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Development of a work algorithm for an integrated microelectronic pulse generator

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ABSTRACT: Pendulum transmitter relays MT-1 are widely used as a pulse shaper in impulse auto-blocking, and in code auto-blocking code path transmitter plug-in КПТШ. Pendulum transmitters MT-1 generate uniform DC pulses. MT-2 is used to control the supply of AC power to the flashing lights of the input and output traffic lights in electrical centralization devices, and crossing signaling. The article discusses the question of replacing MT-1, MT-2, КПТШ-5 and КПТШ -7 with an integrated microelectronic pulse generator, and methods for developing an algorithm for an integrated microelectronic pulse generator, the method for developing an algorithm in an integrated ДРАКОН environment is given in particular detail. The purpose of this work is to develop an algorithm for the operation of an integrated microelectronic pulse shaper and study it, using the ДРАКОН program, to obtain the optimal microcontroller software for the integrated microelectronic pulse generator.

KEY WORDS: Pendulum transmitters MT, auto-blocking, code path transmitter plug-in КПТШ, algorithm, , microcontroller

I.INTRODUCTION

One of the priority directions of the strategy of innovative development of railways is to increase the efficiency of the transportation process through the introduction of innovative technologies and new technical means. The efficiency of the transportation process largely depends on the interval regulation of train traffic (IRTT). The last twenty years of the development of railway automation and telemechanic is characterized by a qualitatively new stage; microelectronic and microprocessor element base, as well as control microcomputers, have begun to be widely introduced into signaling, centralization and blocking devices. Microprocessor technology is characterized by such indicators as high functional flexibility, high reliability, small dimensions. Moreover, the performance of microprocessor tools increases by about an order of magnitude every year. This made it possible to build modern safety systems, primarily systems for interval train control with new expanded functions. One of the modern systems is microprocessor-based auto-blocking.

At the moment, most of the existing systems on the railways of our country are purchased from foreign manufacturers. We see the solution to this program in the creation of local systems. Specifically, this article deals with the creation of an integrated generator. For this, the principle of operation of code and pendulum transmitters was studied in detail and on the basis of the algorithm of operations of MT-1, MT-2, КПТШ -5 and КПТШ -7, an algorithm of operation of an integrated microelectronic transmitter was created. The integrated microelectronic transmitter performs all the functions of MT-1, MT-2, КПТШ -5 and КПТШ -7.

II. SIGNIFICANCE OF THE ALGORITHMS

The creation of technological algorithms for railway avtomatic and telemehanic systems is directly related to the simulation of the control process using software (mathematical) methods [20]. However, to date, no general approaches have been developed to the technology of their synthesis and to methods for assessing railway avtomatic and telemehanic systems at the algorithmic level according to the criteria of safety, reliability and technological efficiency in general. In the created or developed MPC systems, the elimination of a dangerous situation to a certain extent is achieved by hardware or software implementation of the known requirements and postulates formulated for relay systems: elimination of frontal routes, control of the position of the arrows, etc. Today, such an approach can be considered the main one in the synthesis of AO systems of railway avtomatic and telemehanic, and the confirmation of

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the safety of the system is its compliance with the specified requirements. When using microelectronic technology, the known approaches need to be revised, or at least significantly adjusted. This is connected, on the one hand, with additional requirements due to the peculiarities of the microcomputer operation: the speed of information processing, the service protocol, etc.; and, on the other hand, with the emergence of new, previously unavailable capabilities provided by software-controlled systems. Therefore, there is a need for special methods of formalizing the process of functioning of technological systems in their software implementation. In addition, the peculiarities of operation and additional capabilities of microprocessor-based systems of railway avtomatic and telemehanic require the development of fundamentally new methods for assessing their technological efficiency in comparison with the currently operating systems. The solution to one and the same problem can be implemented using various algorithms that differ from each other both in terms of computation time and amount of computations, and in their complexity.

