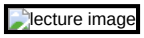

Special Guest Lectures

High Order One-Step Difference Methods for Wave Propagation

Bertil Gustafsson
Uppsala University, Stanford University

Johnston Hall 338
March 22, 2006 - 03:30 pm

Abstract:
It is well known that wave propagation problems over long time intervals require high order methods, and many such methods have been constructed. However, when trying to keep high order accuracy also in time for problems with variable coefficients and with minimal storage, the methods quickly become complicated. One way to achieve high accuracy in time, is to use the Taylor expansion and substitute time derivatives by space derivatives by using the differential equation. For the first order system form of the wave equation, we obtain compact one-step methods that are easy to implement, at least for fourth and sixth order of accuracy. In this talk, Gustafsson will describe this class of methods and demonstrate the quite nice properties with regard to conservation, stability and accuracy. He will show that it works well even for discontinuous coefficients without any special procedure across the material interfaces. Gustafsson will also show how boundary conditions can be implemented by modifying the coefficients and embedding the boundary in a regular domain.

Speaker's Bio:
Bertil Gustafsson received his Ph. D. in Numerical Analysis in 1971 at Uppsala University under Heinz-Otto Kreiss. He became full professor in Numerical Analysis in 1982 at Uppsala University. From 1998-2005 Gustafsson served as the dean for Mathematics and Computer Science at Uppsala University. He was a visiting professor at Caltech in 1980 and at Stanford University for several one-year periods. Gustafsson is currently a visiting professor at ICME (Institute for Computational Mathematics in Engineering), Stanford University. He is a member of the Royal Academy of Science, Sweden. Gustafsson wrote a book in 1995 entitled Time Dependent Problems and Difference Methods .

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