Nonparametric Reliability-based Design Optimization

using Sign Test on Limited Information

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Many methods for reliability analysis and reliability-based design optimization (RBDO) have been developed for the last decades. However, for most of these methods predicting the reliability, the stochastic information of variables has to be assumed as parameters like mean (location parameter) and variance (scale parameter). These assumptions cannot guarantee the accuracy of reliability when the information is limited. In this paper, we suggest a nonparametric RBDO using sign test that doesn't consider the parameters but requires limited information, like sample data, only. We define uncertainty of reliability as a decision error of nonparametric hypothesis test due to limited information. We show the tendency of the solution with respect to the reliability and the uncertainty of reliability through examples.

Keywords: Reliability analysis, Reliability-based design optimization, Uncertainty of reliability,

Nonparametric approach, Sign test, Limited information,