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AN ACCURATE AND ROBUST CONTACT ALGORITHM FOR FINITE-DISCRETE ELEMENT MODELLING

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In the finite-discrete element method, contact problems are very common and their solutions are very complex; therefore, an effective contact algorithm is very significant for precisely predicting contact behaviour of colliding objects.

In this paper, an accurate and robust contact algorithm is proposed for contact problems between spherical particles (discrete elements) and finite element mesh. This algorithm is implemented with global searching, local searching and contact force resolution. The global searching employs the CGRID approach [1], which makes the global searching algorithm efficient; less memory is required and there is little sensitivity to the size variation of particles or finite element meshes. To achieve robustness, the local searching is divided into three contact types: particle-to-facet (PTF), particle-to-edge (PTE) and particle-to-vertex (PTV); and moreover, the PTF has the top priority and is checked first based on the inside-outside strategy [2]; the PTE is superior to the PTV and accordingly checked before the latter. Three contact force resolution models, based on: (a) Hertz contact model [3]; (b) plastic collision and (c) elastic wave theory are applied and comparatively studied to achieve a stable and accurate algorithm. The proposed contact algorithm will be validated by numerical examples to confirm its accuracy and robustness.

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