PARTICLE BASED ANALYSIS OF FRACTURE AND FLOW OF BRITTLE MATERIALS

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ABSTRACT

Deformation and flow of particulate materials can be modelled within the framework of conventional continuum mechanics as long as the average particle size is much smaller than typical structural dimensions. Inversely it is intuitively clear that solids, structured or homogeneous, can be modelled at least approximately as a system of bonded particles with well defined interaction rules. Starting from this simple idea we have derived what we call a mesh free discretisation procedure for boundary value problems of solid mechanics. We give an outline of the method, described briefly the salient features of the algorithm, demonstrate how complex material structures can be "grown" from elemental seed grains using a biological algorithm. We derive relationships between the contact properties of the discrete model and the properties of the underlying continuum and, of finally we illustrate the potential of the method by means of example solutions including rock cutting, buckling and folding of brittle plates and gravity collapse of ore bodies.