



PIMS / AMI Seminar

Friday, March 29, 2019

3:00 p.m.

CAB 657



“Efficient and accurate structure preserving schemes for a class of complex nonlinear systems”

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Abstract

We present in this talk the scalar auxiliary variable (SAV) approach to deal with nonlinear terms in a large class of complex dissipative/conservative systems. In particular, for gradient flows driven by a free energy, it leads to linear and unconditionally energy stable second-order (extendable to higher-orders) schemes which only require solving decoupled linear equations with constant coefficients. Hence, these schemes are extremely efficient as well as accurate, which are also validated by ample numerical results.

We shall present a convergence and error analysis under mild assumptions on the nonlinear free energy, and apply the SAV approach to deal with several challenging applications which can not be easily handled by existing approaches.

Professor Jie Shen received his B.S. in Computational Mathematics from Peking University in 1982, and his Ph.D in Numerical Analysis from Universite de Paris-Sud at Orsay in 1987. Before joining the Purdue Faculty in Fall 2002, he served as Professor of Mathematics at Penn State University and University of Central Florida. Since Jan. 2012 he serves as the Director of Center for Computational and Applied Mathematics at Purdue University.

He is a recipient of the Fulbright award in 2008 and the Inaugural Research Award of the College of Science at Purdue University in 2013, and an elected Fellow of AMS.

He serves on editorial boards for several leading international research journals, and has authored/coauthored over 200 peer-reviewed research articles and two books.

His main research interests are numerical analysis, spectral methods and scientific computing with applications in computational fluid dynamics and materials science.