

# Finite element full-process Gpu parallel computing scheme for complex contact problems

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## Abstract

Based on explicit finite element (FE), this paper presents a parallel computing solution that uses graphical processing unit (GPU) to compute complex contact problems. The procedure implements the parallel unified contact algorithm and the parallel defense node method, and the parallelism of various element technologies is also a concern. Of critical concern for complex contact problem is including to efficiently implement parallelism of various connection relationships, and to accommodate smooth finite element and rigid body dynamics. Various parallel strategies are developed to improve the parallel efficiency of strain smoothing techniques in contact simulation. Combined with the features of NVIDIA's CUDA, this paper achieves finer parallelism and special memory handling for more efficient data operation and less interaction between the GPU and the central processing unit (CPU). Some examples are used to demonstrate the efficiency and precision of the parallel computing scheme described above.

**Keywords:** Contact problems, Smooth finite element, GPU computing, Parallel computing, Explicit time intergration