数学与系统科学研究院

计算数学所定期学术报告

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（ 北京计算科学研究中心 ）

报告题目：

Fast evaluation of Caputo fractional derivative and its application to fractional PDEs

邀请人： 邸亚娜 副研究员

报告时间： 2015 年 12 月 17 日（周四）

下午 16:00~17:00

报告地点： 科技综合楼三层

311 报告厅

Abstract：

In this talk, we will present an efficient algorithm for the evaluation of the Caputo fractional derivative. The algorithm is based on an efficient sum-of-exponentials approximation for the Abel kernel. As compared with the direct method, the resulting algorithm reduces the storage requirement from $O(N_T)$ to $O(logN)$ and the overall computational cost from $O(N^2)$ to $O(NlogN)$ with N the total number of time steps. Furthermore, when the fast evaluation scheme of the Caputo derivative is applied to solve the fractional diffusion equations, the resulting algorithm requires only $O(MlogN)$ storage and $O(MNlogN)$ work with M the total number of points in space; whereas the direct methods require $O(MN)$ storage and $O(MN^2)$ work. The complexity of both algorithms is nearly optimal.

We also present a detailed stability and error analysis of the new scheme for solving linear fractional diffusion equations. The performance of the new algorithm is illustrated via several numerical examples. Finally, the algorithm can be parallelized in a straightforward manner.

报告人简介：

张继伟博士2009年在香港浸会大学获得博士学位，先后到南洋理工大学和纽约大学克朗数学科学研究所做博士后，于2014年5月加入北京计算科学研究中心为特聘研究员。张博士主要研究方向有偏微分方程和非局部方程的数值解法和大规模科学计算、人工边界方法以及神经科学的建模与计算.

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