SCIENCESPRINGDAY

FACULDADE DE CIÊNCIAS E TECNOLOGIA
UNIVERSIDADE NOVA DE LISBOA

Maths Department

Understanding Microstructures

CMA / Differential Equations and Numerical Analysis

Ana Ribeiro

Assistant Professor
FCT - UNL

Post-Doc 2007/2008
Carnegie Mellon – USA

PhD 2006
EPFL-Switzerland

Objectives

NATURE LOOKS FOR MINIMAL ENERGY

Find minimizers for energies in the form $\int_\Omega f(\nabla u(x))\,dx.$

- u may represent a deformation

- f may be SO(3) invariant

Methodology

VARIATIONAL METHODS

- Homogenization: understand macroscopic behaviour determined by the microstructure, mathematical tool : Γ-convergence.

- Differential Inclusions: when f is not convex.
Example: microstructures in elastic crystals $\nabla u(x) \in SO(3)A \cup SO(3)B.$

Expected Results

- Ensure existence of solutions.

- For multiple solutions problems, find a selecting principle.

- Understand the structure of sets like $SO(3)A \cup SO(3)B$ in terms of rank one connections.

differential inclusion
microstructure
crystals
homogenization
energy
minima
convex
SO(3)

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