Laplace transformation method for parabolic problems with time-dependent coefficients

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Laplace transformation method has proven to be very efficient to deal with parabolic problems whose coefficients are time-independent, and is easily parallelizable. Applications include solving integro-differential equations backward parabolic problems, and option pricing. The numerical schemes proposed and analyzed in these papers are based fundamentally on the line of thoughts from the earlier work of D. Sheen, I. Sloan and V. Thomee (2000, 2003).

However, the method has been doubtful to be applicable to any nonlinear or linear problems whose coefficients are time-dependent. The reason is that the Laplace transform of two time-dependent functions leads to a convolution of the Laplace transformed functions in the dual variable. In this paper, we propose a method of Laplace transformation to linear parabolic problems with time-dependent coefficients, which is as efficient as the method for parabolic problems time-independent coefficients. Several numerical results are provided, which support the efficiency of the proposed scheme. This is a joint work with Hyoseop Lee (Bell Labs Seoul) and Jinwoo Lee (Kwangwoon University).

Speaker Biography
Prof. Sheen received his BSc and MSc from the Dept. of Math. at Seoul National University. He worked for Samsung Electronics and received his PhD from the Dept. of Math. at Purdue University in 1991. He was a postdoctoral research fellow at the University of Pavia, Italy and Purdue University. In 1993 he joined Seoul National University where he is currently a full professor of mathematics and Chair of the Interdisciplinary Program in Computational Science and Technology. He served as the Vice-President and President of EASIAM (East Asia section of SIAM) from 2007-2010. His research interests include Numerical Analysis and Scientific Computation. Specifically he has developed several nonconforming finite element methods, parallel algorithms based on Laplace transformation.

Host: Prof. Wang Li-Lian, Division of Mathematical Sciences, School of Physical and Mathematical Sciences