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Keynote Speech

Belief Reliability for Uncertain Random Systems

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Abstract

Measuring system reliability by a reasonable metric is a basic problem in reliability engineering. Since the real systems are usually uncertain random systems, which are affected by both aleatory and epistemic uncertainties, the existed reliability metrics may not work well. This lecture aims to develop a general reliability metric, called belief reliability metric, to cope with the problem. In this paper, the belief reliability is defined as the chance that a system state is within a feasible domain. Mathematically, the metric can degenerate to either probability theory-based reliability, which mainly copes with aleatory uncertainty, or uncertainty theory-based reliability, which mainly considers the effect of epistemic uncertainty. Based on the proposed metric, some commonly used belief reliability indexes, such as belief reliability distribution, mean time to failure and belief reliable life, are introduced. We also develop some system belief reliability formulas for different systems configurations. To further illustrate the formulas, a real case study is finally performed in this lecture.

About the speaker



Rui Kang is a Changjiang Scholars of Chinese Ministry of Education and Distinguished Professor in the School of Reliability and Systems Engineering of Beihang University, Beijing, China. He received his Bachelor's and Master's degree in Electrical Engineering in 1987 and 1990 from Beihang University, respectively. His main research interests include reliability and resilience for critical infrastructures, system prognosis and health management (PHM) and Belief Reliability Theory. Now, he is the director of the Center for Resilience and Safety of Critical Infrastructure (CRESCI) and Sino-French Risk Science and Engineering Lab. He is also an Associate Editor (AE) of the IEEE Transaction on Reliability (ITR) and Journal of Risk and Reliability (JRR). He has developed six courses and published eight books and more than 200 research papers. He received several awards from the Chinese government for his outstanding scientific contributions.