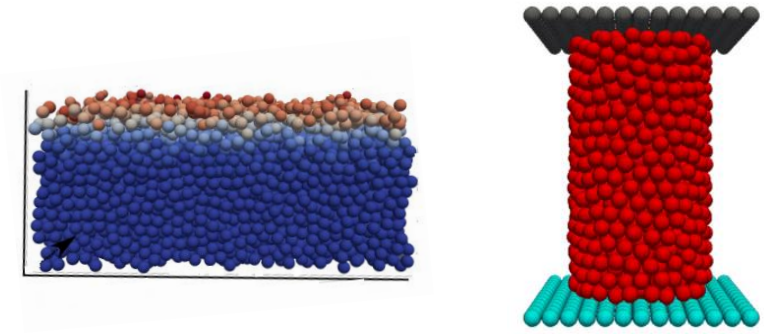
Master thesis

Division of Mechanics

Influence of friction in granular materials modelled by DEM simulations with Abaqus
Master theses 30hp

The discrete element method (DEM) is an intuitive method in which discrete particles collide with each other and other surfaces during an explicit dynamic simulation. It is a versatile tool for modelling particulate material behaviour in pharmaceutical, chemical, food, ceramic, metallurgical, mining, and other industries. In DEM, each particle is modelled with a single-node element that typically has a rigid spherical shape with specified radii. The DEM then resolves the dynamics – displacements and rotations - when several of such discrete particles are in contact with each other. Under gravity, particles are in contact with several other particles simultaneously. Friction between particles significantly influences both displacements and rotations, affecting the flow and compaction of such particles. Contacts are an essential ingredient for DEM analyses. Modelling realistically the interactions between surfaces are, hence, essential. This includes various forms of friction – sliding, rolling, or twisting - between the particles. Therefore, to understand its influence on the behaviour of granular materials, it is necessary to understand in detail the dynamics of interaction between the particles. The proposed Master project aims at investigating the influence of friction in granular materials. The simulations will be performed using Abaqus. In the first part of the Master thesis, a DEM model will be developed using the particle generator in Abaqus to create DEM models. Various frictional mechanic models will be studied, and mechanical responses of granular will be numerically explored. The second part of this work will focus on extracting key components/parameters needed for an elastoplastic constitutive model and studying the granular segregation and crystallization occurring when vibrating. The work is suitable for two students.



Simulation of a uniaxial triaxial test using

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