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The deformable discrete element method

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A new original formulation of the discrete element method (DEM) with deformable cylindrical particles, called the deformable discrete element method (DDEM) will be presented. Uniform stress and strain fields are assumed to be induced in the particles under the action of contact forces. Particle deformation obtained by strain integration is taken into account in the evaluation of interparticle contact forces. Deformability of particle yields a nonlocal contact model, it leads to the formation of new contacts, it changes the distribution of contact forces in the particle assembly and affects the macroscopic response of the particulate material. The non-local contact interactions which appear due to global deformation (shape change) of the discrete particles can reproduce the Poissons effect even in simple assemblies where the standard DEM fails.

The concept of the DDEM has been intorduced in [1]. The development and verification of the numerical algorithm for the DDEM with more details have been presented in [2]. This work will present new results demonstrating a performance and enhanced modelling capabilities of the new discrete model. The new formulation allows for better representation of deformation modes of the particles themselves and introduces a greater flexibility in terms of controlling the elastic behaviour of a particulate system. .

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