Department of Mathematics

University of Houston

Scientific Computing Seminar

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Recent developments and extensions in the variational approach to fracture

Thursday, Feb. 13, 2014
1:30 PM- 2:30 PM
Room 646   PGH

Abstract: Most models for fracture of brittle materials rely on the combination of an energetic argument, the celebrated Griffith criterion, and a ad-hoc branching criterion under smoothness and regularity hypotheses.

The variational approach to fracture was developed as an extension of Griffith's criterion preserving its essence, the competition between surface and volume energy, but devoid of ad-hoc branching criterion or spatial and temporal regularity hypotheses for fracture sets. It is formulated as a sequence of unilateral global minimization problems of a free discontinuity energy.

I will first recall some elements of the mathematical analysis of this approach. I will then describe its numerical analysis and implementation, focussing on methods based on elliptic regularization. I will finally show how this approach can be used in many applications, including transverse fracture and debonding of thin films, drying of colloidal suspension, thermal shocks, dynamic fracture and hydraulic stimulation. I will describe the mathematical and algorithmic tools developed for each specific problem, and present validation and verification experiments.

This seminar is easily accessible to persons with disabilities. For more information or for assistance, please contact the Mathematics Department at 743-3500.