Linearly Stabilized Schemes for the Time Integration of Stiff Nonlinear PDEs

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In many applications, the governing PDE to be solved numerically contains a stiff component. When this component is linear, the use of an implicit time stepping method that is unencumbered by stability restrictions is preferred. On the other hand, if the stiff component is nonlinear, the complexity and cost per step of using an implicit method is heightened, and the use of explicit methods may be preferred. In this talk, we consider new and existing linearly stabilized schemes for the purpose of integrating stiff nonlinear PDEs in time. These schemes compute the nonlinear term explicitly and, at the cost of solving a linear system with a matrix that is fixed throughout, are unconditionally stable, thus combining the advantages of explicit and implicit methods. Applications are presented to illustrate the use of these methods.

This is joint work with Kevin Chow (Simon Fraser University).

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