SEMINAIRE MATHEMATIQUE-INFORMATIQUE

Projet SAFIR
UNSA - INRIA - CNRS :
«*Systèmes Algébriques Formels pour l'Industrie et la Recherche* »

Lieu: *INRIA*,
2004, route des Lucioles,
Sophia Antipolis,
Salle E003.
Autre accès: `http://www.inria.fr/safir/MEETING/seminaires.html`

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Le Vendredi 26 Avril à 14 heures, E003 :

V. Pan
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Professeur invité (SAFIR),
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«*Polynomial and Matrix Computations* »

One of the major topics of our recent book [B-P] was the study of computations with Toeplitz and other dense structured matrices considered as a link between computations with polynomials and with general matrices. This study has lead us to improving computations in both of the latter areas and to narrowing the gap historically arisen between them. In the talk we recall some examples of correlations between Toeplitz matrices and general matrices and between Toeplitz matrices and polynomials, which enabled us to improve parallel algorithms for some fundamental computations in all 3 areas. For some major computations with $n \times n$ Toeplitz and Toeplitz-like matrices A (rank, inverse, linear system solving), we have obtained the parallel complexity bounds

a) of $O(\log^2 n)$ time and $O(n^2/\log n)$ arithmetic processors over any field of characteristic zero or greater than n (recalled from [B-P]),

b) of $O(\log^3 n)$ and $O(n^2/\log^2 n)$, respectively, over any field [P1], and

c) of $O((\log n)\log(n \log \|A\|))$ and $O(n \log n)$, respectively, over the integers [B-P], [P2].

The two latter results, of b) and c), over any field and integers, are randomized, and our computations over the integers (part c)) only involve $O(n \log \|A\|)$-bit precision.

[B-P] D. Bini, V. Y. Pan, *Polynomial and Matrix Computations*, vol. 1, Birkhäuser, Boston, 1994.
[P1] V. Y. Pan, Parallel Computations of Polynomial GCD and Related Computations, *Proc. Seventh Ann. ACM-SIAM Symp. on Discrete Algorithms,* January 1996.
[P2] V. Y. Pan, Effective Parallel Computations with Toeplitz and Toeplitz-like Matrices Filled with Integers, preprint.