological trajectory will count any sequence of letters of the alphabets, the appropriate total serial input, states and outputs, leading to the production of the final product.

Can be considered a binary partition of alphabets of each factor, wherein 0 corresponds to a undesirable value, and 1 - is expected (Pic.2).



Picture 2- Alphabetic partition factors

In (Pic.2) ties enough a lot, although in force the features described of technological process of links absent in (Pic.2). for optimize the number of relationships you can amount the transition table and conduct their analyze.

For the simulation of such systems can use genetic algorithms, which is bases on a few basic ideas and abstractions, each of which gets its implementation.

1. Population. The final set of machines, where one or another machine (or its descendant) may be constitute a candidate that, that how more accurate way to describe the specific technological operation, aggregate or repartition.
2. Mutations. The following are the possible mutation of the machine:

- add state;
- deleting a state (in case if the number of States more units);
- replacement the initial state (in case if the number of States more units);
- replacement transition;
- replacement of actions on transition.

3. cross breeding. The machine can ask in several ways, but interest in this case are those, which most descriptive for the man, so and the computer. These ways are:

- transition table with rows of States and columns in the input elements, where at the intersection of the corresponding row and column contains the values of the final states and the values of the output element;
- the task of the machine of aggregate of matrices, each of which puts corresponds initial state some final state at a certain value of the input element.

4. The fitness function. After adding the descendants of the population at all its individuals need to compute the fitness function. Its calculation is possible in several ways, the most simplest of which - this driving machine through tests, asked pair of the input sequences and the expected sequence on outputs. Minimizing the number of States, can be solve the problems associated with the «conversion training»,when the machine shows the correct behavior only on the input sequences, corresponding a set of tests.

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