

Hybrid approach for the assessment of PSA models by means of binary decision diagrams

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Abstract-

Binary Decision Diagrams are a well-known alternative to the minimal cutsets approach to assess Reliability Boolean models. They have been applied successfully to improve Fault Trees models assessment. However its application to solve large models, and in particular the Event Trees coming from the PSA studies of the nuclear industry remains to the date out of reach of an exact evaluation. For many real PSA models it may be not possible to compute the BDD within reasonable amount of time and memory without considering truncation or simplification of the model. This paper presents a new approach to estimate the exact probabilistic quantification results (probability/frequency) based on combining the calculation of the MCS and the truncation limits, with the BDD approach, in order to have a better control on the reduction of the model and to properly account for the success branches. The added value of this methodology is that it is possible to ensure a real confidence interval of the exact value and therefore an explicit knowledge of the error bound. Moreover, it can be used to measure the acceptability of the results obtained with the traditional techniques. The new method was applied to a real life PSA study and results obtained confirm the applicability of the methodology and open a new viewpoint for further developments.

Index Terms- Probabilistic safety assessment, binary decision diagrams, event trees, hybrid approach

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