proposed.

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Mathematical Finance and Probability B3. 15:15-15:40 (June 2, Sun.)
Numerical methods for pricing European options with proportional transaction costs

We propose a numerical approach to the HJB equation arising from the valuation of European options with proportional transaction costs. This approach involves two a stage approximation: the HJB system is first approximated by a penalised nonlinear PDE and the resulting nonlinear PDE is then discretised by upwind finite differencing in space and an implicit time-stepping scheme. We show that the solutions generated by both of these two approximation techniques converge to the viscosity solutions of the irrespective original problems. We also propose an iterative scheme for solving the nonlinear algebraic system arising from the discretization and establish aconvergence theory for the iterative scheme. Numerical experiments are presented to demonstrate the robustness and accuracy of the method.

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Numerical PDEs B3. 15:15-15:40 (June 2, Sun.)
Nodal discontinuous Galerkin and Runge-Kutta-Nyström methods for second-order wave equations: Stable boundary treatments

Many wave phenomena in general relativity, acoustics, and electromagnetic, are described by second-order wave equations. To simulate these wave problems, it is often encountered that the space domains are large compared the characteristic wavelength. Hence, the propagating waves have to travel long distances or have to require long time integrations. As a consequence, accumulation of the numerical dispersion error affects the simulation quality. It is known that high-order methods are more efficient than the low-order methods in preserving low accumulation of dispersion error during long time integration. However, high-order schemes are very sensitive to the imposition of boundary conditions, and great care must be exercised to ensure stable computations of the schemes.

In this talk we present a high-order scheme based on the nodal discontinuous Galerkin finite element method in space and the Runge-Kutta-Nyström algorithm in time, to solve second order wave equations. The key toward to the success of constructing such a stable scheme hinges upon properly imposing penalty boundary conditions at every collocation equations. We shall use model problem to illustrate the conceptual ideas of the method. Special attention is paid to analyzing the stability of the scheme subject to various types of boundary conditions. Through conducting energy estimates it is shown that the scheme can be made stable by properly choosing the penalty parameters. Numerical experiments for model problems are conducted, and we observe the expected convergence results.

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Mathematical and Computational Biology B3. 15:15-15:40 (June 2, Sun.)
Brief of mathematical models for gene evolution

The field of molecular evolution is in part to study the process of evolution from DNA, RNA or protein levels. This process deserves a detailed consideration because it is essential for understanding the mechanism of genetic development and also for reconstructing the evolutionary history of organisms. In this field, mathematical models provide a constructive foundation and perspective insight. In this talk, I will introduce some developed models from my research, including the nucleotide substitutions between DNA sequences and subfunctionalization of duplicate genes. Also, I will introduce some applications from real genomics data.

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