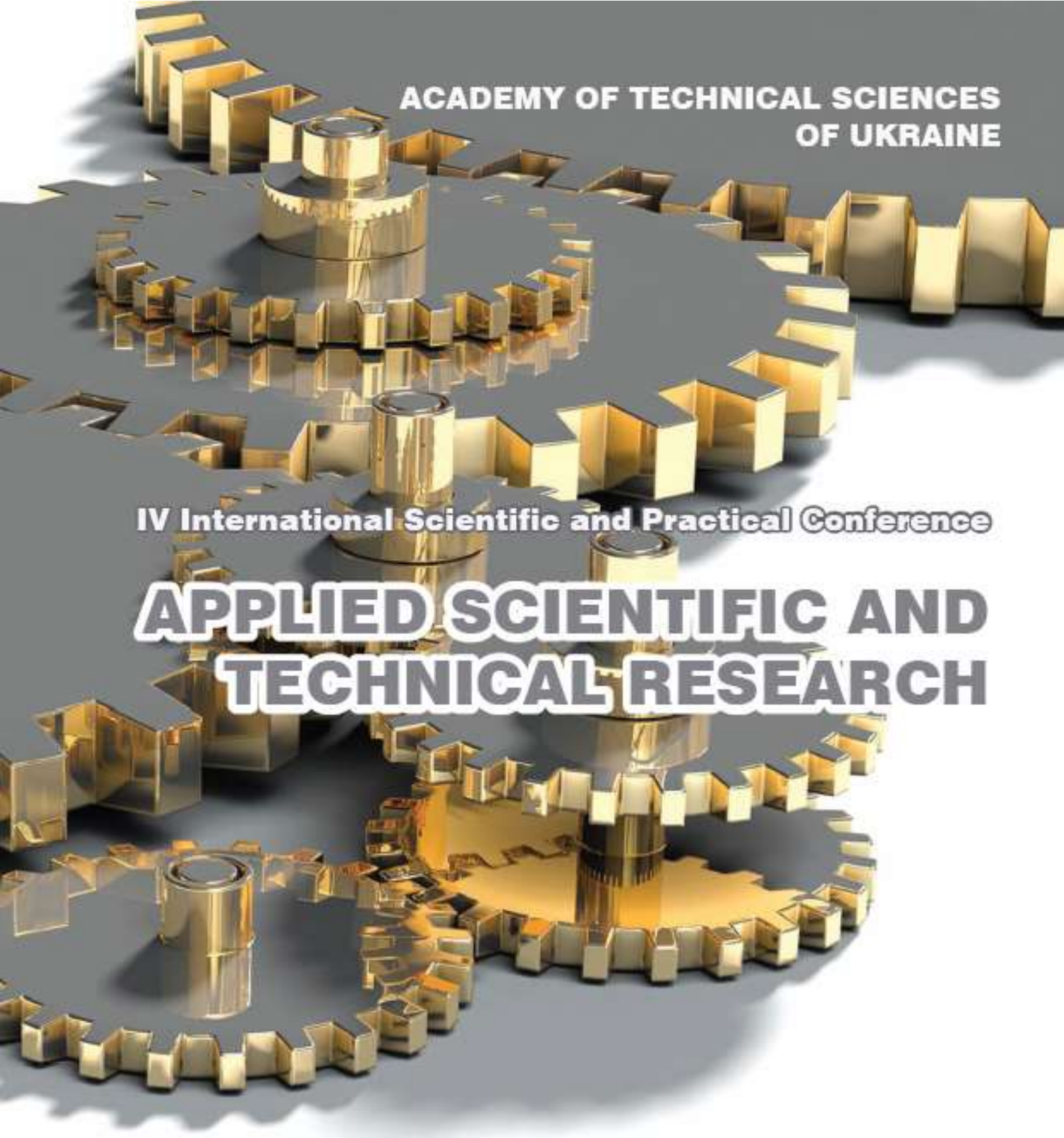

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APPLIED SCIENTIFIC AND TECHNICAL RESEARCH

April 1-3, 2020

In Two Volumes
Volume 2

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CONSTRUCTION OF THE MATHEMATICAL MODEL OF THE STRUCTURAL UNIFICATION OF SPECIALIZED COMPUTER SYSTEM ON RAILWAY TRANSPORT

