Please use the following format for the title of the file so as to ease the management of the web site.

ECXX_LABYY_ NOMChercheur_ Numer
ECXX = ECLi, ECL, ECM, ECN, CS
LABYY = acronyme du laboratoire
NOMChercheur = nom du chercheur émetteur du sujet
Numer = numéro de la proposition (01, 02, ….) pour le chercheur

PhD Proposal 2017

School: Ecole centrale de Lyon	
Laboratory: LTDS	**Web site: http://ltds.ec-lyon.fr**
Team: TPCDI	**Head of the team: F. Thouverez**
Supervisor: A. Le Bot	**Email: alain.le-bot@ec-lyon.fr**
Collaboration with other partner during this PhD: **In France: J. Perret-Liaudet**	**In China:**

Title: Roughness noise of sliding/rolling contact
Scientific field: Numerical mechanics
Key words: Tribology, Vibration, Sound

Details for the subject:

(Maximal length of 2 pages, including images, list of reference, …The pdf file should not exceed 1Mo)

Background, Context:

Sound emission of noise of a rolling contact (wheel/rail, tyre/road) stems from the dynamical interaction between the track roughness and the surface of the rolling solid. This type of noise is sometimes called roughness noise. It is at the the origin of a large number of noise annoyances particularly in urban environment. The objective of this study is to clarify the conditions of apparition of vibrations into the contact, and therefore to better caracterize the sound emission of a rolling/sliding contact in the presence of roughness.

This thesis will be realized with the software Ra3D developed in the Laboratory of tribology and dynamics of systems during previous PhDs, H. Ben Abdelounis (2009) , V.H. Dang (2013) and Z. Bazari (2016). This software aims to solve the equations of contact mechanics in the time domain by detecting all asperities in contact at each time step. Other validation tests will be performed with the commercial software Abaqus.

Research subject, work plan:

The first part of the study will consist in studying the effect of dissipation in the contact (local dissipation) or in the wheel (global dissipation) on the noise level. We shall highlight the evolution of noise level versus the rolling speed and roughness of the track. Experiments on a rig test will be performed to confirm the analysis.

The key point of the thesis will be to understand the contact interaction in terms of a statistics at the spatial scale of asperities (micrometre) and the time scale of microshocks (microsecond). Those constitute the vibrational sources of the mechanism. The objective is therefore to propose a probabilistic theory in time and space domains. In particular, we shall focuse on the prediction of the spectrum of contact forces. Direct numerical simulations provided by Ra3D will confirm the theory.

The practical problem aimed during the thesis will be the sound radiation of a disc rolling on a rough plane. The numerical results obtained will be compared with empirical results known for rail/wheel and tyre/road noise.

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