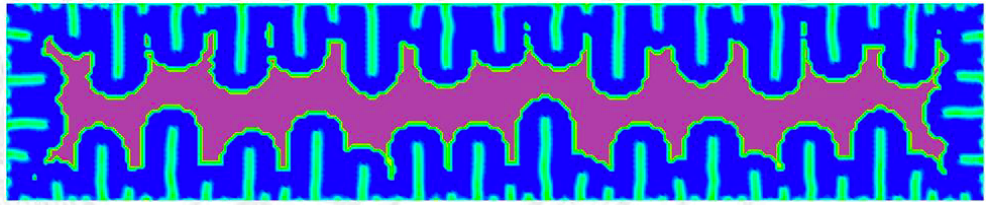
Università degli Studi di Pavia
Computational Mechanics & Advanced Materials Group - DICAr

SEMINAR

Simulation of multi-physics problems in brittle materials with Peridynamics

A thermo-mechanical peridynamic model using adaptive grid refinement is developed to investigate crack propagation in ceramics. Compared to a standard peridynamic model, using uniform grid, this approach allows to increase the resolution of analysis only in the critical zones. The performance of this approach in solving 2D thermoelastic problems is examined and then it is applied to study the fracture of a ceramic disk under central thermal shock. Finally, the proposed approach is adopted to investigate thermal shock in thin rectangular and circular slabs. The accuracy of the method is evaluated by comparing its numerical results with those obtained by applying the finite element method (FEM), a standard peridynamic approach or with experimental data available in the literature. A proper agreement is achieved at a much smaller computational cost.

As the second step in this study, a chemo-thermo-mechanical peridynamic model is developed to investigate crack propagation in non-reinforced concrete at early-age. The temperature evolution and the variation of the hydration degree in conjunction with the mechanical behaviour of cement-based materials are examined. Firstly, a new peridynamic model is introduced to solve fully coupled chemo-thermal problems by satisfying thermal equilibrium condition and hydration law simultaneously and then the effects of the chemo-thermal analysis are imposed in the mechanical calculations to investigate all the interactions.



Dr. Soheil Bazazzadeh
Università degli Studi di Padova

February 5th, 11:30 (sharp)
Aula MS1, DICAr
Via Ferrata, 3 – Pavia