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, UMR 6303 CNRS/UBFC	Website address :	http://icb.u-bourgogne.fr/fr/
Institution :	Université de Technologie de Belfort-Montbeliard	Website address :	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 of the Franche-Comté center of the National AIP-Priméca (S.mart now) network (2005/2010). The major research interests of F. Peyraut are: computational mechanics, finite element analysis, non-linear mechanics, hyperelasticity, periodic homogenization, additive manufacturing, and quantum mechanics. F. Peyraut published more than one hundred peer-reviewed papers and conference papers.

Two major publications in the field proposed for the PhD :

1. R. Cai, L. Hu, F. Holweck, F. Peyraut, Z.-Q. Feng. Convexity, polyconvexity and finite element implementation of a four-fiber anisotropic hyperelastic strain energy density – Application to the modeling of femoral, popliteal
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 : Improvement of mechanical constitutive laws of soft tissues under high-speed dynamic configuration with a polyconvex, nonlinear, and anisotropic hyperelastic behavior

Subject :

This subject is linked to the development of a biofidelic numerical model of soft tissues, able to replicate in a biofidelic manner the behavior of soft tissues. Indeed, under large deformation the human body undergoes large deformations and stress, which can lead to injuries. In that context the PhD subject will deal with the enhancement of material laws of the human tissues which are of interests to model in a realistic way their mechanical behaviour, and their interaction with a structure. The understanding of the mechanical behaviour of such tissues is very complex, and several mechanical points can be considered to model them correctly: especially nonlinear, polyconvex and anisotropic hyperelastic laws will be considered in this PhD subject. The developped models will be implemented in biofidelic finite element models 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 : Mechanical engineering, Mechanics of materials, Continuum mechanics, Numerical knowledge (industrial codes : Ansys, Abaqus, Radioss), computational mechanics (Finite element simulation), eventually programming skills
Strong motivation, autonomy and fluent english are required to apply for this PhD.

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

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