

Discrete-Time Signatures of Coherent Systems: Properties, Stochastic Orderings and Transformations

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Abstract

In the study of coherent systems in reliability theory, the concept of the system signature, originally introduced by Samaniego [1] and subsequently developed by Kochar, Mukerjee, and Samaniego [2], has become a fundamental tool for analysing the reliability properties of systems, assessing their structural efficiency, and developing inferential methods based on system lifetime data. Several extensions of the signature concept have subsequently been proposed in the literature, including the survival signature, the extended signature, the joint signature, and the ordered system signature. Previous research has focused predominantly on coherent systems composed of components with continuous lifetimes. In practice, however, such systems often consist of components with discrete lifetimes. This situation arises, for example, when the system is monitored only at discrete time points or when it operates in cycles and the observations represent the number of successfully completed cycles before failure occurs. In [3], we consider coherent systems composed of independent components with discrete lifetimes and introduce the concept of a discrete-time signature. We discuss its fundamental properties, establish stochastic ordering results, and derive transformation formulas that facilitate comparisons between the signatures of systems with different numbers of components. In addition, we present several examples illustrating the theoretical results.

Keywords

Reliability system, Discrete-time signatures.

References

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