Original article

Standby system with general repair, reboot delay, switching failure and unreliable repair facility—A statistical standpoint

Ying-Lin Hsu [a,b,*], Jau-Chuan Ke [c], Tzu-Hsin Liu [a]

[a] *Department of Applied Mathematics, National Chung Hsing University, Taichung 402, Taiwan, ROC*
[b] *Institute of Statistics, National Chung Hsing University, Taichung 402, Taiwan, ROC*
[c] *Department of Applied Statistics, National Taichung Institute of Technology, Taichung 404, Taiwan, ROC*

Abstract

This study statistically examines an availability system with reboot delay, standby switching failures and an unreliable repair facility, which consists of two active components and one warm standby. The time-to-failure and the reboot time are assumed to be exponentially distributed. The repair time of the service station and the time-to-repair of component are assumed to be generally distributed. A consistent and asymptotically normal estimator of availability of such a repairable system is developed. Based on this estimator, interval estimation and testing hypothesis are performed by using logit transformation. To implement the simulation inference for the system availability, two repair-time distributions, lognormal and Weibull distributions, are used. Three Weibull distributions characterized by distinct shape parameters are considered. Finally, all simulation results are displayed as appropriate tables and curves to reveal the performance of the statistical inference procedures.
© 2011 IMACS. Published by Elsevier B.V. All rights reserved.

Keywords: Hypothesis test; Logit transformation; Power function; Reboot delay; Switching failure; Unreliable repair facility

1. Introduction

The availability of repairable systems is becoming increasingly important in the power plants, manufacturing systems and other contexts. Maintaining a high or required level of reliability and/or availability is commonly essential. Lewis [10] introduced the concept of standby switching failures in the reliability with standby system. Huang et al. [7] examined a repairable system with switching failure and fuzzy parameters, using a parametric nonlinear programming approach. Trivedi [14] introduced the concept of reboot delay and its effect on the reliability or availability model of a repairable system. Ke et al. [8] addressed a two-unit repairable system with imperfect coverage, reboot, and fuzzy parameters. Gururajan and Srinivasan [5] investigated a two-unit system with an unreliable service station, in which the lifetime of the functioning unit was generally distributed, while the standby unit has a phase-type distribution.

Statistical inference can be used to estimate the system parameters/characteristics from experimental data or by simulation. However, issues regarding statistical inferences for the availability/reliability systems with a general repair time and imperfect switching of failed components have seldom been addressed. Masters et al. [11] and Sridharan and