# Development of a Parallel Earthquake Simulator for Use in Large-Scale Building Seismic Response Analysis

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**Key Words:** *Earthquake simulator, Parallel computing, FEM based on orthogonal discontinuous basis functions, Large-scale seismic analysis*

A better prediction of possible earthquake disaster requires a better estimate of ground motion distribution in a target area. These estimates must capture the spatial variability of ground motion, by analyzing a high-fidelity model of underground structures. For this purpose, we are developing an earthquake simulator which is based on finite element method (FEM) and implemented with parallel computing. This simulator consists of a hybrid grid (tetrahedron and voxel) mesh generator and an explicit time integration scheme. A key characteristic of the simulator is the use of orthogonal discontinuous basis functions from which a diagonal mass matrix is derived without approximation. We implemented simple domain decomposition and hybrid (MPI-OpenMP) parallelization for use in a large-scale parallel computing environment. We report on the performance of the simulator for application to a realistic crust and earthquake model, and its utility for large-scale building seismic response analysis.

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