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### FAKULTÄT FÜR MASCHINENBAU

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# Case Study/Semesterarbeit

## <u>Topic</u>

Comparison of bulk processes using different open-source DEM programs

## **Background**

Discrete Element Method (DEM) simulations are a powerful tool to examine processes of particulate systems important in energy, pharmaceutical, agricultural and other industries. By describing the motion of individual particles and the interaction with their surroundings, DEM allows to model the bulk behaviour inside energy plants and other devices offering the chance to improve the design and understand the processes involved.

In the development of such a DEM code physical correctness and computational efficiency are crucial aspects which may be tested by compact unit or model testing. Additionally, benchmarking with other codes helps with the overall assessment of a program which is the topic of this work.

## <u>Task</u>

The task for this study comprises the evaluation of the in-house Discrete Element Code of LEAT in comparison to other established DEM programs. The paper<sup>1</sup> serves as a reference for simulations of various cases to compare the bulk behavior.

The student will perform simulations for three general test cases. First, a rotating drum is examined, followed by the outflow out of a silo and the penetration of a large ball into a bed of smaller particles. The work includes the postprocessing of the simulation data and the comparison to results in the reference. Additionally, an evaluation of computing time will be done using the framework LIGGGHTS as the benchmark for comparison of simulations with the inhouse code and LIGGGHTS on the same working machine. Optionally, a study of the parallel scaling of the LEAT DEM code will be done.

<sup>1</sup> M. Dosta et al., "Comparing open-source DEM frameworks for simulations of common bulk processes," Computer Physics Communications, vol. 296, p. 109066, Mar. 2024, doi: 10.1016/j.cpc.2023.109066.

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