NTNU – Trondheim
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Review for Dissertation Thesis of Ing. Ondrej Nyvlt

Ondrej Nyvlt submitted a dissertation thesis entitled: "Risk Management Methods for Industrial Systems". The thesis has been supervised by doc. Ing. Jan Bilek and doc. Ing. Lukas Ferkl, at the Czech Technical University in Prague, Faculty of Electrical Engineering, Department of Control Engineering.

The dissertation is made of an introductive part including the problem statement, the goals of the doctoral thesis and the state of the art. Then, the results of the thesis are presented through a collection of 3 papers. At the end, a fulfillment of the goals is presented followed by a general conclusion.

The introductive part is short (at least compared to the standard in France and Norway), but it is well documented and efficient. Given the problem statement and the goals, the main existing references are correctly listed and cited in a relevant manner. The author could have cited some papers related to more high level modeling languages to address some levels of complexity for the studied cases. The general idea of the thesis is to investigate the use of existing methods to perform risk and reliability analysis and to test them on study cases.

Through the collection of papers, the author gives a good overview of existing models and method to evaluate the risk. He has chosen a progressive implementation starting with classical fault trees, then going on with Petri Nets to analyze dependences in event trees, and ending with Stochastic Petri Nets to model complex accident scenarios.
The three papers are published in international peer-reviewed journals and 2 of them are published in *Reliability Engineering and System Safety*, which is considered as a top-level journal in the framework of reliability and safety in France and in Norway.

- The first paper shows that Ondrej Nyvlt is able to use classical fault trees for a reasonable study case.
- The second paper shows that the author is able to use more advanced tools and methods that allow the integration of explicit dependences in Event Trees (shared basic events). The Petri nets are carefully presented and an approach to take into account explicit dependences is detailed.
- The last paper is devoted to the use of advanced class of Petri nets for the modeling of complex accident scenarios. Complex scenarios states here for cases when the order of events can vary and some events may occur anywhere in an event chain. Stochastic Petri Nets are used in combination with structured high level modeling language inspired from Programmable Logic Controllers. The software GRIF is extensively used. The tools chosen are relevant in light of the application. The use of a

structured high level modeling language shows that the author is able to have a good overview of the existing methods and is able to combine them in an efficient way.

The collection of papers show also that Ondrej Nyvlt is able to develop international collaborations. He has been able to move in Norway and to publish with two strong people who have different backgrounds (Reliability theory and Risk Analysis).

The work achieved is complete and well structured. Ondrej Nyvlt showed that classical tools and more advanced ones can be used to solve some realistic class of problems related to dependability analysis. The objectives of the thesis are fulfilled and the presented work is of importance for many applications. Ondrej Nyvlt used appropriated tools for the given problem statements but he could have looked more carefully at high-level modeling languages (AltaRica e.g.). The proposed approach in the last paper with inspiration from Programmable Logic Controllers is creative. The method highlights implicitly one main problem of the Petri nets tool: the size of the model a the end and the difficulty to re-use it and maintain it. I would have appreciated at some point, a more extensive analysis of the proposed models maintainability as well as a critical overview of the difficulty to build them, to validate them and to update them. This could be research perspective for the author.

As a conclusion, the author of the thesis proved to have an ability to perform research and to achieve scientific results. I do recommend the thesis for presentation with the aim of receiving the Degree of Ph.D.

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