数学与系统科学研究院

计算数学所网络学术报告

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报告题目：

Higher order accurate bounds preserving time-implicit discretizations for the nonlinear time-dependent equations

邀请人： 于海军 研究员

报告时间：2021 年 12 月 9 日（周四）

下午 16:30-17:30

报告工具：腾讯会议（ID：203213021）

会议链接：

https://meeting.tencent.com/dm/99FN6lIh7Ixy

Abstract:

In this talk, we discuss a novel semi-implicit spectral deferred correction (SDC) time marching method. The method can be used in a large class of problems, especially for highly nonlinear ordinary differential equations (ODEs) without easily separating of stiff and non-stiff components, which is more general and efficient comparing with traditional semi-implicit SDC methods. The proposed semi-implicit SDC method is based on low order time integration methods and corrected iteratively. The order of accuracy is increased for each additional iteration. This SDC method is intended to be combined with the method of lines, which provides a flexible framework to develop high order semi-implicit time marching methods for nonlinear partial differential equations (PDEs). Coupled with the LDG spatial discretization, the fully discrete schemes are all high order accurate in both space and time, and stable numerically with the time step proportional to the spatial mesh size. Using Lagrange multipliers the conditions imposed by the positivity preserving limiters are directly coupled to a DG discretization combined with implicit time integration method. The positivity preserving DG discretization is then reformulated as a Karush-Kuhn-Tucker (KKT) problem. We therefore develop an efficient active set semi-smooth Newton method that is suitable for the KKT formulation of time-implicit positivity preserving DG discretizations. Convergence of this semi-smooth Newton method is proven using a specially designed quasi-directional derivative of the time-implicit positivity preserving DG discretization. Numerical experiments are carried out to illustrate the accuracy and capability of the proposed method.

欢迎大家参加！