

# Interactive Simulation of Granular Matter

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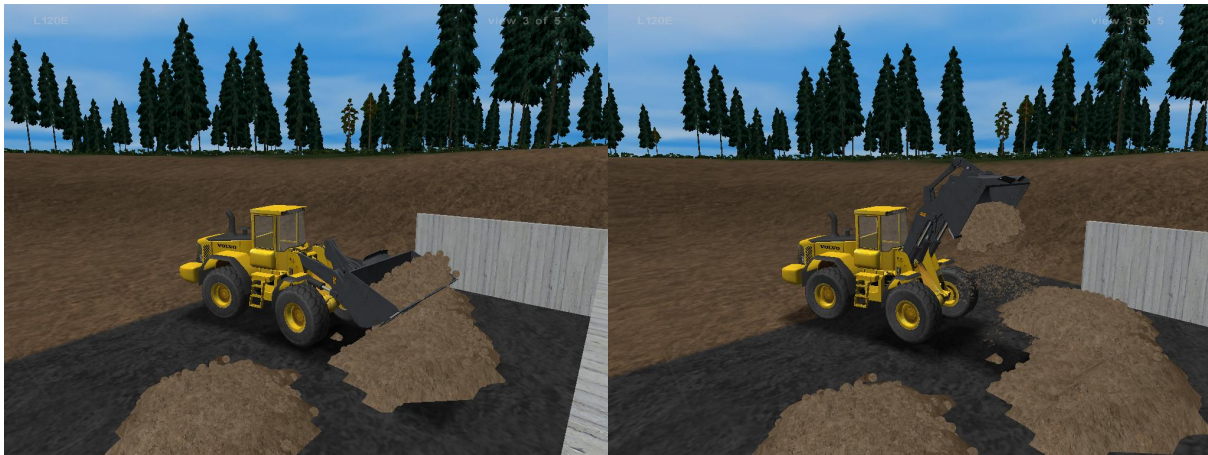
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## Abstract

We present work in progress on a method for interactive simulation of granular matter e.g. sand and gravel, and we show examples from a sample implementation in a vehicle simulator system (see figure below). Our model is based on a particle system with an attractive short-range pair potential, hard core repulsion, inelastic collisions and dissipation terms. Experiments have shown that granular matter in a gravitational field, or subject to external forces, is self stabilizing due to the build up of internal force columns. We use these and related results with heuristic reasoning to motivate how our model can produce plausible simulations for the dynamics of granular matter at an intrinsic intermediate length scale. This model system has also been integrated with a rigid-body simulation system.

Furthermore, we present an overview of the physics of granular material in general, and in particular an analysis of the necessary requirements on a model system for interactive and computer graphics intense applications.

We look at different norms for plausibility based on spatial and temporal considerations and also on the skill acquisition context of the vehicle driving simulator. Furthermore, we also analyze the real-time aspects and scalability issues of the problem.



*Figure:* Screenshots from the implementation of the presented simulation method in a vehicle simulator system illustrating interaction between the vehicle (rigid body system) controlled by the user, and the ground material (granular matter).

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