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 : PEYRAUT Given names : François

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

Laboratory : Laboratoire Interdisciplinaire Carnot de Bourgogne (ICB), UMR 6303, CNRS Website address : https://icb.cnrs.fr/

Institution : Université de Technologie de Belfort-Montbeliard Website address : https://www.utbm.fr/

Scientific competence of the supervisor:

F. Peyraut is full Professor at UTBM since 2005. He was member of the UTBM Scientific Council (2008/2012), Head of the M3M Laboratory (ICB/CO2M now) between 2010 and 2015, and Deputy Director, from 2005 to 2010, of the Franche-Comté center of the National AIP-Priméca network (S.mart network now). The major research interests of F. Peyraut are: hyperelasticity, non-linear mechanics, computational mechanics, and finite element analysis. F. Peyraut published more than one hundred peer-reviewed papers and conference papers.

Two major publications in the field proposed for the PhD :

1. Z.-Q. Feng, F. Peyraut, Q.C. He. Finite deformations of Ogden's materials under impact loading, International Journal of Non-Linear Mechanics, 41, 575-585, 2006.
2. J. Shen, S. Roth, Validation of rib structural responses under dynamic loadings using different material properties: A finite element analysis, Medical Engineering & Physics 105, 103820, 2022.

Website address of the personal page :

Supervisor's email : francois.peyraut@utbm.fr

Description of the research work proposed for a PhD ***Topic # (see list) :*** IV-6

Title : Polyconvex anisotropic hyperelastic behavior of soft tissues under high-speed impact loadings

Subject :

The subject is to develop a numerical model that is able to replicate in a biofidelic manner the behavior of soft tissues submitted to high-speed loading. This kind of study is of interest because the human body undergoes large deformations and stress under high-speed loading, which can lead to injuries. In that context, it is needed to enhance the material laws of human tissues which are of interests to model in a realistic way their interaction with a mechanical structure. Understanding the behaviour of such tissues is very complex, and several issues must be investigated to model them correctly, such as nonlinearity, polyconvexity and anisotropy of hyperelastic behavior laws. The developped models will be implemented in a finite element software of the body, and a validation procedure will be conducted, in order to ensure the "biofidelity" of the developped constitutive laws.

Keywords :

Biomechanics, finite element analysis, nonlinear mechanics, hyperelasticity, anisotropy, polyconvexity, high-speed impact

Expected collaborations :

Background required from the applicant :

Skills required to apply for this PhD thesis: mechanical engineering, mechanics of materials, continuum mechanics, computational mechanics.

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

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