CS3: Contributed Session III

Signal Flow Design Approach to Orthogonal Radix-2 DCT-DST Algorithms

Sirani M. Perera, *Daytona State College*

Commonly in theoretical computer science and electrical engineering perspective, signal flow designs are used to build devices to implement or realize classical or fast algorithms.

In this talk, sparse and orthogonal factorizations of completely recursive, radix-2, stable discrete cosine transformation (DCT), discrete sine transformation (DST), and their inverse transform algorithms are presented with their complexity. Based on sole algorithms for DCT I-IV or DST I-IV or their inverses, signal flow graphs are presented.

A Fast Algorithm for Computing Integration Matrices for Spectral Methods

Nguyen Hoang, *University of West Georgia*

A fast algorithm for computing spectral integration matrices for an arbitrary node distribution has been proposed. Formulas for computing integration matrices for several node distributions based on Chebyshev and Legendre polynomials have been derived. Numerical experiments to demonstrate the efficiency of the new algorithm on solving integral equations are included.

Computation of Energy Release Rate Using Non-Uniform Rataional B-Spline Geometrical Mapping Method with Multiple Patches

Hyunju Kim, *North Greenville University*

The geometrical mapping techniques based on NURBS were introduced to solve an elliptic boundary value problems containing a singularity. In the mapping techniques, the inverse function of the NURBS geometrical mapping generate singular functions as well as smooth functions by an unconventional choice of control points. We extend the application of the mapping techniques into materials which have multiple singularities or cracks by adopting the structure of multiple patches which were introduced in Isogeometric Analysis.

Sedimentation and Thermophoresis Effects in the Presence of Convection in Colloidal Suspensions

Mahmoud DarAssi, *Princess Sumaya University for Technology*

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.