数学与系统科学研究院

计算数学所学术报告

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报告题目：

Adaptive Finite Element Method for fractional differential equations usin g Hierarchical Matrices

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报告时间：**2016** 年 **7** 月 **27** 日（周三）

上午 **8:30-9:30**

报告地点：　　数学院南楼七层

702 会议室

Abstract:

A robust and fast solver for the fractional differential equation (FDEs) involving the Riesz fractional derivative is developed using an adaptive finite element method on non-uniform meshes. It is based on the utilization of hierarchical matrices (H-Matrices) for the representation of the stiffness matrix resulting from the finite element discretization of the FDEs. We employ a geometric multigrid method for the solution of the algebraic system of equations. We combine it with an adaptive algorithm based on a posteriori error estimation to deal with general-type singularities arising in the solution of the FDEs. Through various test examples we demonstrate the efficiency of the method and the high-accuracy of the numerical solution even in the presence of singularities. The proposed technique has been verified effectively through fundamental examples including Riesz, Left/Right Riemann-Liouville fractional derivative, and furthermore, it can be readily extended to more general fractional differential equations containing these operators. To the best of our knowledge, there are currently no other methods for FDEs that resolve singularities accurately at linear complexity as the one we propose here.

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