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LIQUEFACTION ANALYSIS OF GRANULAR SOILS USING DEM

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Abstract. The Discrete Element Method (DEM) is a numerical method that allows to compute stresses and displacements of a group of particles of any shape, within an arrangement that may also have different shapes. This method was originally proposed by Peter A. Cundall in 1971, but it has very high computational demand; therefore, it started to be applied to practical problems towards the end of the 20th century, specially in the following industries: chemical, pharmaceutical, food, mining and metallurgic. This work describes the general concepts of the DEM method and its application in the field of soil mechanics. Some of the latest developments in the field of numerical simulation of granular soils under cyclic loading are described, considering spherical particles and different contact laws (modified Cundall contact law and Hertz Mindlin). The open source and free licensed software YADE is used to carry on the simulations. The calibration procedure of the model based on the results of triaxial laboratory tests performed at the Seismic Research Institute of the National University of San Juan is also explained. Special emphasis is made on the analysis of the micromechanical behavior of a granular assembly subjected to dynamic liquefaction through controlled cyclic deformation. The evolution of the force chain distribution during the cyclic deformation phase is also analyzed, and conclusion are drawn about the relationship between the studied micromechanical behavior and the macromechanical response of the spherical particles assembly.