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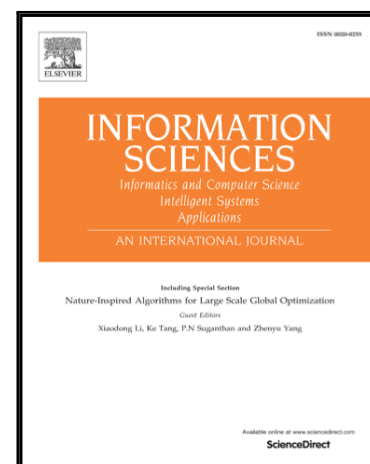
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# Uncertainty theory as a basis for belief reliability

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## Abstract

Belief reliability is a newly developed, model-based reliability metric which considers both **what we know (expressed as reliability models) and what we don't know (expressed as epistemic uncertainty in the reliability models) about the reliability**. In this paper, we show that due to the explicit representation of epistemic uncertainty, belief reliability should not be regarded as a probability measure; rather, it should be treated as an uncertain measure in uncertainty theory. A minimal cut set-based method is developed to calculate the belief reliability of coherent systems. **A numerical algorithm is, then, presented for belief reliability analysis based on fault tree models**. The results of application show that the developed methods require less computations than the structure function-based method of classical reliability theory.

*Keywords:* Reliability, epistemic uncertainty, uncertainty theory, belief reliability, fault tree,

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## 1. Introduction

Modern reliability engineering is increasingly looking at the model-based methods (cf. physics-of-failure (PoF) methods [5], structural reliability methods

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