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RELIABILITY OF COMPLEX ENVIRONMENTAL MONITORING SYSTEMS

The environmental monitoring complex systems (EMCS) should operate under extreme conditions by means of adaptation to operative environment, working structure and behavior standards [1, 2]. In other words, EMCS must be robust. It means, that EMCS are capable gradually (regardless of various soft or structure faults) to change the intrinsic performance in acceptable boundaries. The main operation functions are considered as admissible and their performability is satisfactory when the system remains in predicted extent or goes over to another legitimated predictive extent. This transition is

transfer to alternative deviation – eventual way to implementation of installation-specific activity [3].

In itself the robustness should be provided by feature of EMCS with structural and informational redundancy to variate its pattern for the sake of follow-on intrinsic functions or seeking the alternative algorithmic and heuristic deviations for appropriate operation when the standard procedures are unfeasible or the base structure is disturbed. In these processes the seeking of admissible deviations, i.e. reasonable structural or/and algorithmic changeovers in limits of legitimate EMCS operation, is the responsible task. Deviation is a quality estimation of engineering system behavior conformity under internal and external parameters variations as well as structural and separate subsystem's malfunctions. This estimation must be an answer about EMCS behavior: whether the system in general operates in scope of common sense and operation requirements and capable to perform inherent tasks.

Ensuring of trouble-free EMCS functioning under real conditions is illustrated in Fig. 1. Reliability characterizes the engineering system's ability to steady (i.e. without malfunctions and essential performance characteristic's alteration) execute all main functions and assure the formulated aims delivered by designers under real conditions and in limits of predicted disturbances of environment's parameters and even in extreme situations.

Here the next varieties of reliabilities are considered:

– *Constructive*, i.e. ability to resist against physical, mechanical, chemical, environmental external influences (in pre-established bounds and time intervals), which are possible during system operation at all living cycle or during storage in nonactivation.

– *In time*, i.e. ability to regular operating over a period specified as life-time cycle.

– *Static*, i.e. ability to preserve their functioning in working bounds during the all life-time cycle or during storage in nonactivation.

– *Dynamic*, i.e. ability to maintain their functioning along all life-time cycle disregard of unsteady-state processes and external disturbances during operations.

– *Statistical*, i.e. ability to keep up system statistical characteristics in bounds of confidence intervals along the system's life-time cycle.

Robustness [4–5] as it's stated above characterizes the EMCS facility of keeping its feature invariable along the specified time. After this time such characteristics may gradually deteriorate but with a decrease in quality of operation within predefined limits (by reducing dynamic and static accuracy, increasing response time, increasing transient intervals, reducing possible additional functions, performance/cost metrics, etc.).

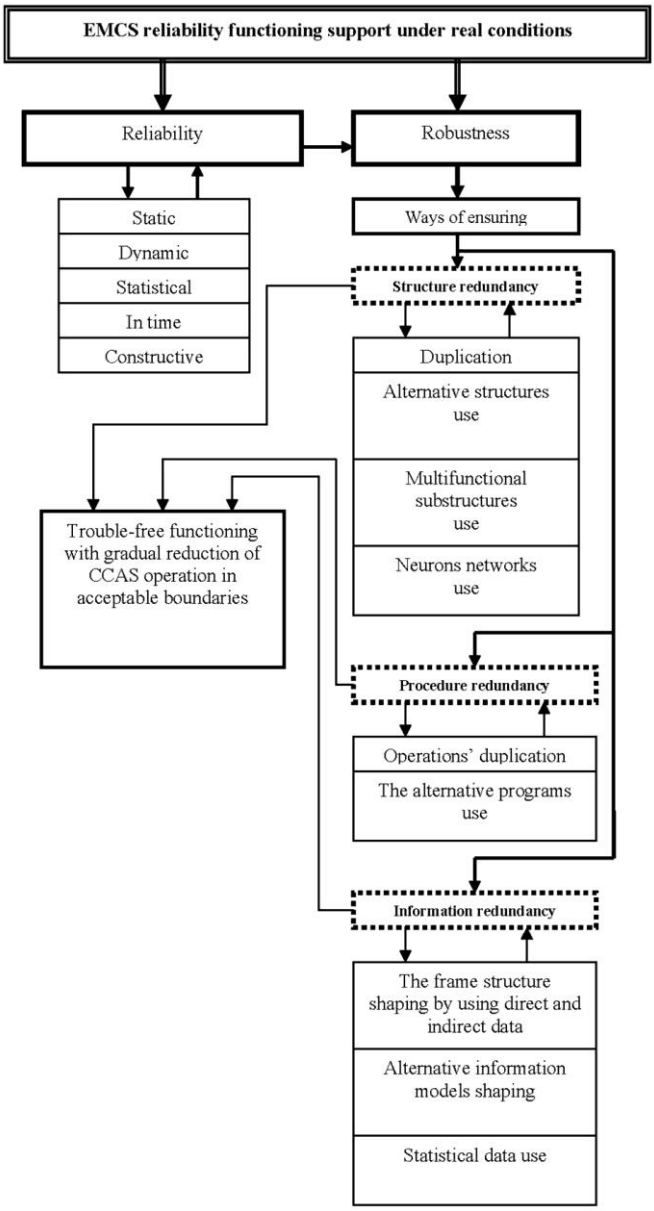

Fig. 1. Ensuring of trouble-free EMCS functioning under real conditions

Thus, robustness of the environmental monitoring system can be ensured by procedural redundancy, which implies a multiple solution by the same problem using the same source data, with the conclusion, that the outcome of the decision is correct, is based on the evaluation of most of the same or close decisions. Procedural redundancy is necessarily accompanied by the input of a redundancy of technical means for temporary storage of intermediate results. Informational redundancy includes the redundancy variables in the system to receive the reference ratio between the variables.

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