

Research Grants for PhD students from the China Scholarship Council

Information Form (please read the guidelines carefully on the website www-csc.utt.fr)

Supervisor's name : KRATZ Given names : Frédéric

Status (prof., assistant prof., ...) : Full Professor

Laboratory : PRISME Website address : <http://www.univ-orleans.fr/en/prisme>

Institution : INSA Centre Val de Loire Website address : <http://www.insa-centrevaldeloire.fr/>

Scientific competence of the supervisor:

The team « Automatic Control » of the PRISME laboratory is specialised in RAMS, diagnosis, maintainability and state-observers theory.
Professor KRATZ is an expert on diagnosis model-based, supervision and estimation of the degradation of complex systems.
The co-supervisor of the thesis, namely Associate Prof. Yunhui HOU, has a strong expertise in the field of structural analysis.

Two major publications in the field proposed for the PhD :

1. Dakil, M., Simon, C., & Boukhobza, T. . Reliability and availability analysis of the structural observability of bilinear systems: A graph-theoretical approach. Proceedings of the Institution of Mechanical Engineers, Part
2. Cressent R., David P., Idasiak V., Kratz F.: Designing the database for a reliability aware Model-Based System Engineering process, Reliability Engineering and System Safety 111 (2013), pages 171-182.

Website address of the personal page :

Supervisor's email : frederic.kratz@insa-cvl.fr

Description of the research work proposed for a PhD **Topic # (see list) :** VI-2

Title : Structural properties analysis and detectability quantification of complex system with model-based system engineering languages

Subject :

Nowadays, systems, for example, complex cyber-physic systems, are expected to support many different levels uses as parts of an interconnected system of system (SoS). As a result, model-based system engineering languages such as SysML, Modelica, AltaRica etc. are proposed to satisfy the the evolving requirements. On the other side, in FMECA, risk priority calculation takes into account the detectability, severity and occurrence of each component and failure mode. The classification of the two latter indicators are widely discussed as main issue on FMEA. However, the detectability (the ability to monitor, detect and report the failure) is a measure which depends on structural properties of systems such as observability and controllability. The objectif of this thesis is to develop methods to analyze the structural properties and the detectability of a complex physic system built in model-based system engineering languages for each failure mode. Graph theory approaches are going to be used to explore and quantify the dependability of the fonction ensuring the system essential structural properties. An extended dysfunction propagation method are also needed to be developed to extract the information of dysfunctional models connecting failure modes from different levels and components with detectability information.

Keywords :

FMECA, model-based system engineering (MBSE), diagnostics

Expected collaborations :

French research groups Health Management and Maintenance and Safety, Monitoring and Supervision of the GdR MACS - CNRS
French research groupe AFIS

Background required from the applicant :

Master degree in electrical engineering, control engineering and eventually in object-oriented software engineering with background in reliability and modelization for systems engineering applications.

Existence of a PDF file detailing the proposal ("yes" or "no") : no

(see guidelines on the website www-csc.utt.fr)