Reliability analysis with linguistic data: An evidential network approach

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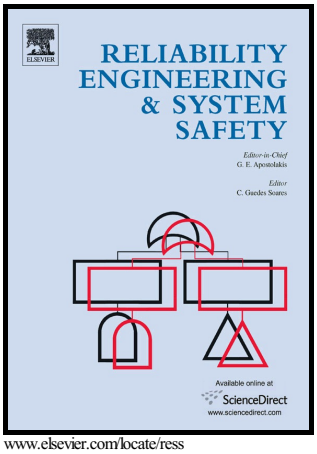

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Reliability analysis with linguistic data: An evidential network approach

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Abstract

In practical applications of reliability assessment of a system in-service, information about the condition of a system and its components is often available in text form, e.g., inspection reports. Estimation of the system reliability from such text-based records becomes a challenging problem. In this paper, we propose a four-step framework to deal with this problem. In the first step, we construct an evidential network with the consideration of available knowledge and data. Secondly, we train a Naive Bayes text classification algorithm based on the past records. By using the trained Naive Bayes algorithm to classify the new records, we build interval basic probability assignments (BPA) for each new record available in text form. Thirdly, we combine the interval BPAs of multiple new records using an evidence combination approach based on evidence theory. Finally, we propagate the interval BPA through the evidential network constructed earlier to obtain the system reliability. Two numerical examples are used to demonstrate the efficiency of the proposed method. We illustrate the effectiveness of the proposed method by comparing with Monte Carlo Simulation (MCS) results.

Keywords: Dempster-Shafer theory, Reliability assessment, Linguistic data, Basic probability assignment, Classification

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