Probabilistic Risk Assessment of Multi-State Systems Based on Bayesian Networks

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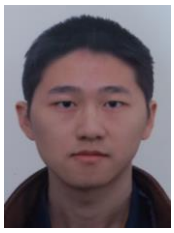
***Abstract*—Probabilistic approaches are common in the risk assessment of complex engineering systems. Although conventional methods such as fault tree (FT) have been used effectively in probabilistic risk assessment (PRA), they are only suitable to binary-state systems. As an extension of FT, multi-state fault tree (MSFT) is a good way in the modelling of multi-state systems, but it suffers severely limitation of efficient analysis and assess for systems risk, which is of great significance in PRA. Due to the difficulty of risk assessment in the multi-state systems, a new method based on Bayesian networks (BNs) is proposed. The BN model is constructed by converting MSFT and logic operators of the system through a mapping algorithm. Then the calculations of consequence probability and importance degree for each component are proposed based on Bayesian inference. Also, diagnose of failure system states can be achieved by posterior inference of BN. Finally, an example is illustrated to verify the effectiveness and feasibility of the proposed method.**

***Keyword*—risk assessment, multi-state systems, BNs, consequence probability, importance degree**



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