

CEE 595 – Geotechnical Engineering Seminar

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11:00AM, Newmark Lab 3310

Shared memory parallelization of polyhedral granular particle simulation using discrete element modeling

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Abstract

Granular materials such as sand, gravels, ballast, and rock are inherently highly heterogeneous and anisotropic. While they are known as one of the most widely used materials in industry, their complex behaviors have not been fully understood. To account for complex particle interactions, discrete element method (DEM) was proposed 40 years ago. Since then significant algorithmic developments have been made to enhance the computational performance, but DEM is still a computationally expensive numerical method due to its particulate natures. Recently impulse based DEM (iDEM) was developed at UIUC that resulted in two orders of magnitudes speed up over the conventional DEM. Further speedup is achieved through shared memory parallelization algorithms. This presentation will describe development made in polyhedral DEM and iDEM simulation and parallelization. The scalability of the code is studied with various particle assemblies up to 10 million polyhedral particles. The study shows that code achieves up to 28 times speed-up with 48 cores on a LINUX machine. A number of example simulations will be presented demonstrating the performance of the software.