Proceedings of the 13th International Conference on Quality and Dependability
Neptun, Romania, September 5th-7th, 2012
ISSN 1842-3566
Pages 53-58

Dependability Estimation of Mechatronic Systems

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Abstract
Dependability estimation is becoming an important issue of the design process of mechatronic systems. The concept of dependability is frequently seen as being one of the least controlled points and for some as being the critical point. Since these systems are very complex to study, the evaluation of their reliability is extremely difficult. In this paper, we propose a global method to estimate the mechatronic system reliability using operating field data. Since we have a small amount of data, we use an estimation method called Bayesian Restoration Maximization (BRM) method, thus increasing the estimation accuracy. The BRM method needs to define some prior knowledge. For this purpose, we propose to define the prior distribution using a Monte- Carlo simulation based on stochastic Petri Nets (SPN) model and on the operating field data. The stochastic PN model describes the functional and dysfunctional behaviours. In this study, we deal with the case of n repairable systems until a deterministic censoring time (for example, this censoring time may be the warranty period of an ABS system). We consider repair as the replacement of the failing component by an identical one in the case of electronic and mechanical subsystem and in the case of software, the default is rectified on all the subsystems. We simulate the failures times and we compute the confidence interval. The proposed method allows dependability evaluating both for n mechatronic systems and for their different subsystems.

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