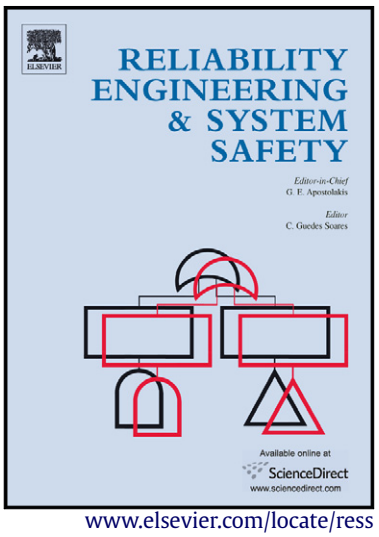

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Optimal Preventive Maintenance and Repair Policies for Multi-state Systems

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Abstract

This paper studies the optimal preventive maintenance (PM) policies for multi-state systems. The scheduled PMs can be either imperfect or perfect type. The improved effective age is utilized to model the effect of an imperfect PM. The system is considered as in a failure state (unacceptable state) once its performance level falls below a given customer demand level. If the system fails before a scheduled PM, it is repaired and becomes operational again. We consider three types of major, minimal, and imperfect repair actions, respectively. The deterioration of the system is assumed to follow a non-homogeneous continuous time Markov process (NHCTMP) with finite state space. A recursive approach is proposed to efficiently compute the time-dependent distribution of the multi-state system. For each repair type, we find the optimal PM schedule that minimizes the average cost rate. The main implication of our results is that in determining the optimal scheduled PM, choosing the right repair type will significantly improve the efficiency of the system maintenance. Thus PM and repair decisions must be made jointly to achieve the best performance.

Keywords: Maintenance; Optimization; Reliability; Multi-state system; Non-homogeneous

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