

Reliability inference with extended sequential order statistics

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Relevance to the Centre

In this article, we will address the complexity of non-identical components in multi-component systems. Most technical systems can be described as such since either component types or component functions within the system vary amongst components. While most reliability related work resorts to the assumption of homogeneous components, we aim to address the often more realistic assumption of heterogeneous components extending the model of Extended Sequential Order Statistics by two inferential methods. Firstly, the derivation of Maximum Likelihood Estimates including a simulation study demonstrating their good performance for large enough sample size. Secondly, we introduce a likelihood ratio test to test whether components can be assumed identical accompanied by a power study. Both methods are powerful tools in reliability contexts. The former increases our understanding of component behaviour, especially upon failure of other components. This knowledge empowers system operators to make better decisions regarding maintenance schedules and failure time prediction. The latter supports operators in their quest of identifying component equivalence. Therefore, both methods can be used to achieve meaningful results in real life applications.

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