



Special Colloquium



Modeling and Simulation of Nonlocal
Diffusion and Structural Mechanics

Dr. Giacomo Capodaglio
Florida State University

Abstract: The talk is an overview of two computational mathematics projects that have in common the use of the finite element method (FEM) to perform numerical simulations. I will begin discussing some recent advances in the modeling of nonlocal diffusion processes with interface. Nonlocal problems are characterized by a type of interaction that is not limited to points that are in direct contact with each other, and long range communication can occur. Nonlocal interface problems differ considerably from their local counterpart and therefore call for an appropriate treatment. The proposed formulation relies on an energy minimization approach inspired by a similar strategy used for elliptic partial differential equations, and aims at guaranteeing well-posedness and consistency. These two features are currently not both guaranteed by existing nonlocal interface formulations. Next, I will discuss the coupling of the material point method (MPM) with the FEM for the simulation of the interaction between two solid bodies. The coupling is motivated by the properties of the two methods under different deformation regimes, and it is achieved in a monolithic fashion. With such a choice, the two bodies are treated as a single continuum and compenetration cannot occur. Hence, contact search and detection algorithms, that may be considerably expensive from a computational standpoint, are avoided.

Keywords: numerical analysis, partial differential equations

Thursday, February 27, 12:05-12:50pm in 8-249