III.LITERATURE SURVEY

There are three main ways of writing algorithms.
o Verbal - the algorithm is described in natural language
o Symbolic - the algorithm is described using a set of symbols
o Graphical - the algorithm is described using a set of graphical images

Common ways to write algorithms are graphical writing using flowcharts and symbolic writing using a programming language. The connections between steps can be represented as a graph. A graph in which vertices correspond to steps and edges to transitions between steps is called a flowchart. Its vertices can be of two types: from which one edge emerges - operators; from which two edges emerge - logical conditions or predicates. In addition, there is a single end operator (from which no edges emerge) and a single start operator. A feature of the block diagrams is that the links that it describes do not depend on whether the steps are elementary or are independent algorithms - blocks. For a given block, it doesn't matter how other blocks are arranged; to program a block, it is enough to know where the initial information lies, what the form of its presentation is, what the block should do and where to write the result. Flowcharts correspond to the logic that a programmer uses to create complex, multivariate, iterative action plans. A flowchart is a common type of flowchart that describes algorithms or processes, depicting steps as blocks of various shapes connected by arrows. Writing algorithms using flowcharts allows you to compare them, choose the best algorithm, simplify, find and eliminate errors.

Rejection of the flowchart language in the development of an algorithm and the development of an algorithm directly in the programming language leads to significant losses of time, to the choice of a non-optimal algorithm. Therefore, it is necessary to initially develop an algorithm for solving the problem in the flowchart language, after which the algorithm should be translated into a programming language. When developing an algorithm for a complex problem, the method of step-by-step detailing is used. At the first step, the general structure of the algorithm is thought out without detailed elaboration of its individual parts. Blocks requiring detailing are outlined with a dashed line, and at subsequent steps in the development of the algorithm are thought over and detailed.

IV.METHODOLOGY

We have chosen an integrated environment "ИС ДРАКОН" developed by G.N. Tyshov to compile an algorithm for the operation of our device. The integrated environment "ИС ДРАКОН" is one of the few open implementations of the algorithmic language ДРАКОН, created within the framework of the space program "БУРАН" and intended to unify the representation of algorithms not only for programmers, but also for a wide range of specialists not directly related to programming technologies. It differs from other implementations in the depth of interface design, usability and a large number of available capabilities.

The environment allows you to create sheets of arbitrary size, place on them an arbitrary number of algorithmic schemes, save the resulting schemes in a graphical format, generate source code in various programming languages.

The editor is distinguished by automatic formatting and built-in protection tools that exclude the development of algorithmic structures that are incorrect for the ДРАКОН language. Advanced editor tools allow you to copy and move both individual elements and pieces of circuits, as well as quickly change the structure (replanting and grounding vines). Together with the textual language, ДРАКОН forms a hybrid language: ДРАКОН -JavaScript, ДРАКОН -Python or ДРАКОН -C ++. Programming in a hybrid language is as follows: We draw a ДРАКОН ДРАКОН -scheme, put small pieces of code in the corresponding programming language inside the icons, the translator program converts the ДРАКОН -scheme into a text file with the source code, this text file is included in the project in the usual way.

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V.EXPERIMENTAL RESULTS

Since the integrated microelectronic transmitter consists of two main functional microcontrollers, two separate ДРАКОН circuits were made for each. One of them works as the main code generator, i.e. generates pulses similar to МТ-1, МТ-2, КПТШ-5 and КПТШ -7. (fig. 1)

Fig. 1. it can be seen that the name of the circuit is always placed at the top left, in our case «Формирователь», then there is a question icon that can be answered yes or no, with this icon, we choose which of the functions МТ-1, МТ-2, КПТШ -5 or КПТШ -7 of the integrated microelectronic generator will be performed by the microcontroller. After the question icon there is a combination cycle, which includes the blocks of the beginning and end of the cycle. We used this block for all modes. And inside the loop, an action is performed, this is shown using the process block. In the process blocks, we show the sequence of all possible actions in all modes. And all these branches end at block end.

