

# ON STRUCTURE SIGNATURES AND PROBABILITY SIGNATURES OF GENERAL DECOMPOSABLE SYSTEMS

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## ABSTRACT

Consider a semicoherent system made up of  $n$  components having i.i.d. continuous lifetimes. Its *structure signature* ([5, 6]) is the  $n$ -tuple  $s$  whose  $k$ -th coordinate is the probability that the  $k$ -th component failure causes the system to fail. This  $n$ -tuple depends only on the structure of the system and not on the distribution  $F$  of the component lifetimes.

In the general case of semicoherent systems whose components may have dependent lifetimes, the same definition for the  $n$ -tuple gives rise to the *probability signature*  $p$ . The latter may depend on both the structure of the system and the probability distribution  $F$  ([3, 4]). The dependence of  $p$  on  $F$  is captured by the *relative quality function* ([3]).

It was shown in two independent papers ([1, 2]) how the structure signature of a system partitioned into two disjoint modules can be computed from the signatures of these modules.

We consider the general case of a system partitioned into an arbitrary number of disjoint modules organized in an arbitrary way and we provide a formula for decomposition of the signature of the system in terms of the signatures of the modules.

In the general setting of probability signature, we provide a decomposition formula under a natural condition expressed in terms of the relative quality function of  $F$ .

## References

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