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 :	SEGUY	Given names :	Sébastien
Status (prof., assistant prof., …) :	Assistant Professor HDR		
Laboratory :	Institut Clément Ader UMR CNRS 5312	Website address :	https://ica.cnrs.fr/
Institution :	INSA Toulouse	Website address :	http://www.insa-toulouse.fr

Scientific competence of the supervisor:

Dynamics, vibrations and nonlinear phenomena by analytical, numerical, and experimental techniques. Applications:
- Manufacturing process
- Nonlinear energy sink

Two major publications in the field proposed for the PhD :

1. T. Li, D. Qiu, S. Seguy, A. Berlioz, Activation characteristic of a vibro-impact energy sink and its application to chatter control in turning, Journal of Sound and Vibration 405 (2017) 1–18.
2. D. Qiu, S. Seguy, M. Paredes, Design criteria for optimally tuned vibro-impact nonlinear energy sink, Journal of Sound and Vibration 442 (2019) 497–513.

Website address of the personal page : https://ica.cnrs.fr/author/sseguy/

Supervisor's email : sebastien.seguy@insa-toulouse.fr

Description of the research work proposed for a PhD ***Topic # (see list) :*** VI-1 VI-3

Title : Improved design of nonlinear energy sink: application to chatter milling control

Subject :

The nonlinear dynamics of structures is a growing field, in academic research, because it helps to explain new phenomena. The vibration mitigation is also an important challenge for chatter reduction in manufacturing of lighter structures, especially in 5 axis milling. Thus, the introduction of nonlinear absorber seems to be a way forward. A concept of vibration absorber was proposed: the idea is to use a mass-spring-damper with a nonlinear stiffness in order to attenuate vibrations by transferring energy. Energy pumping mechanism consists in irreversibly transferring vibratory energy from a master system to an essentially nonlinear coupled auxiliary system – namely the Nonlinear Energy Sink NES – by triggering resonances between related nonlinear normal modes. These nonlinear absorbers seem to have a decisive advantage because they operate over a wide frequency range. The work is related to chatter reduction on manufacturing process. However, the optimal design of the NES for delayed system, the conditions of occurrence of energy pumping and the experimental implementation are major scientific challenges that require novel developments to offer reliable dynamic absorbers for manufacturing process.

Keywords :

Mechanical engineering; Dynamics; Nonlinear Energy Sink; Manufacturing; Chatter; Milling; Experiment

Expected collaborations :

This thesis is part of an international collaboration with the Northwestern Polytechnical University, Xi'an China and with the hosting of Zhenghang QIU for his thesis (2018-2022) at the Institut Clément Ader laboratory.

Background required from the applicant :

The approach should link the development of specific models, the use of theoretical and experimental tools (CNC machine) for observing, understanding and studying mechanical phenomena. Pre requested in dynamics/manufacturing are required for this PhD. Thus, the candidate will complement its core competencies in modeling and / or experimentation.

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

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