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 : Mencik | Given names : Jean-Mathieu

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

Laboratory : Laboratoire de Mécanique Gabriel Lamé | Website address : http://www.univ-orleans.fr/laboratoire-de-mécanique/

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

Scientific competence of the supervisor:

The research field of the supervisor covers vibroacoustics and model order reduction. He is a well-recognized international expert in the field of the wave finite element (WFE) method and possesses strong skills in the analysis of the vibroacoustic behavior of structures. He published more than 20 research articles on this topic and initiated strong partnerships with national and international institutions (Ecole des Ponts ParisTech in France and University of Campinas in Brazil, among others).

Two major publications in the field proposed for the PhD :

1. M. N. Ichchou, J.-M. Mencik, W. Zhou, Computer Methods in Applied Mechanics and Engineering 198 (15-16), 2009, 1311-1326
2. J.-M. Mencik, Computer Methods in Applied Mechanics and Engineering, 200 (45-46), 2011, 3051-3065.

Website address of the personal page :

Supervisor's email : jean-mathieu.mencik@insa-cvl.fr

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

Title : Damage identification in complex waveguides using wave-based approaches

Subject :

Structural health monitoring has become a critical problem in mechanical and civil engineering. This aims at detecting and preventing the deteriorations of structures at an early stage. Usually, non-destructive testing (NDT) techniques are applied to waveguide systems like pipelines with or without internal fluids (e.g., gas, oil,…). The strategy consists in generating guided waves and measuring their reflection to determine the occurrence, type and localization of defects. For engineering applications, waveguides are often made up of straight and curved complex-shaped joints which penalize the detection of damages via a classic wave propagation analysis. In terms of modeling, wave-based approaches are able to predict the wave properties of waveguides, as well as the wave reflection/transmission properties of damages and joints at a reduced numerical cost. The objective of this thesis is to investigate the potential of those wave-based approaches to identify damages in complex waveguides. A whole scattering matrix which takes into account the reflection/transmission properties of waves (in the frequency domain) around damages and curved joints will be developed and updated from measured experimental data. Single and multi-layered pipes, without and with internal fluids, will be analyzed. An integrated experimental/numerical tool to identify damages in practical waveguides will be developed.

Keywords :

waveguides, non-destructive testing, damage characterization, vibration, finite element

Expected collaborations :

Ecole des Ponts ParisTech (France); University of Campinas (Brazil)

Background required from the applicant :

Master in mechanics or acoustics with an interest in numerical modeling. A small background in experimentation would be appreciated.

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

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