The Formalized Approach to a Choice of a Variant of Radio-frequency Identification System of Equipment on a Rail Transport

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Abstract - **In this paper the formalized approach for a choice of variant of radio-frequency identification (RFID) systems on a rail transport are given.**

Keywords - **Radio-frequency identification system, Choice of variant.**

I. Introduction

Market strategy of development of a rail transport in the conditions of a competition imposes rigid restrictions on quality and terms of designing of RFID systems. Therefore there is a contradiction between constantly increasing complexity of considered systems and requirements of improvement of quality of designing and reduction of its terms. In such conditions traditional methods of designing often appear inefficient. One of approaches to elimination of this contradiction is working out of methodology of designing of RFID systems on the basis of application of methods of an artificial intellect, in particular, by construction of expert systems. The report purpose is working out of a technique of the decision of problems of formation and a choice of variants of RFID systems from a set alternative interchangeable, but various components under the characteristics.

II. Estimation of Quality and Competiveness of RFID Systems

Problems of formation and choice of variants of RFID systems from separate components when for each component exists a little interchangeable, but variants differing on the characteristics, it is formulated as follows. Let RFID system choice is made from set of alternatives $S = \{s_i, i = \overline{1, N}\}$ under the set requirements or criteria $Q = \{q_j, j = \overline{1, M}\}$. It is necessary to choose such alternative which in the best way corresponds to set of requirements Q from set of possible variants of RFID systems.

The decision of problems of formation and choice of variants of systems even from rather small number of making components, as a rule, represents certain difficulties because of variety of variants and the big number of difficultly considered and badly formalizable factors. The decision of such problems is interfaced with considerable time and material inputs, demands several cycles of updating and in many cases cannot be effectively realized by means of traditional approaches. Result of the decision of a considered problem is creation new or meeting the requirements of the technical project variants of RFID system which it is possible to present in a kind column $G_k = (E_k, S_k)$ where E_k - set of the components entering into structure; S_k - set of communications between structure components; k - structure number. The system structure is understood as a set of components $E_k = \{e_1, e_2, \mathbf{K}, e_n\}$ making it and communications between them $S_k = \{s_1, s_2, \mathbf{K}, s_m\}$. Are Thus in advance set an admissible set of used structural components $E = \bigcup_{k=1}^{K} E_k$, Possible rules of their connection among themselves, i.e. A set of following restrictions: $V = \{V_1, V_2, \mathbf{K}, V_L\}$ and ways of definition on synthesized structure of functions which it realizes.

Designing of any systems, in particular RFID systems, includes three basic stages: formation of set of possible variants; an estimation of set of the generated variants and its truncation at the expense of removal of the worst variants; decision-making on a choice from set of not worst variants (Pareto set) best variant. Formation of set of possible variants is carried out on the basis of the morphological approach where localization of formed variants of system in vicinity Парето - optimum variants of system as a whole has special value, or its separate components. The metrics of morphological distance between morphological variants of system is with that end in view entered:

$$r(A', A'') = \sum_{i=1}^{L} (1 - d_{A'_i A''_i}), \qquad (1)$$

where L - number of morphological classes, $d_{A'_i A''_i} = \{1, \text{при } A'_i = A''_i; 0, \text{in other case}\}$.

At formation of set A_D of admissible variants of system with subsequent finding Парето - optimum variants sometimes it appears useful to analyze level-by-level structure of set A_D.

III. Conclusion

In this paper the approach using at the decision of specific targets of a choice of a variant of construction of RFID systems of a rolling stock on a rail transport are considered.

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