



## Séminaire PIMM

Judi 20 octobre 2011 à 14 heures

Amphi Fournel

Arts et Métiers ParisTech, 151 bd de l'hôpital, 75013 Paris

**14h00**

**Hubert Teysedre**

Doctorant PIMM

### **AFM REFERENCE IMAGE RECONSTRUCTION BY DIC**

From two AFM images, scanned in two orthogonal directions, a method is proposed to reconstruct a reference image that is deprived of the slow-scan drifts of each image, and hence that benefits from the fast-scan accuracy of both images. This method is formulated as a global Digital Image Correlation (DIC) problem. The analysis provides not only a reference image but also a residual map, allowing checking of the validity of the correction, and the slow-drift corrections. The algorithm is applied to AFM images of spherulites obtained in tapping mode. It is shown that artificial strains as large as 16 per cent can be corrected from this procedure.

**14h40**

**Stéphane Roux**

LMT, ENS Cachan

### **MECHANICAL ASSISTANCE TO DIC**

Digital Image Correlation (DIC) is an ill-posed problem. To circumvent this difficulty, the needed regularization is often introduced implicitly through the choice a kinematic basis used to embed the sought solution for kinematic fields. Relaxation of this regularization, as motivated by enhanced spatial resolution, is unavoidably accompanied with a degradation of uncertainty.

However, in the field of solid mechanics, a priori knowledge on the sought displacement field is often available, and this information is much more secure and physical than the choice of specific basis selected for its ease of implementation or flexibility. The presentation will thus be focused on different ways of supplementing DIC with mechanical information to achieve enhanced fidelity and robustness.

Different routes can be followed to couple mechanical modelling and DIC: analytic elastic solutions can be used when available for modelling simple tests [1], or fracture problems [2,3]. Numerical simulations can also provide the required complement [4].

[1] F. Hild & S. Roux, *Digital image correlation: from displacement measurement to identification of elastic properties*, *Strain* **42**, 69-80, (2006)

[2] S. Roux, J. Réthoré & F. Hild, *Digital Image Correlation and Fracture*, *J. Phys. D: Appl. Phys.* **42**, 214004, (2009)

[3] J. Réthoré, S. Roux & F. Hild, *Hybrid Analytical eXtended Finite Element Method (HAX-FEM): A new enrichment procedure for cracked solids*, *Int. J. Num. Meth. Eng.* **81**, 269-285, (2010)

[4] H. Leclerc, J.-N. Périé, S. Roux & F. Hild, *Integrated Digital Image Correlation for the Identification of Material Properties*, *Lecture notes in computer science* **5496**, 161-171, (2009)

**15h40 Café**