BA/MA/Dipl-Thesis: Design and Implementation of a tool for reliability analysis of complex systems

Background

Wind turbines for electricity production have increased significantly during the last years both in production capacity and in size. Because of the economical aspects, wind turbines have to minimize the down time caused by hardware and software failures. The traditional software design has to be changed accordingly for this type of systems to guarantee both functional as well as non-functional aspects. One idea is to integrate the reliability analysis into the early phases of design process to be able to identify the week points in the architecture as soon as possible. Methods as Fault tree analysis (FTA), Fault Modes and Errors Analysis (FMEA) or Reliability Block Diagram (RBD) are usually used to analyze the reliability of the system qualitatively and quantitatively.

Description

In this thesis, a tool should be developed to perform such kind of reliability analysis for control systems of wind turbines. The high level model of the control system should be extended with probabilistic data. Based on this data, the reliability and availability of the overall system should be quantitatively calculated.
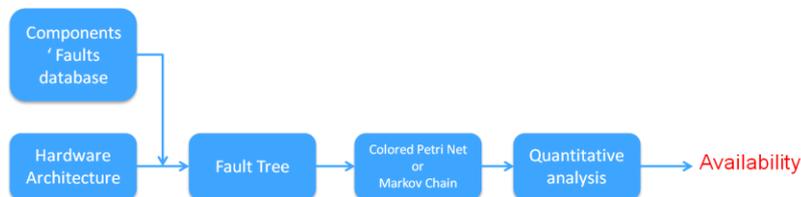
Tasks

This student project consists of the following tasks:

- Review and Implementation of transformation algorithms from high level model to FTA, FMEA and RBD.
- Implementation of algorithms for quantitative reliability analysis.
- Testing and documentation of the developed software components.

Literature examples:

- KS Trivedi - Modeling High Availability Systems - PRDC 06. 12th Pacific Rim International Symposium on Dependable Computing.
- Mark L. McKelvin, Jr. - A formal approach to fault tree synthesis for the analysis of distributed fault tolerant systems - Proceedings of the 5th ACM international conference on Embedded software.
- M. Walter, M. Siegle, and A. Bode - OpenSESAME - The simple but extensive, structured availability modeling environment - Reliability Engineering & System Safety, Volume 93, Issue 6, Pages 857-873, June 2008

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Research project:
WIND

Type:
SEP/IDP/BA/MA

Research area:
Embedded Systems

Programming language:
Java

Required skills:
Eclipse, Java

Language:
english/german

Date of submission:
TBA

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