

# Research Grants for PhD students from the China Scholarship Council

Information Form (please read the guidelines carefully on the website [www-csc.utt.fr](http://www-csc.utt.fr))

Supervisor's name : KRATZ Given names : Frédéric

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

Laboratory : PRISME Website address : [www.univ-orleans.fr/prisme](http://www.univ-orleans.fr/prisme)

Institution : INSA Centre Val de Loire Website address : [www.insa-centrevaldeloire.fr](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.

Two major publications in the field proposed for the PhD :

1. CHEN, Yunxia, GONG, Wenjun, XU, Dan, et al. Imperfect Maintenance Policy Considering Positive and Negative Effects for Deteriorating Systems With Variation of Operating Conditions. IEEE Transactions on
2. DAIGLE, Matthew J. et GOEBEL, Kai. A model-based prognostics approach applied to pneumatic valves. International journal of prognostics and health management, 2011, vol. 2, no 2, p. 84-99.

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 : Imperfect maintenance integration to model-based prognostics considering uncertainties on effect of maintenance actions and initial states

Subject :

The objective of this thesis is to build a model-based prognostic model with maintenance decision and uncertain imperfect actions integrated in order to satisfy continuously system performance criteria and other constraints. In order to assure the system performance continuously, maintenance actions are (pre-) programmed according to different constraints or determined according to system condition. Maintenance action can be integrated within the discrete event model by means of a variable associated to the intervention on a certain component's damaging model. Imperfect maintenance presents either positive or negative effect on the operated component which often materialized by probability distributions. However, the epistemic uncertainties caused by insufficient information are not discussed. Uncertainties are characterized as epistemic, if the modeler sees a possibility to reduce them by gathering more data or by refining models. In this thesis, firstly we need to integrate pre-scheduled uncertain imperfect maintenance effect into a model-based prognostic process. Secondly, the maintenance is programmed dynamically based on the current system conditions with constraints, i.e. cost, availability, etc. Finally, the parameters of maintenance strategies (considered as part of initial system condition or configuration) satisfying both system availability objectives and maintenance constraints can be identified while inverting the process.

Keywords :

imperfect maintenance, model-based prognostic, epistemic uncertainty, optimisation

Expected collaborations :

French research groupe IMdR  
French research groupe GdR MACS - CNRS

Background required from the applicant :

We are looking for highly self-motivated candidates with a master's degree in a discipline related to mathematical, statistical, electrical or system engineering. Attention will be paid to academic record, motivation for the particular position, and personal projects. Autonomy, open-mindedness and motivation, as well as good English speaking/writing skills, are also expected.

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

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