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QUESTIONS INTELLECTUALIZATION OF MANAGEMENT OF TRANSPORTATION PROCESSES FOR RAILWAYS

Summary. *The article describes peculiarities of electronic document management of technical documentation of railway automatics and telemechanics. The questions of intellectualization of control processes on the basis of a synthesis of mathematical descriptions of electronic document management of technical documentation of railway automatics and telemechanics. The article describes the formalized representation of electronic document management of technical documentation of railway automatics and telemechanics.*

Keywords: *high-speed traffic, intellectualization control, railway automatics and telemechanics, electronic document management, technical documentation, formal methods and models.*

In the Republic of Uzbekistan embarked on the modernization of its Railways, where the priority is to increase speeds of passenger trains. In this direction have already been put into operation high-speed line at the site Tashkent-Samarkand with a train speed of 150–250 km/h. Was carried out a number of measures to ensure traffic safety of high-speed trains such as the strengthening of railway lines, renewal of the dimensions of the structures, reconfiguration of switches [1].

In connection with growth of volumes of construction and modernization in areas of high-speed traffic in front of the Uzbekistan Railways are reducing the time and cost of design, construction and pre-commissioning when commissioning systems of railway automatics and telemechanics.

In modern conditions, expanding the functionality of the latest systems of automation and telemechanics, grow the amount and quality of information provided by the railway automatics and telemechanics systems for traffic management, monitoring of train location and state of infrastructure. With further development of these systems, their design, process Troubleshooting of failures becomes more difficult; increase the number of subcontractors participating in the design, construction and supply of equipment, constructs and components; lengthened periods of verification systems in commissioning.

Unfortunately, with the establishment of railway automatics and telemechanics systems do not always use modern design techniques, the organization of interaction of involved organizations, quality control of work execution, automation, input and retrieve information. The result increases the duration of design, construction and commissioning of the systems, waste of time, more difficult scheduling of deadlines, it is impossible to take timely corrective management decisions and, consequently, significantly raise the price of supplies work.

Today in world practice in the field of automation occupies a leading position in developing highly efficient systems of control of technological processes with the involvement of intelligent technologies. Further development of intelligent control technology in rail transport allows you to implement advanced technical systems with high performance and enhanced functionality. In this regard, the establishment of an integrated monitoring and control the design, construction, commissioning works, supply of devices, materials, and equipment, as well as analysis of the quality of work performed on the basis of electronic circulation of technical documentation is up to date.

The use of electronic document management [2] due to the increasing complexity of systems and, as a consequence, huge amounts of transmitted and processed information. For example, a test project of electric centralization of station visual method without the use of technical means at the time can be comparable with the time of system design. Thus, without the use of means of complex automation of processes of obtaining information and information exchange impossible to reduce time and increase efficiency of production work.

The most effective decision of problems of automation can be achieved by formalizing and applying mathematical methods of optimization of the coordination

of the processes of electronic document management of technical documentation, in particular the main part of the contract specifications (DCS) to devices of railway automatics and telemechanics systems [3]. Control and order management equipment is a complete solution for work with specifications, order management and control of execution of orders equipment in the construction and overhaul of systems of automation and telemechanics.

In this work, for building algorithmic display DCS are encouraged to use the languages a direct description of discrete processes, which include Petri nets, logic circuits, algorithms, logic circuits, requirements of parallel logic schemes of algorithms [4].

The presence of parallel branches allows to make a conclusion about the necessity of choosing languages, the means of display of the characteristics of algorithms DCS. Such remedies have the Petri nets and the language of parallel logic schemes. In addition, the necessity of unification algorithms DCS requires the enable of formal transformations of algorithms.

The need to meet these requirements leads to the choice of language parallel logic schemes of algorithms, which is an evolution of logic scheme of algorithms.

Customized specifications will be described as follows:

$$s_g \in S,\ g = \overline{1,G}$$
$$p_{g,m} \in P_g,\ m = \overline{1,M} \qquad (1)$$

where, s_g — specifications; $p_{g,m}$ — m-th parameter of the equipment in the specification of g; Here, the set G forms a plurality of processed spec S; set M of parameters of the specification forms for the sets P_g all considered parameters g-th specifications (every m-th parameter is entered in the position specification).

Developed a formalized schema includes many private algorithms $A_g,\ g = \overline{1,G}$ process DCS. Private algorithms $A_g,\ g = \overline{1,G}$ are synthesized on the basis of analysis of existing technology and the current state of electronic document management systems.

Private algorithm describing similar technological function performed by one participant in the workflow [5]. Private algorithm of management for a customized spec A_g is a set carried out in a sequence of operations and checks the Boolean condition.

The algorithms are numbered in sequence $A_g,\ g = \overline{1,G}$. Taking into account the introduced designations of the participants workflow algorithms near-by shafts of indexes $A_{q,g}$.

