

Short Course on DEM Simulations in Geoscience using Esys-Particle

Geologie-Endogene Dynamik, RWTH Aachen University

Overview

We are offering a 5 day compact course introducing the participants to the discrete element method (DEM) using the open source DEM software Esys-Particle. The aim of the course will be to enable the participants to use DEM for the investigation of geoscience problems. Particular emphasis will be placed on post-processing and visualisation of the data generated by the Esys-Particle simulations. Esys-Particle is a fully parallel, script-driven DEM software package (see also www.launchpad.net/esys-particle). The course will be given by one of the current developers of the software (Steffen Abe).

Date and Place

20th – 24th September 2010
Geologie-Endogene Dynamik, RWTH Aachen University
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Target Audience

The course is aimed primarily at students and researchers who are interested in using the Discrete Element Method and specifically the parallel DEM software Esys-Particle to investigate problems in geomechanics or related areas or are interested in gaining an insight into the possibilities of the DEM approach. The course may also be useful for people from a computer science or similar background who are interested in DEM from a software point of view.

The course should be suitable for participants from MSc-student level upwards. Requirements are

- Basic knowledge in maths and physics (differential equations, vector algebra, basic mechanics . . .)
- Some programming knowledge, preferably in Python. The programming language used in the course will be Python, but any programming experience (Matlab etc.) will be helpful.
- Some basic experience with Unix-like operating systems (Linux, Mac OSX ...)

Course Outline

Planned course schedule

Day 1: Introduction to DEM

- Basic ideas of DEM
 - Lagrangian vs. Eulerian methods
 - Particle dynamics
 - Contact Laws, particle interactions
- Algorithmic considerations
 - time stepping, stability
 - neighbour detection
 - parallelisation
- Applications, demos

Day 2: The Basics of ESyS-Particle

- Running a simulation
- Simulation scripts
 - Short introduction to Python
- Model geometry setup
- Model visualisation

Day 3: Advanced use of ESyS-Particle, Part I

- Boundary conditions, walls, boundary meshes
- Extracting Data: data savers, checkpoints, available post-processing tools

Day 4: Advanced use of ESyS-Particle, Part II

- Generating complicated model geometries
- Examples . . .

Day 5: Post-processing and Visualizing EsyS-Particle data

- The structure of EsyS-Particle snapshot files
- Reading and processing snapshots in Python