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Entry. Nowadays in a railway transport are used the national and foreign microsystems of the train dispatching. And although they execute identical functions however they have separate features as on programmatic as at vehicle level. In time of globalization of world market before railway there are new tasks – integration in the unique complex of the systems and built on railway automation of the different setting that compels cardinally to do logic of functioning of the systems and built on different setting, realizing the system integration and standardization on all levels. Features of every separately taken system the microsystems of traffic control are not presently noticeable because a necessity to be integrated in each other to this time did not arise up. The refore creation of their models becomes actual and research of which allows to analyse the conduct of the system on the whole, to represent co-operation between the elements of the structure, to estimate their influence on each other, to find out «weak» points in a structure. This is important especially for development and planning, and also subsequent operation, informatively – the sensor-based systems of railway automation.

It is efficient in such case to probe the structures of the separate existent systems of modern microprocessor centralizations.

Exposition of material. In this work it is suggested to present the structures of the separate existent systems of modern microprocessor centralizations in the type of the oriented graphs. The got graphs are farther probed by the construction of adjacency and distances matrices, and also receipt on their basis of numerical descriptions[1]. It enables to compare the different systems of microprocessor centralization and draw conclusion about expedience of their use in those or other terms.

In the conducted research the considered structures of two microprocessor centralizations of pointers and signals of “Impuls” and Ebilock-950 that have already used on the railways of the general use of Ukraine. Below resulted table 1, that contains data on the system of microprocessor centralization of “Impuls”.

Table 1. - Correspondence of “Impuls” structure elements to graph vertices

Hierarchy levels	Structure element	Graph vertix
Executor level	Operator	1
	Engineer	2
	Tuner	3
Provision and planning level	Operator workstation (main)	4
	Operator workstation (reserve)	5
	Engineer workstation	6
	Distance dispatching workstation	7
Net	Communication switch board 1	8
	Communication switch board 2	9
Control and check level	Control calculator	10
	Control calculator	11
	Control calculator	12
Net	Communication module	13,14,15
Interface level	Microprocessor 1	16,18,20,22,24
	Microprocessor 2	17,19,21,23,25
	Wayside apparatus connection	26,27,28,29,30

On the basis of these information the built count fig.1.

