

2nd Workshop of Numerical Algebra and Applications

1 4月14日

待定

演講者：王辰樹

時間：19:00–19:30

abstract:

待定

演講者：蔡文彬

時間：19:30–20:00

abstract:

Introduction to Inverse Quadratic Eigenvalue Problem

演講者：郭岳承

時間：20:00–20:30

abstract: Given k pairs of complex numbers and vectors (closed under conjugation), we consider the inverse quadratic eigenvalue problem of constructing $n \times n$ real symmetric matrices M , C and K (with M positive definite) so that the quadratic pencil $Q(\lambda) \equiv \lambda^2 M + \lambda C + K$ has the given k pairs as eigenpairs. Using various matrix decompositions, we first construct a general solution to this problem with $k \leq n$. Then, with appropriate choices of degrees of freedom in the general solution, we construct several particular solutions with additional eigen-information or special properties.

待定

演講者：王偉仲

時間：20:45–21:15

abstract:

Recent works on Bose-Einstein Condensates

演講者：謝世峰

時間：21:15–21:45

abstract: In this talk, we first prove that the solution curve of ground/positive bound states of a two component Bose-Einstein condensate (BEC) undergoes supercritical pitchfork bifurcations at some finite values of the inter-component scattering length. The ground state solutions bifurcate into two symmetric solutions with respect to

some suitable axis on the symmetric domain, when a two-component BEC has equal intra-and inter-component scattering lengths. Second, we propose a Gauss-Seidel-type iteration (GSI) or the computation of energy states of a multi-component BEC. We prove that the GSI method converges locally and linearly to a solution of a nonlinear algebraic eigenvalue problem if and only if the associated minimized energy functional problem has a strictly local minimum. Numerical experience shows that the GSI converges globally within 10 to 20 steps.

2 4月15日

Rayleigh-Ritz Approximation and Refinement of Periodic Eigenproblems

演講者：范洪源

時間：16:30–17:00

abstract: In this talk, we study the Rayleigh-Ritz approximation for the eigenproblem of periodic matrix pairs. We show the convergence of the Ritz value and periodic Ritz vectors. Furthermore, we prove the convergence of refined periodic Ritz vectors and propose an efficient algorithm for computing the refined periodic Ritz vectors. The numerical results show that the refinement procedure produces an excellent approximation to the original periodic eigenvectors.

Combined Effects of Concave and Convex Nonlinearities in Semilinear Elliptic Equations

演講者：吳宗芳

時間：19:00–19:30

abstract: In this talk, we will consider the combined effects of concave and convex nonlinearities on the number of positive solutions for semilinear elliptic equations. With the help of the Nehari manifold, we prove that the existence of multiple positive solutions for semilinear elliptic equations involving concave and convex nonlinearities.

Multigrid Methods for Solving the Transient

Navier-Stokes Equation

演講者：吳金典

時間：19:30–20:00

abstract: Multigrid methods are very popular in large scale computation in both science and engineering communities recently. On the other hand, adaptive error controls are devised to increase accuracy of numerical solutions without exponentially increasing the computation cost. In this talk, we shall introduce two types of multigrid algorithm, the geometric multigrid method (GMG) and the algebraic multigrid method (AMG). We will also introduce an a posteriori error indicator for convection-diffusion problem and show how it is used to adaptively refine computation meshes particularly in solving the transient Navier-Stokes equation. The transient Navier-Stokes equation is then discretized by the stream-line diffusion finite element method (SDFEM) on the adaptive meshes and solved by GMRES. In order to speed up the convergence of GMRES, GMG and AMG are employed for preconditioning. Numerical results will be shown for several benchmark problems of incompressible flows.

prove that two neurons reach synchronization under a linear condition assumption. In numerical simulation we also observe the synchronization phenomenon under the nonlinear condition assumption.

Liapunov-Schmidt Reduction and Numerical Continuation for Nonlinear Schrödinger Equations

演講者：張勝麟

時間：20:00–20:30

abstract: We study the bifurcation scenario and discuss numerical solutions of N-coupled nonlinear Schrödinger equations (NCNLS), $N=2, 3$. First we apply the Liapunov-Schmidt reduction to show that the bifurcations are pitchfork. The pitchfork bifurcation can be subcritical or supercritical depending on the coupling coefficients we choose. Next we show how the predictor-corrector continuation method can be exploited to trace solution curves and surfaces of the NCNLS. When the chemical potential is large enough, we obtain peak solutions of the NCNLS for certain values of the coupling coefficient.

待定

演講者：彭振昌

時間：20:45–21:15

abstract:

A Return Map of the Spiking Neuron Model

演講者：張書銘

時間：21:15–21:45

abstract: We study two neuronal behavior in a return map of the spiking neuron model. We can