CS2: Contributed Session II (Student Session)

Extended Session: 2:15PM -4:45PM

Linear Elliptic Systems with Nonlinear Boundary Conditions Without Landesman-Lazer Conditions

Alzaki Fadlallah, *University of Alabama at Birmingham*

The boundary value problem is examined for the system of elliptic equations of from $-\Delta u+A(x)u = 0$ in Ω, where $A(x)$ is positive semidefinite matrix on $\mathbb{R}^{k\times k}$, and $\frac{\partial u}{\partial \nu}+g(u) = h(x)$ on $\partial\Omega$. It is assumed that $g \in C(\mathbb{R}^k, \mathbb{R}^k)$ is a bounded function which may vanish at infinity. The proofs are based on Leray-Schauder degree methods.

A Few Model Problems as Symmetric Positive Systems

Mohammad H Akanda, *Auburn University*

A symmetric positive system, also known as Friedrich's system, is a system of first-order partial differential equations endowed with symmetry and positivity properties. The system immediately delivers existence and uniqueness results. A wide range of model problems can be accommodated into this framework. We prove some new model problems such as variants of linear poroelasticity equation, simple fokker-plank equation , as Friedrich's systems. Both analysis and numerical results will be presented on each problem.

Numerical Analysis and Testing of a Fully Discrete, Decoupled Algorithm for MHD in Elsässer Variable

Muhammad Mohebujjaman, *Clemson University*

We consider a fully discrete, efficient algorithm for magnetohydrodynamic (MHD) flow that is based on the Elsässer variable formulation and a timestepping scheme that decouples the MHD system but still provides unconditional stability. We prove stability and optimal convergence of the scheme. Numerical experiments are given which verify predicted convergence rates of our analysis, show the results of the scheme match well the results found when the computation is done with MHD in primitive variable.

Application of the Reduced Basis Method to the Forward Problem of Hyperspectral Diffuse Optical Tomography

Rachel Grotheer, *Clemson University*

In this talk, we develop a reduced basis method approach to solve the forward problem in hyperspectral diffuse optical tomography (hyDOT). Our work is motivated by the computationally expensive image reconstruction problem in hyDOT which requires solving the forward problem hundreds of times. We show how the reduced basis method greatly improves the computational burden of the forward problem, and show initial results as to how this improves the efficiency of the inverse problem.

Method for Comparing Saliency Maps in Computer Vision

Ali Darwish, *University of Alabama at Birmingham*

We propose new comparison metric for assessing the quality of saliency map prediction techniques. Our approach solves the issue of low sensitivity to false negative rate in eye-fixations hits over the saliency map. Also, it does not require the real eye-fixations coordinates to be present for the comparison. The technique increases the accuracy in the visual saliency, which is very significant in several areas such as defense systems, computer vision, and in parallel computing

Towards a Diagnostic Tool for Facial Dysmorphia

Serdar Cellat, *Florida State University*

The aim of this study is to develop a diagnostic tool that can help clinicians identify and categorize different facial dysmorphic syndromes based on facial shape. We introduce a tool that is able to locate the key differences between families of shapes and classify them according to those dissimilarities. The tool potentially can be applied to facial data and help to differentiate and categorize craniofacial dysmorphic syndromes, as well as separate dysmorphic faces from the normal faces. The tool also contains a Monte Carlo optimization technique which is called the simulated annealing method.