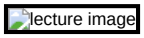

Special Guest Lectures

A New Basis for Spectral Methods

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Institute for Mathematics and Its Applications (IMA)
Johnston Hall 338
March 27, 2006 - 03:30 pm

Abstract:
The spectral methods have been very successful in many applications, such as weather prediction, seismic imaging and etc. The main reason for their success is the exponential accuracy: For smooth problems on simple domains, spectral methods can achieve 10 digits accuracy, compared to 2 ~ 3 digits for finite difference or finite element methods with similar computational cost. However, there are still two issues with the Legendre/Chebyshev polynomials based spectral methods for non-periodic problems: the time-step size and the number of points needed to resolve a wave. In this talk, I address this two issues by using a new basis, the prolate spheroidal wave functions (PSWFs), for spectral methods. The relevant approximation theory will be covered. The advantage of the new basis over Legendre/Chebyshev polynomials will be showed for marginally resolved broadband solutions.

Speaker's Bio:
Dr. Qian-Yong Chen received his B.S. degree in Mathematics from the University of Science and Technology of China, Hefei, in 1996. In 2004 he received his Ph.D. degree in the Division of Applied Mathematics at Brown University with Professor David Gottlieb and Jan S. Hesthaven as his advisors. He also had a M.Sc. degree in Computer Science from Brown University. He then got the industrial postdoctoral fellowship from the Institute for Mathematics and Its Applications (IMA) in University of Minnesota. He spent the first year (2004/09-2005/08) of his postdoc working with the industrial partner, the ExxonMobil Upstream Research Company located in Houston Texas. Now he is a second-year postdoctoral associate with IMA.

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