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 : SERRA Given names : ROGER

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

Laboratory :	Laboratory of Mechanics Gabriel LAME (LaMé)	Website address : www.lmr.univ-tours.fr
Institution :	INSA CENTRE VAL DE LOIRE	Website address : www.insa-centrevaldeloire.fr

Scientific competence of the supervisor:

Dr SERRA Roger received his Master's degree in 1996 and his PhD degree in 1999 in mechanical engineering from Franche-Comte University, Besancon, France. Since 1999, he is Associate professor at INSA Centre Val de Loire at Blois, France and member of the Laboratory of Mechanics G. Lamé (LaMé). In 2016, he becomes HDR. His research interests include mechanical vibration analysis and structural dynamics, experimental modal identification, structural health and condition monitoring of mechanical structures, machining vibrations, cutting tool wear monitoring, signal processing, vibratory fatigue and dynamic mechanical characterization.

Two major publications in the field proposed for the PhD :

1. R. SERRA, L. LOPEZ “Damage detection methodology on beam-like structures based on combined modal Wavelet Transform strategy”, Mechanics & Industry (2017) https://doi.org/10.1051/meca/2018007
2. R. SERRA et al. « Variance analysis for identification of structural parameters by finite element based subspace fitting approaches », MSSP (2017) http://dx.doi.org/10.1016/j.ymssp.2017.01.006

Website address of the personal page : https://www.researchgate.net/profile/Roger_Serra

Supervisor's email : roger.serra@insa-cvl.fr

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

Title : Vibration based structural health monitoring of structures under specific loading using a structural modification approach

Subject :

Structural damage detection based on vibration testing has received a lot of interest in recent years. Various methods (experimental and numerical methods, artificial intelligence techniques, wavelet analysis, classical indicators methods, ...) have been employed for the damage detection. But due to the large dimension of the structural identification problem, these approaches often get trapped in a local optimum and failed to obtain a reasonable solution. In this PhD, an investigation of structural modification approach (perturbation theory) is proposed in order to increase the efficiency, accuracy and precocity of the structural health monitoring. After a literature review of existing methods, the work will start with existing cases and the crack detection algorithms will be developed with Euler-Bernoulli beam simulated data and contrasted with others methods. In order to evaluate several problem parameter configurations, a perturbation theory will be used to define a quantification parameter od damage according with specific loading cases and some interactions/correlations will be analyzed. The methods should distinguish the damage localisation/ patterns in a clear manner and with efficiency. Finally, a validation on experimental measurements on beam and truss structures will be performed, contrasted and discussed according with the litterature. The PhD student will be integrated in the research team with two previous CSC PhD students.

Keywords :

structural health monitoring; structural vibration; frequency; mode shape; modal analysis; damage detection; vibration fatigue; dynamic loading;

Expected collaborations :

The objective of this project is to initiate collaborations with chinese or international researchers working on related topics in order to develop and share the knowledge on this topic. The local team will bring competences with non-european students for many years and will ensure a blooming the phD student through extracurricular activities like cultural or sport activities (golf, 1 skiing week/year, Tennis,…) and the participation to the high level scientific congress (Fatigue Design, EWSHM, …). Blois is a little but marvelous historical city in the UNESCO Loire valley.

Background required from the applicant :

After a top Master graduation in mechanical engineering where the applicant developed excellent skills on solid mechanics, dynamics, mathematics, programming, engineering science, computational methods, finite element and/or statistical concepts, the applicant should have a goal to excel and live up the expectations in performing the project assigned and a great motivation about the field of the PhD thesis and a strong determination to push down scientific limits. The supervisor will help the applicant in this process and on these relevant topics.

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

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