

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 (LaMé) Website address : <https://www.mechlabgabriellame.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 Rheology and Mechanical Laboratory (LMR), Francois Rabelais University, Tours, France. In 2016, he becomes HDR. His research interests include mechanical vibration analysis and structural dynamics, experimental modal identification, condition monitoring of mechanical structures, machining vibrations, cutting tool wear monitoring, signal processing, vibratory fatigue and mechanical characterization.

Two major publications in the field proposed for the PhD :

1. R. SERRA et al. "New Experimental Single-Axis Excitation Set-Up for Multi-Axial Random Fatigue Assessments". Machines 13(7):539 (MDPI), June 2025, DOI: 10.3390/machines13070539
2. Wang Y, SERRA R. "Vibration Fatigue Damage Estimation by New Stress Correction Based on Kurtosis Control of Random Excitation Loadings". Sensors. (2021) 21(13):4518. <https://doi.org/10.3390/s21134518>

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) : I-1/I-8/IV-12/VI-2

Title : Definition of an Equivalent Fatigue Test using vibration shaker based on AI methods

Subject :

Historically, many laboratory tests used systems powered by a single-axis (SA) exciter to conduct the vibration testing to reach the fatigue damage produced by vibration in the real environment, as multi-axis (MA) simultaneous excitation systems have only recently been introduced but have limitations relating to their different technologies. Most companies are equipped with SA shaker, so the question is how to meet customer demands using SA shaker ? In response to this question, our objective is to develop equivalence models built from IA approaches like machine learning. These models, enriched by experimental and numerical data, aim at defining sequential SA tests representative of the loading histories reproducing the actual environment (on several axes, with different coupling levels). To this scientific challenge is added the industrial challenge of ensuring engineers that the equivalence approach thus developed meets specifications and normative requirements when they exist. In this way, the excitation can be defined in terms of exposure duration, intensity and direction, with any SA exciter within the limits of its own features. Instrumentation effects (mass of sensors, cables, fixing) between SA must also be investigated for an optimal configuration. Ultimately, the equivalent tests may help with structural shape optimization which aims to design material efficient or cost-effective components.

Keywords :

structural health monitoring; vibration fatigue; frequency; mode shape; modal analysis; damage; random; shaker test

Expected collaborations :

The objective of this project is to initiate collaborations with Chinese or international researchers working on related topic in order to develop and share the knowledge on this topic. The local team will bring skills with european and non-european students for many years and will ensure a blooming of the PhD student with extracurricular activities like cultural and sport (golf, tennis, skiing week, ...). 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 mathematics, programming, mechanical engineering, finite element and statistical concepts, i am looking for an applicant which has a goal to excel and live up the expectations in performing the project assigned. The applicant should have a great motivation about the field of the thesis and a strong determination to push down scientific limits. The co-supervisors will help the applicant to start his scientific career on this relevant topic.

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

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