Operation O_p will call elementary action on DCS of the set S. All operations performed in the process of doing $s_g \in S$, forms a set of $O = \{o_p\},\ p = \overline{1,P}$. In the index $O_p,\ p = \overline{1,P}$ operation specifies the number of the participant and algorithm, as well as its individual number on record sequence.

Presents the FCS will allow you to define sets of initial data on algorithmic and parametric mapping DCS. The main feature of the algorithms DCS is the presence of parallel branches. FCS provides sufficient flexibility descriptions DCS, because it is based on an algorithmic mapping system. In accordance with this method of formalization should be focused primarily on the identification and description of algorithms DCS.

We introduce the symbols write algorithms DCS A_g on the parallel logical schemes of algorithms taking into account the FCS. The main elements are the operators corresponding to O_p, logical conditions $\alpha_k, k = \overline{1,K}$ marked by arrows $\alpha_k{}^{\uparrow p},\ p = \overline{1,P}$, where p is the index of the arrow. The transition specifications when false the value of α_k is to the element of the parallel logic schemes of algorithms marked with an arrow with the same index $\downarrow^p$.

To account for the quality of the process of doing a custom specs, additionally introduced the following types of operations: k — operations, determining quality DCS (benchmarks); α — probabilistic logical conditions that depend on the quality DCS.

The set $A = \{\alpha_k\}, k = 2$ consists of probabilistic Boolean type:

$$\alpha_k = \begin{cases} 1 - \text{the verification result is positive;} \\ 0 - \text{otherwise.} \end{cases}$$

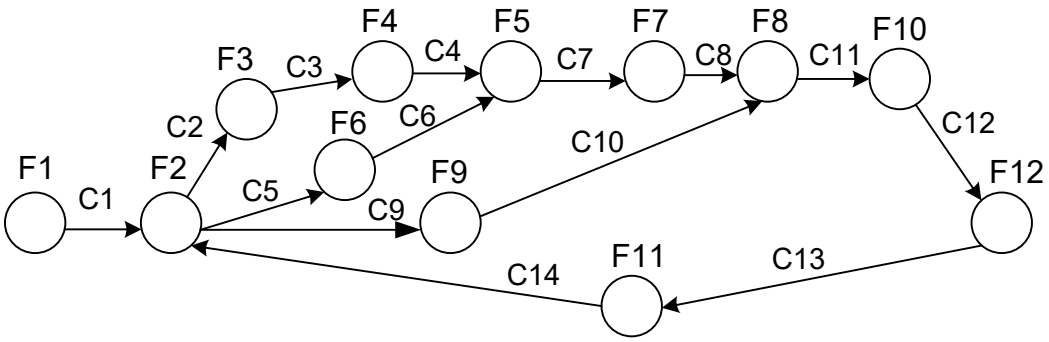

Fig.1. The graph model of algorithmic descriptions A11

The analysis of processes A11 included in DCS at all levels received by parallel logic schemes of algorithms view:

$$A11 = b_{111}\downarrow^{111} b_{112}\alpha_{111}\uparrow^{111}\downarrow^{117} d_{111}\alpha_{112}\uparrow^{112}\alpha_{113}\uparrow^{113}\upsilon_{119}b_{113}\times$$
$$\times\omega\uparrow^{116}\downarrow^{113}\upsilon_{111}\downarrow^{116}\upsilon_{112}\upsilon_{113}\upsilon_{114}\upsilon_{115}\upsilon_{116}\upsilon_{117}\upsilon_{118}\alpha_{114}\uparrow^{114}\downarrow^{114} b_{115}\times$$
$$\times b_{116}b_{117}\upsilon_{1111}\upsilon_{1112}\downarrow^{112}\upsilon_{1110}b_{114}\alpha_{115}\uparrow^{115}\upsilon_{+}\omega\uparrow^{117}\downarrow^{115}\upsilon_{J}$$

To display the transition process, the algorithmic description by using the graph theory constructed the transition graph (Fig.1).

In the graph model following symbols have been used:

– changed as the documents used in simulated process — F1,..., F12.
– algorithms performed on the documents to change the conditions — C1,..., C14.

Possible chains (CH) passing algorithm A11 in the graph model:

CH1=F1C1-F2C2-F3C3-F4C4-F5C7-F7C8-F8C11--F10C12-F12

CH2=F1C1-F2C5-F6C6-F5C7-F7C8-F8C11--F10C12-F12

CH3=F1C1-F2C9-F9C10- F8C11-F10C12-F12

CH4=CH1-CH2-CH3-C13F11C14-CH1-CH2-CH3

The combination of these chains determines all possible scenarios of movement of documents in the process, describes all the possible states of the documents in the algorithm A11.

Needs high-speed rail transport increase, which reveals the need to update and upgrade systems and devices of Railways, to develop modern information technologies in electronic document processing.

Based on the methodology of formal description models of document management systems technical documentation this paper presents a formalized scheme of electronic document management of technical documentation, in particular process management custom specifications of railway automatics and telemechanics.

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