THE ANALYSIS OF SOFTWARE RELIABILITY PREDICTION MODELS FOR SAFETY-CRITICAL SYSTEMS

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Firstly, the analysis of software faults' rising process and, secondly, the creation of mathematical models for software reliability indexes' estimation are most strongly-developed line of investigation in software reliability evaluation and control sphere. These researches are really essential, taking into account the importance of reliability control for safety-, life-critical software [1].

Software reliability is defined as the probability of failure-free software operation for a specified period of time in a specified environment. Basic definitions of software reliability theory are: cumulative number of failures - $M(\tau)$, mean failure function - $\mu(\tau) = E[M(\tau)]$, failure intensity function - $\lambda(\tau)$, failure rate function - $F(\tau)$, hazards rate - $z(\tau) = \lim_{\Delta t \to 0} F(\tau)$ etc. [2].

In spite of such a fact, that some authors express doubts for software reliability estimation's accuracy, main regulations in IT-sphere recommend to use the software reliability models (SRM). Preferably, the **application of reliability prediction models is the main approach for software reliability and quality estimation** [2, 3].

Software reliability modeling has been around since the early 1970s with the pioneering works of Jelinski and Moranda (1972), Shooman (1977), and Coutinho (1973). More than 50 statistical models are currently being used now [3]. Different classification for SRM exists, but it is essential to admit some main categories of them, such as: error seeding, failure rate, curve fitting, reliability growth (RGM), non-homogeneous Poisson process (NHPP), Markov structure etc.

However, the most widespread class of software reliability models is reliability growth models, which based on analysis of time dependencies between software failures. They strongly rely on statements of classic reliability theory. In addition to the estimations of measured reliability indexes, the probabilistic reliability models may be applied for different optimization tasks' solving, which are connected with software testing resources control, optimal time for putting software into operation [1]. Also, they are used in metric estimations of software quality and reliability for calculation of metrics' variety.

That's why, the main goals of investigation are: the essential substantiation of probabilistic reliability models' application; the description of practical recommendations of RGM usage for software quality and reliability estimation; the resolution of essential problem of **optimal selection of preferable reliability model** for the estimation of specific software characteristics. The proposed approach for software reliability model selection seems perspective, because it allows taking into consideration all pros and cons of reliability models and its possibility of application to the specific software. The following practical application of method will be connected with its development, formalization and detailed elaboration etc. The perspective of the following investigations are connected with such a fact, that class of software reliability models is constantly developing, expanding with new models, which form the basis of tools' creation for software reliability estimation.

References

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