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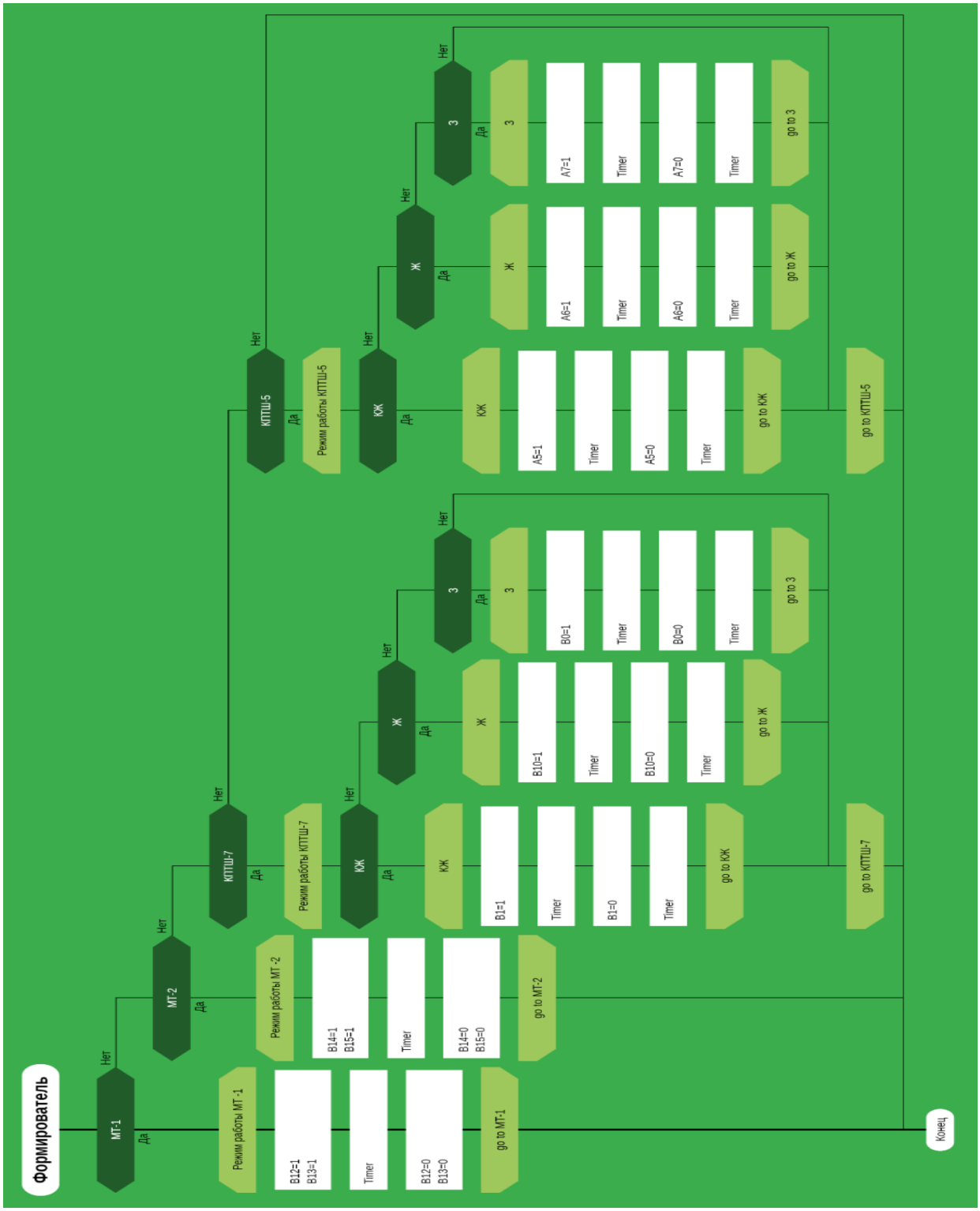

Fig. 1. Algorithm of work of the integrated microelectronic code generator

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The second microcontroller works as a code decoder, i.e. checks the correct operation of the main microcontroller. The decoder algorithm was composed similarly. (fig. 2.)

