Extended Abstracts

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Bayesian Analysis of 3-State Devices

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Key Words — **3-State devices, Failure mode, Partial failure, Bayesian analysis.**

There have been numerous papers detailing the use of Bayesian inference regarding the stochastic behaviour of 2-state devices. This paper extends these methods to cover the behaviour of 3-state devices in equilibrium. The posterior distribution of the state probabilities is derived under two models:

1. Two types of *s*-independent failures.
2. Partial and complete failures.

The (constant) failure and repair rates are assumed to follow *s*-independent Gamma prior distributions and the devices are assumed to have Markov behaviour. It is shown that, up to a constant of proportionality, the posterior distribution has a simple form for both models. Estimation is discussed and, in particular, the consequences of a quadratic loss function are examined. Finally, the ideas are illustrated by means of a numerical example. Full details are available in a separately available Supplement.

SUPPLEMENT

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Availability of a 2-Unit Cold-Standby System with Degraded State

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Key Words — **Standby redundancy, Point availability, Laplace transform, Laplace-Stieltjes transform.**

A cold standby redundant system with two i.i.d. units and one repair facility is studied. Units can be in three states: *good, degraded,* and *failed.* We suppose that only the following state-transitions of a unit are possible: *good* goes to *degraded, degraded* goes to *failed, degraded* goes to *good, failed* goes to *good.* Transition times of a unit between the states *good, degraded,* and *failed* are i.i.d. random variables. The repair of a *degraded* unit causes it to become *good.* This can be interpreted as a preventive maintenance, the realization of which depends on states of both units. Three conditions on the starting state of the system are considered. Point available of the system is derived by means of the theory of regenerative processes and is expressed in terms of Laplace and Laplace-Stieltjes transforms. For derivations and results, see the separately available Supplement.

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