

## Logical-Probabilistic Modeling of the Reliability of Complex Systems

**Authors :** Sergo Tsiramua, Sulkhan Sulkhanishvili, Elisabed Asabashvili, Lazare Kvirtia

**Abstract :** The paper presents logical-probabilistic methods, models and algorithms for reliability assessment of complex systems, based on which a web application for structural analysis and reliability assessment of systems was created. The reliability assessment process included the following stages, which were reflected in the application: 1) Construction of a graphical scheme of the structural reliability of the system; 2) Transformation of the graphic scheme into a logical representation and modeling of the shortest ways of successful functioning of the system; 3) Description of system operability condition with logical function in the form of disjunctive normal form (DNF); 4) Transformation of DNF into orthogonal disjunction normal form (ODNF) using the orthogonalization algorithm; 5) Replacing logical elements with probabilistic elements in ODNF, obtaining a reliability estimation polynomial and quantifying reliability; 6) Calculation of weights of elements. Using the logical-probabilistic methods, models and algorithms discussed in the paper, a special software was created, by means of which a quantitative assessment of the reliability of systems of a complex structure is produced. As a result, structural analysis of systems, research and designing of optimal structure systems are carried out.

**Keywords :** Complex systems, logical-probabilistic methods, orthogonalization algorithm, reliability, weight of element

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