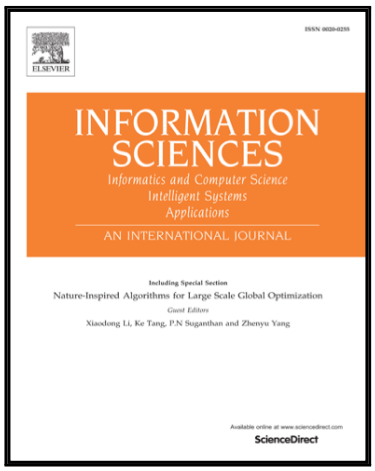

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Uncertainty theory as a basis for belief reliability

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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,

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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