Large Scale Massively Parallel Frictional Contact Dynamics on the Graphics Processing Unit

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Abstract

This talk summarizes an effort at the Modeling, Simulation and Visualization Center at the University of Wisconsin-Madison to model and simulate large scale discrete dynamics problems. This effort is motivation by a desire to address unsolved challenges posed by granular dynamics problems, mobility of tracked and wheeled vehicle on granular terrain, and digging into granular material, to name a few. Tackling problems on this scale has been made possible by recent advances in commodity parallel hardware, which have led to affordable Graphics Processing Unit (GPU) cards that use in parallel 448 Scalar Processors to process up to 6 GB data stored on the device. In this talk we cover the modeling of granular dynamics problem, discuss the topic of collision detection and handling of friction, and conclude with some benchmark simulations that illustrate the size of the problems that can be tackled by the proposed approach when run on one to four GPUs. The talk concludes with a short summary of other applications that stand to benefit from the computational power available on today's GPUs.