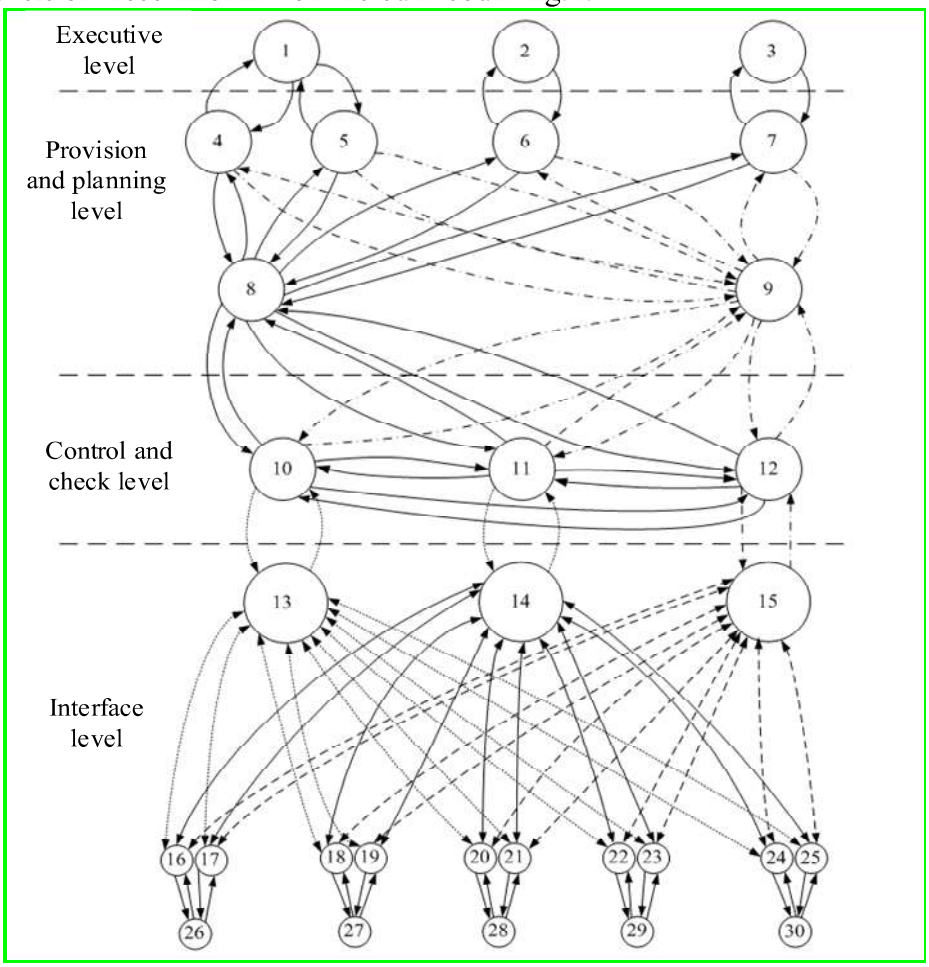

Figure 1 - “Impuls” system structure graph.

During the leadthrough of analysis of the built counts of control system “Impuls” and Ebilock-950 structural surplus(0,172 and 0,11227), structural compactness (0,934 and 0,8231), index of centrality (0,74 and 0,56) and number of basic contours(74 and 20), is certain. It enabled to define

certain advantages of "Impuls" in comparison of Ebilock-950, that responsible for reliability and higher unconcern of the system [2].

Conclusion. The mathematical model of research of control system is built enables in number to compare descriptions of control systems and define more optimum. Advantages of this model with the using of graphs is simplicity of the using, clearness and evidentness of results.

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METHOD OF WEIGHTS DETERMINATION BASED ON RATINGS OF SOFTWARE QUALITY METRICS

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Introduction. Currently, software is as necessary as any other product that is used by humankind. Therefore, software, like other products, must have high quality.

The set of qualitative indicators of software products and methods of their determination are regulated by a number of international standards [1]-[8]. These standards are adapted in Ukraine as national. In fact, they are just a direct translation. Standards [5]-[8] do not contain the methods of software product quality indicators determination. They contain the determination methods for quality attributes only, which are indicators of the lowest level. There are no methods for determination of subcharacteristics and characteristics. In this work we used the methodic from [9] in order to improve methods from mentioned above standards.

The number of quality attributes is above two hundred. They are combined into metrics in order to make it easier the determination and the results processing. Attribute metrics are combined into subcharacteristic metrics, which are subsequently combined into characteristic metrics [5].

Quality absolute indicator $P_м$ for each metric can be expressed as follows [9]:

$$P_м = \sum_{i=1}^{n} (P_i \cdot V_i), \quad (1)$$

where P_i – indicator of i-th subcharacteristic/characteristic; V_i – weight of i-th subcharacteristic/characteristic. Quality indicators can be determined in this manner for each hierarchical level.

International standards [5]-[8] do not explain how to get weights values. So, practical quality evaluating is significantly complicated.

The objective of this work is to develop methods for determining characteristic/subcharacteristic weights.

Method of weights determination. Documents [6]-[8] contain ratings of quality metrics H – high, M – middle, and L – low. That can be a basis for weights determination. The ratings for in-use quality metrics are presented in the Table 1 [8].

Table 1 – Ratings for in-use quality metrics

Characteristic		Rating
Name	Code	
Effectiveness	U.1	H
Productivity	U.2	H
Security	U.3	L
Satisfaction	U.4	M

The developed algorithm for weights determination works as follows.

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