The Problem Providing Reliability of Radio Electronic Means in Terms Operating Vagueness

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Abstract –**The problems of forecasting the reliability of complex technical systems are examined with providing of minimum approximation error indexes and the possibility of removal operational vagueness of parameters.**

Keywords – **Reliability, technical system, identification systems, approximation.**

I. Introduction

A new methodological approach of estimation of reliability of complex technical systems is offered in basis of that not prognostication of reliability on statistical properties of parameters of reliability of structural elements of structural elements and identification of the reliability parameters for the behavioral characteristics of the whole system.

II. Instruction for Authors

Considerable complication of task of estimation and prognostication of reliability of modern radio electronic equipment (REE) is predefined first of all by the swift increase of her functionality and technical complication [1]. Combination of large variety of elements and subsystems with different descriptions of reliability in one device (system) results in a volume that the adequate estimation of reliability on the whole is possible only with considerable approximation or in general not possible through the presence of large great number of the possible states and ambiguousness of input streams of parameters. Moreover the large error of approximation that is mortgaged yet on the stage of planning of REE is conditioned by the presence of vagueness of row of system signs of reliability (emergention, correlative copulas in the middle systems, presence of the unstable states and others like that) [1] that in most cases can not be forecast. Under such conditions obvious is a necessity of search fundamentally new more flexible methodological approach of estimation of reliability what gives an opportunity generalized to consider all possible sets of uncertainties states of the system in a wide range of operating conditions.

The authors proposed the basic provisions of the new methodological approach to analyzing and predicting the reliability of complex technical systems based on deterministic methods for identification of unknown systems that are widely used in the theory of automatic control systems and radio engineering.

The main idea of this methodological approach in that the reliability system of the whole is evaluated not by a priori statistical characteristics of separate components and subsystems but on estimated by a posteriori behavior (dynamics) of certain (selected by weight) indexes of functioning. At such approach mathematical model of reliability of a separate sample of REE (a group of samples) consisting of n - conditionally independent subsystems examined as functional that is characterized by two sets of input $A(x_1, x_2, x_3, \ldots, x_m)$ and $B(y_1, y_2, y_3, \ldots, y_k)$ and one set of output parameters $C(z_1, z_2, z_3, \ldots, z_l)$ (fig.1).

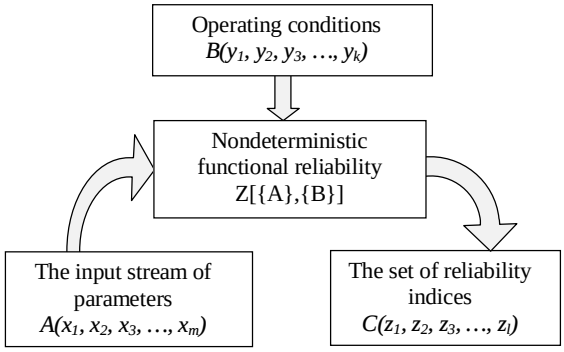

Fig.1 Mathematical model of reliability of complex technical systems

Obviously with such an interpretation model of a system its adequate functional or structural-operator representation is not possible primarily through nondeterministic of operator *Z[{A},{B}]* and vagueness of the array $A(x_1, x_2, x_3, \ldots, x_m)$. However if to take into account the necessity of providing of the defined values of array of $C(z_1, z_2, z_3, \ldots, z_l)$ (or values of his separate elements) and determinism of $B(y_1, y_2, y_3, \ldots, y_k)$ functional of *Z[{A},{B}]* can be conventionally identified with any multiple $A(x_1, x_2, x_3, \ldots, x_m)$. In simplified form the mathematical model of a system can be written as:

$$opt\{C\} = Z[\{\overline{A}\}, var\{B\}], \quad (1)$$

where $\{\overline{A}\}$ – set of averaged values input parameters; $var\{B\}$ –set of variables (controlled) input parameters which is achieved at the optimal value of output ($opt\{C\}$).

III. Conclusion

Research has shown nondeterministic approach in in the estimation of reliability of complex technical systems gives opportunity to remove considerable part of errors of approximation caused by a wide range of operating conditions REE and displays of systemic signs environments due to variations in the values of row input parameters during operation or at the construction stage taking into account the accumulated experience.

References

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