香 港 浸 會 大 學
HONG KONG BAPTIST UNIVERSITY

Institute for Computational Mathematics Colloquium

IDR --- A Brief Introduction

Speaker　:　Prof. Martin H. Gutknecht
　　　　　　ETH Zurich, Switzerland

Date　　　:　15 January 2010 (Friday)

Time　　　:　4:30 - 5:30 p.m.

Venue　　:　FSC1217, Fong Shu Chuen Library
　　　　　　HSH Campus
　　　　　　Hong Kong Baptist University

Abstract:

The Induced Dimension Reduction (IDR) method is a Krylov space method for solving linear systems that was first developed by Sonneveld around 1979 and documented on three and a half pages of a 1980 proceedings paper by Wesseling and Sonneveld. Soon after IDR, Sonneveld introduced his widely applied Conjugate Gradient Squared (CGS) algorithm.　Then, in 1990, van der Vorst suggested Bi-CGSTAB, which he claimed to improve both those methods.

Bi-CGSTAB has become a method of choice for nonsymmetric linear systems, and it has been generalized in various ways in the hope of further improving its reliability and speed. Among these generalizations there is the ML(k)BiCGSTAB method of Yeung and Chan, which in the framework of block Lanczos methods can be understood as a variation of Bi-CGSTAB with right-hand side block size 1 and left-hand side block size k.

In 2007 Sonneveld and van Gijzen reconsidered IDR and generalized it to IDR(s), claiming that IDR is equally fast but preferable to Bi-CGSTAB, and that IDR(s) may be much faster than IDR(1) $\approx$ IDR. It turned out that IDR(s) is closely related to BiCGSTAB if s = 1 and to ML(s)BiCGSTAB if s > 1. In 2008, a new, particularly ingenious and elegant variant of IDR(s) has been proposed by the same authors.

In this talk we first try to explain the basic, seemingly quite general IDR approach, which differs completely from traditional approaches to Krylov space methods.　Then we compare the basic properties of the above mentioned methods and discuss some of their connections.

- All interested are welcome -

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