Editorial

This special issue contains 17 full length, referred manuscripts which were presented at the Mini Symposium on 'Computational Failure Mechanics' during the Fifth US National Congress on Computational Mechanics. The Mini Symposium comprised of five sessions with a total of 30 oral presentations. They were delivered at the Fifth Congress of the US Association for Computational Mechanics, USACM, held at the Boulder Campus of the University of Colorado, 4–6 August 1999. Altogether, the Congress featured 700 invited and contributed papers on computational methodologies and applications which were arranged in 131 sessions within 40 Mini Symposia. The three-day Congress convened 565 regular participants and 135 students, including 189 from abroad. The Book of Abstracts and the Session Program may be viewed on the congress website http://civil.colorado.edu/usnccm99/ together with selected photographs from the banquet.

The strong participation in the Mini Symposium on 'Computational Failure Mechanics' reflects the large interest in the complexity of failure processes in solids and structures. In the last decades there have been important advances in characterizing the transition of continua to discontinua and the modeling of the final stages of the failure process. Still, many theoretical and computational challenges remain open in the numerical simulation of failure because of the inherent difficulties with material instabilities and localized effects, leading to highly non-smooth problems dealing with discontinuous solutions. The 17 contributions in this IJSS issue address many different aspects of failure analysis including:

- Characterization of strain localization in inelastic materials.
- Formulation of general damage and plasticity models for failure prediction.
- Numerical treatment of different regularization techniques, including rate dependent, non-local and higher-gradient continuum theories.
- Discontinuous and decohesive approaches.
- Failure in coupled porous media.
- Probabilistic aspects of failure and their numerical implementation.
- The characterization of failure modes in polymers.
- Numerical simulation of discrete fracture.
- Finite elements incorporating singularities.
- Adaptive finite element techniques for the resolution of failure.
- Failure analysis using mesh-free methods.
- Integration algorithms for general plasticity and damage models.

We hope that this special issue will serve as a catalyst to further advances in the area of Computational Failure Mechanics.

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