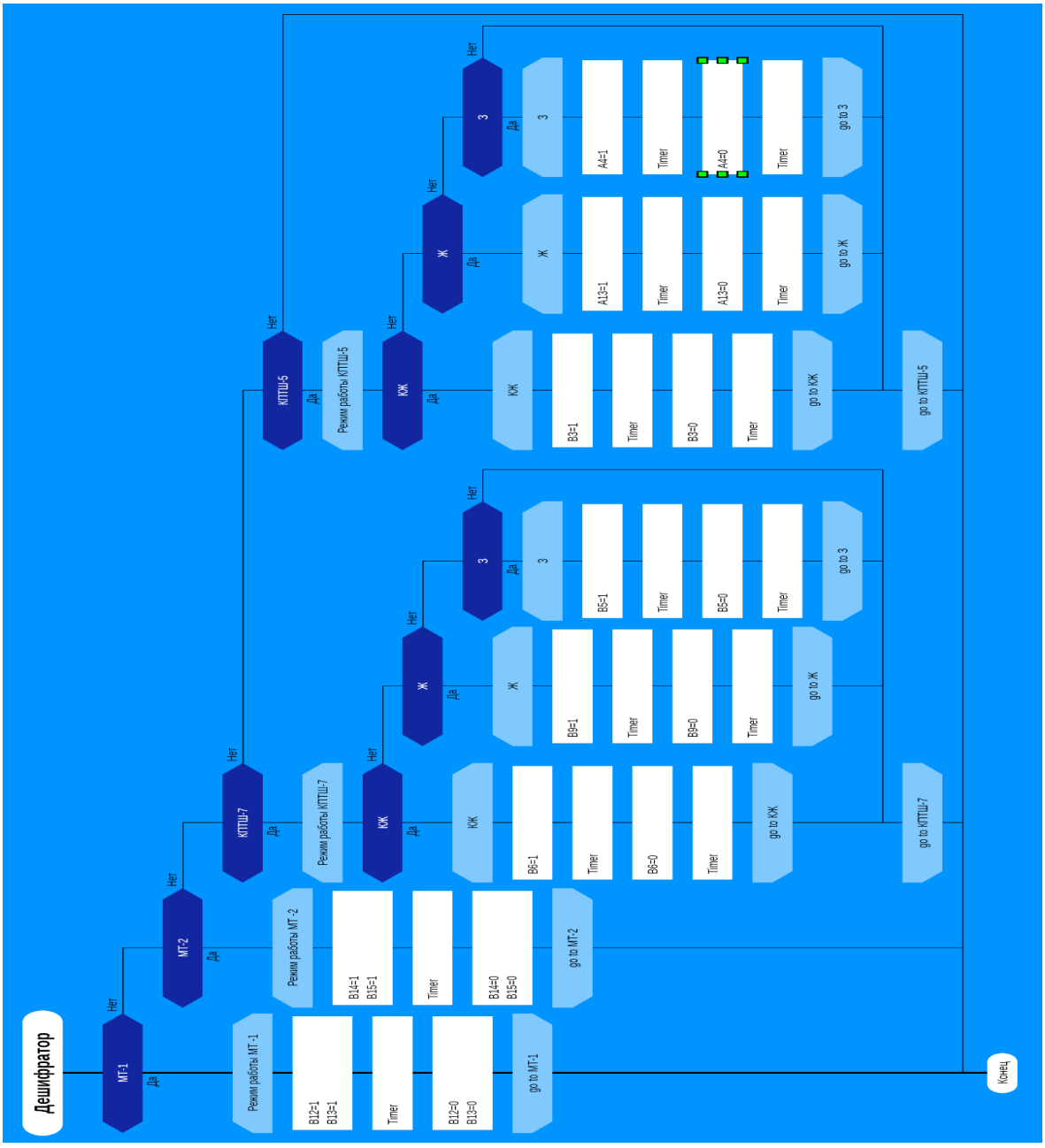

Fig. 2. Algorithm of operation of the decoder of the integrated microelectronic code generator

In the ДРАКОН program, all this is done easily and beautifully and clearly.

VI. CONCLUSION

The program has the ability to translate already finished programs by algorithms, for this there are flags in each block, simply by clicking on them with the cursor, we submit to the programming environment. The ДРАКОН

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program is recommended to be used for teaching students, and also, specialists can easily perform any complex algorithms. In our case, we got a full-fledged algorithm with a ready-made program for an integrated microelectronic pulse shaper.

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