INTERDISCIPLINARY CENTRE FOR ADVANCED MATERIALS SIMULATION

MMM Special Seminar

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Cohesive element model for crack path simulation and optimization in brittle composite material

Quasi-static crack propagation is considered based on energy minimization. To this end a 2-d elastic body under loading is observed as model for a brittle composite material. In contrast to the classical mathematical variational formulation, where the standard potential energy is minimized over the cracked domain under admissibility conditions like non-penetration, in this talk we include a 'cohesive force' term in the energy expression and obtain a mathematically concise set of partial differential equations with non-linear boundary conditions at the crack interfaces. We then perform a finite element discretization placing cohesive elements possibly between all continuous finite elements. Minimizing the amount of the total energy consisting of the sum of the potential energy and the surface energy due to the crack the crack path is determined. Beyond the equilibrium problem alluded to above the problem ultimately to be addressed in this talk is to identify different material parameters in order to maximize the fracture energy. By this the most energy as possible is dissipated by the crack and therefore the energy stored in the body will be decreased as much as possible.