Kolloquium Angewandte Mathematik
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Vortragsankündigung

Am **Montag, den 11.03.2019,** hält **um 17:00 Uhr**

Alexander Leichner
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einen Gastvortrag über das Thema

A Voxel-based Algorithm for Contact using an Implicit Boundary Representation

Der Vortrag findet im **Raum 2401** in **Gebäude 33** statt.

Vortragszusammenfassung

Nowadays, computational contact mechanics has developed into an effective simulation tool for collisions between solids in various engineering problems. During the last decades, the development of alternative solvers operating on regular grids has been driven forward, too. Hence, the question has arisen if a voxel-based method for contact problems can be established. In contrast to a standard polygonal discretization, the numerical treatment of those based on a structured mesh is not equally perfected.

The common procedures rely on boundary aligned meshes which support the numerical enforcement of the contact conditions. Based on that geometrical approximation, the finite element method proves itself to be suitable to handle with those. Concerning computational performance, voxel-based procedures are generally competitive with the common ones. In particular, direct image processing is possible eliminating the need for expensive mesh generations.

Nevertheless, the main disadvantage of regular grids is the poor quality of the boundary approximation in general. Even with fine resolutions, surfaces can not be reproduced as accurately as by comparable unstructured meshes. In addition, the application of surface projections is not as straightforward as with the standard discretization.

For all mentioned issues we propose the usage of the implicit boundary representation: Instead of the precise localization of surfaces we only require isovalues of level set functions. The boundaries are then identified as surface contours resulting in a Eulerian description of the kinematics. In combination with Nitsche's approach, we obtain an appropriate scheme for handling contact problems in connection with regular grids. Our proposed Nitsche-based method additionally relies on a novel reference surface correcting the biased choice of the contact surface through the usual master-slave view.

The final algorithm is a composition of methods operating from different perspectives: On the one hand, we apply in particular the level set method and fast marching method for the active set search in the Eulerian point of view. On the other hand, the finite element formulation based on structured meshes is applied according to the Lagrangian description. This variation of perspectives allows for a simple and efficient implementation and accurate results on regular grids. We validate this at the end of the talk by showing optimal convergence and presenting complex examples with multiple contacts.

Alle Interessierten sind dazu herzlich eingeladen.