

数学与系统科学研究院

计算数学所学术报告

报告人: **Associate Prof. Eric T. Chung**

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报告题目:

Multiscale simulations of wave propagation

邀请人: 张文生 研究员

报告时间: **2014 年 7 月 1 日 (周二)**

下午 16:00-17:00

报告地点: 数学院南楼七层

702 会议室

Abstract:

Numerical modeling of wave propagation in heterogeneous media is important in many applications. Due to the complex nature, direct numerical simulations on the fine grid are prohibitively expensive. It is therefore important to develop efficient and accurate methods that allow the use of coarse grids. In this talk, we present a multiscale finite element method for wave propagation on a coarse grid. To construct multiscale basis functions, we start with two snapshot spaces in each coarse-grid block where one represents the degrees of freedom on the boundary and the other represents the degrees of freedom in the interior. We use local spectral problems to identify important modes in each snapshot space. These local spectral problems are different from each other and their formulations are based on the analysis. To our best knowledge, this is the first time where multiple snapshot spaces and multiple spectral problems are used and necessary for efficient computations. Using the dominant modes from local spectral problems, multiscale basis functions are constructed to represent the solution space locally within each coarse block. These multiscale basis functions are coupled via the symmetric interior penalty discontinuous Galerkin method which provides a block diagonal mass matrix, and, consequently, results in fast computations in an explicit time discretization. Our methods' stability and spectral convergence are rigorously analyzed. Numerical examples are presented to show our methods' performance.

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