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A Flexible Distribution and Its Application in Reliability Engineering

Yan-Gang Zhao , Xuan-Yi Zhang , Zhao-Hui Lu

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Highlights

- A probability distribution based on the cubic normal transformation in a conventional and simple form is proposed.
- The proposed distribution includes six distinguished types, the boundaries of each type are identified, and the completeness of each type in the proposed distribution is proven.
- The applicable range of the proposed distribution covers a large area in the skewness-kurtosis plane and the skewness-kurtosis relationship for commonly used distributions are within the applicable range of the proposed distribution.
- The proposed distribution has rich flexibility and can fit the existing two- or three-parameter distributions quite well.
- The accuracy and efficiency of the proposed distribution in simulating distributions of random variable, calculating reliability index, finding optimal inspection interval and assessing the influence of the input uncertainties on the entire output are demonstrated through several practical engineering problems.

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