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RESEARCH ARTICLE

A new risk prioritization model for failure mode and effects analysis

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Abstract

Failure modes and effects analysis is a framework that has been widely used to improve reliability by prioritizing failures modes using the so-called risk priority number. However, the risk priority number has some problems frequently pointed out in literature, namely its non-injectivity, non-surjectivity, and the impossibility to give weights to risk variables. Despite these disadvantages, the risk priority number continues to be widely used due to its higher simplicity when compared with other alternatives found in literature. In this paper, we propose a novel risk prioritization model to overcome the major drawbacks of the risk priority number. The model contains 2 functions, the risk isosurface function that prioritizes 3 risk variables considering their order of importance in a given risk scenario, and the risk prioritization index function which prioritizes 3 risk variables considering their weights. The novelty of the proposed model is its injectivity, surjectivity, and ease of use in failure modes prioritization. The performance of the proposed model was analyzed using some examples typically used to discuss the conventional risk priority number shortcomings. The model was applied to a case study and its performance correlated with other risk prioritization models. Results show that the failure modes prioritization reached with the proposed model agrees with the expectations made for the risk scenario.