The 14th International Conference on Quality, Reliability, Risk, Maintenance, and Safety Engineering (QR2MSE2024)

July 24-27, 2024, Harbin, Heilongjiang, China

Special Session on:

Predicting and Optimizing Multi-Objective Reliability of Complex Systems Based on Digital Models and Experiments

In many industries such as aerospace, energy, and manufacturing, the reliability of complex systems directly impacts production efficiency, safety, and cost control. Digital models and experiments are essential tools for predicting and optimizing the reliability of complex systems. Digital models describe the structure and behavior of complex systems using mathematical models, aiding in understanding the system's working principles, characteristics, and potential issues. Simultaneously, experiments provide data and observation results from real operating environments, helping to validate the accuracy and reliability of the models.

However, predicting and optimizing the reliability of complex systems face numerous challenges. Firstly, complex systems often have multiple objectives, such as performance, safety, and maintainability, with interdependencies and trade-offs among these objectives. Therefore, balancing and optimizing between multiple objectives becomes a complex and challenging task. Secondly, the operating conditions of complex systems are often subject to changes, such as environmental conditions and varying loads, which can affect the system's reliability. These variations make accurate prediction of system reliability even more difficult.

To address these challenges, this special session will focus on the application of digital models and experiments, exploring how these tools can be utilized to predict and optimize the multi-objective reliability of complex systems. The session will cover various topics, including digital modeling and simulation of complex systems, multi-objective reliability assessment and optimization methods, data-driven prediction and optimization models, fault diagnosis and prediction methods, and case studies on reliability prediction and optimization for industrial applications. The aim of this special session is to discuss and share the latest research findings and innovative methods in predicting and optimizing the reliability of complex systems, and to facilitate collaboration and knowledge exchange between academia and industry.

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