



Bachelor-, Master or Diploma Thesis

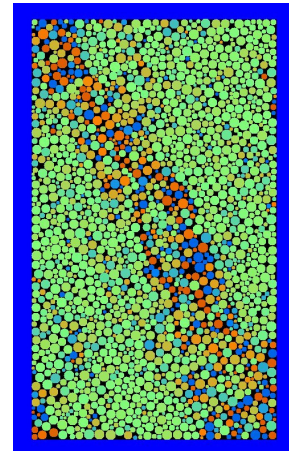
(Kann auch in Form einer Studien-, Bachelor-, Master- oder Diplomarbeit durchgeführt werden)

Micro-Macro Models for Rotations in Granular Media and Powders

Abstract: The micro-mechanical behavior of granular materials and powders can be readily modeled with the discrete element method (DEM) for particle simulations. From DEM of a granular solid, one can obtain the structure (fabric), the stress- and the strain tensors in average over a sub-set of interacting particles (RVE). Furthermore, the particles rotate due to friction and therefore also the rotation (spin) intensity can be obtained from the simulations.

On the macroscopic side, stress-strain relations are needed to model the flow behavior. The new goal of this project is to generalize classical models towards micro-polar theory, by using the information from DEM particle simulations to propose new and better constitutive relations for the evolution of, e.g., asymmetric stress.

In particular, relations for the evolution of both rolling and sliding spin degrees of freedom and their coupling to the anisotropic structure of the granular materials will be the issue. With the new micro-based continuum model, uni- or bi-axial shear will be studied as well as Couette ring-shear devices - in close relation to experimental and numerical data available in the literature.



Requirements: Background in mechanics and continuum mechanics;
Interest in interdisciplinary work with engineers and physicists

Duration: according to Examination regulations
Part of the project can be performed in Bochum, Germany / UTwente, Netherlands

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