Postdoctoral Job Offer
with Labex "Mechanics and Complexity"
at LMA, CNRS & Aix-Marseille University, France

Project: Identification of elastic microstructures from full-field measurements

In this research project we focus on image-based identification problems for physical quantities of interest in solid mechanics within the framework of optical measurement methods [1] for complex manufactured materials. The overarching questions we would like to address are: (1) How to optically monitor the physical response of a solid body? (2) How to exploit such acquired data to identify and characterize a set of spatially varying constitutive parameters?

The guideline objective of this research project is to develop an identification framework for complex elastic microstructures, i.e. multiscale, heterogeneous and anisotropic. The expected outcome of this research is the availability of a practicable method, i.e. numerically efficient and robust, based on a suitable modelization of the relevant physical phenomena and measurements. The approach adopted is twofold and consists in the theoretical developments of an efficient identification method, ant its implementation and validation into a numerical platform. The first leap towards characterizing multiscale multimaterials is to develop an identification tool for heterogeneous anisotropic configurations based on PDE methods [2] or geometrical approches.

Focusing on the method developed for isotropic elastic media [3], research activities will aim at generalizing the proposed identification approach to the generic tensorial framework of anisotropic elasticity. To do so, we plan to tackle an increasing level of complexity in the material symmetries that are taken into account to describe the microstructure of interest. The aim is (i) to characterize the elastic quantities that can be identified, e.g. the elasticity parameters or the invariant of the elasticity tensor, (ii) to determine which measurement conditions are required to stably reconstruct these quantities, and (iii) to provide numerical proof-of-concept for the overall approach.

References

[1] M. Grédiac, F. Hild (Eds), *Full-Field Measurements and Identification in Solid Mechanics*, John Wiley & Sons, Inc., 2013.

[2] G. Bal, G. Uhlmann *Reconstruction of coefficients in scalar second-order elliptic equations from knowledge of their solutions*, Commun. Pure Appl. Math., 2013.

[3] G. Bal, C. Bellis, S. Imperiale, F. Monard, *Reconstruction of constitutive parameters in isotropic linear elasticity from noisy full-field measurements*, Inverse Problems, 2014.

Applications and contact: The successful candidate will join the research group *Materials and Structures* at the CNRS Laboratory of Mechanics & Acoustics, Marseille, France. The project is coordinated by Cédric Bellis and funded within the framework of the Labex "Mechanics and Complexity" at Aix-Marseille University. The postdoctoral fellowship will be awarded for a one year period and the annual net salary is 23500€ to 27600€ depending on experience and including benefits. The candidate's expertise must align with some of the project thematic fields, namely solids mechanics and applied mathematics while research interests must be oriented towards the described applications. A doctoral degree is required and the thesis must have been defended at the time of appointment.

Applications, including a CV, a statement of research interests and the contact information of up to three references are to be sent to: **Cédric Bellis** – bellis@lma.cnrs-mrs.fr by **Feb. 28th**.

Laboratory of Mechanics & Acoustics – CNRS, Aix-Marseille Univ., Centrale Marseille – France