Numerical simulations of granular materials using DEM

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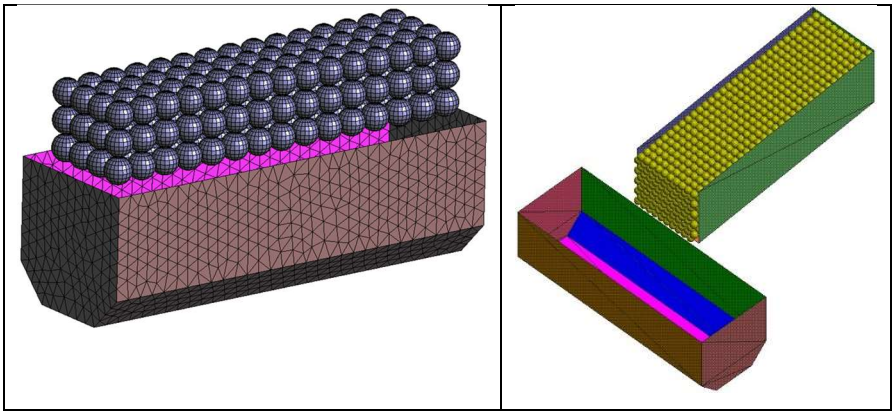
ABSTRACT

This paper presents a brief formulation of particles to simulate the behavior of granular materials using the Discrete Element Method (DEM). The dynamics of individual particles under the combined action of particle collisions, particle-surface contact and adhesive interactions is simulated and aggregated to obtain the overall behavior of the system. The formulations for calculating the forces and momentums developed in the particles are explained in detail. Environmental and gravity forces are considered, as well as the contact forces that occur due to contact between particles and walls, such as normal contact forces, frictional contact forces, damping and bonding. Rolling phenomena are also taken into account. The numerical algorithm of integration over time is presented and is adapted from [1] and [2]. At the end of the paper, some three-dimensional examples of granular materials are simulated. Two three-dimensional models of rolling of granular material are presented, showing some configurations over time, see Figure 1. Discussions about the performance of the algorithm, contact search optimization between particles and total time of analysis are presented in the conclusions.

Figure 1 – Examples: Problems definitions



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