THE DISTINCTION OF SIMULATED FAILURE DATA BY THE LIKELIHOOD RATIO TEST

by

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1 INTRODUCTION

In some applications failure rates are viewed as random variables, following a known type of distribution, e.g., a gamma distribution. Often the parameters of the known type of failure rate distribution are unknown. The integration of the failure rate distribution times the probability of failure in a test time (e.g., a Poisson distribution) over all failure rate space (0 to ∞) yields a marginal probability distribution, i.e., the probability of failure during a given test time for a process with a known type of failure rate distribution. This marginal distribution leads to Bayesian analysis, or Bayesian estimation [1]. In Bayesian estimation sample evidence obtained through direct observation is combined with prior information about the failure rate distribution, to make estimates of the parameters of their distribution.

If a group of items or components are required to perform a certain task, the components either operate or fail to operate. For example, when switched on a light bulb will light or remain dark. These kinds of components may be viewed in two ways, classical or Bayesian.

When a group of similar components is viewed in a classical sense all of the components are assumed to be completely identical. Because they are assumed identical all of the components are assumed to have the same probability of failure when energized or the same probability of failure per unit time. For example, all the light bulbs produced in a certain batch may be assumed to have a 0.01% probability of failing to light when turned on (i.e., once per one hundred tries the light bulb will fail) and may have a 25% probability of failing during a year of operation. If the same group of components is viewed in a Bayesian sense, the components are not assumed to be identical but are viewed as having