Invitation à la soutenance publique de thèse

Pour l'obtention du grade de Docteur en Sciences de l'ingénieur et technologie

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Master en génie mécanique

Contributions to nonlinear micromechanical modeling of composite and porous materials under small and large deformation

The expectations on the material performance have never been higher: lighter, stronger, greener and multifunctional materials are in the midst of the revolution speed-up of many industries. By combining different materials, or different states of the same material, one can greatly improve some particular properties to achieve performance that could not be attained with a single material. Understanding the physical behaviour and predicting accurately the effective properties of heterogeneous materials is essential in order to take full advantage of their functionalities and tailor their properties according to the destined application. To address this challenge, multi-scale modeling approaches with predictive capabilities have been developed and allow to link information about the microstructure of the material with its macroscopic, or engineering, properties. In this thesis, we investigate several issues related to the homogenization of composite and porous materials and try to answer some of the remaining questions via both analytical and numerical approaches. We adopt a mean-field homogenization (MFH) approach, while full-field finite element technique will serve as a tool for evaluating and verifying homogenization models that will be developed. Concretely, we aim at addressing the following issues that are still open in the literature:

To which extent are MFH models able to predict effective behavior of highly porous and cellular solids in linear elasticity and viscoelasticty?

Is it possible to derive a macroscopic yield function accounting for interactions between voids and thus enhance the original Gurson’s model predictions for moderate to high porosities without adding fitting parameters?

For an anisotropic porous matrix material, is there an alternative to the existing literature on analytical derivation of macroscopic yield criterion?

How to generalize MFH schemes from linear elasticity to finite strain elastoplasticity?

Membres du jury:
Prof. Issam Doghri (UCL), supervisor
Prof. Renaud Ronsse (UCL), chairperson
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Jeudi 01 mars 2018 à 16h30
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