

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 : GRALL

Given names : Antoine

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

Laboratory : Charles Delaunay Institute FRE CNRS 2019-
System Modelling and Dependability Laboratory

Website address :
<http://icd.utt.fr/en/index.html>

Institution : University of Technology of Troyes (UTT)

Website address :
www.utt.fr

Scientific competence :

Stochastic modeling for gradual degradation prediction, estimation of failure times and residual lifetimes for industrial systems. Maintenance and monitoring policies optimization, sensitivity and reliability analysis.

Two major publications in the field proposed for the PhD :

Ghamlouch, H., Fouladirad, M. and Grall A. The use of real option in condition-based maintenance scheduling for wind turbines with production and deterioration uncertainties
The use of real option in condition-based maintenance scheduling - Nguyen, K.T.P., Fouladirad, M. and Grall A. New methodology for improving the inspection policies for degradation model selection according to prognostic measures, IEEE Transactions on Reliability 2018

Website address of the personal page : <http://lm2s.utt.fr/en/plugins/mypage/mypage/content/grall.html>

Supervisor's email : antoine.grall@utt.fr

Description of the research work proposed for a PhD

Topic # (see list) : VI-2

Title : Multi-component systems, interaction modelling and maintenance planning

Subject :

Nowadays, maintenance optimisation of multi-component systems is an important issue and has attracted a lot of attention. In absence of interaction between components, the reliability and optimal maintenance policies of multi-component systems can be obtained by similar approaches as the single unit systems. However, such assumption is often unrealistic because of the internal complex structures of the systems, the set up costs, the common cause failures to the components, etc. There are several types of interaction between components of the multi-component systems. One consider a multi-component system such as a gearbox or a wind farm. The components are deteriorating and the failure, maintenance action and duration of one component impact the degradation level of the other components. To propose an efficient maintenance policy it is essential to focus on the degradation interaction modeling by stochastic models. The maintenance efficiency modelling is also one of the key to the maintenance optimisation policy. The objective of the thesis is to propose a stochastic degradation modeling framework and the associated maintenance decision rule in order to allow efficient condition-based predictive maintenance policy on multi-component systems with strong interactions between components. The optimisation problem should take into account all the maintenance constraints.

Keywords :

stochastic modelling, estimation, degradation, wear, reliability, maintenance planning, gamma or IG process

Expected collaborations :

Lorraine University (Nancy - FRANCE), Electricité de France (EDF - R&D - Paris - FRANCE), Salford University (Manchester - GREAT BRITAIN), Delft University of Technology (Delft - THE NETHERLANDS), Norwegian University of Science and Technology of Trondheim (Trondheim - NORWAY).

Background required from the applicant :

Knowledge in Probability and Statistics, knowledge of programming would be appreciated

Good knowledge in one or several of the following fields : Probability and statistics ; reliability & maintenance theory, modelling and engineering. Skills in computer programming (Matlab, R, ...)

- Methodological skills: Autonomy, initiative and critical thinking; Independent working; Academic writing and presentations ; Documenting and reporting ; Research methods

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

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