A SYSTOLIC ARRAY FOR THE LINEAR-TIME SOLUTION OF TOEPLITZ SYSTEMS OF EQUATIONS

R. P. BRENT AND F. T. LUK

Abstract

The solution of an $(n+1) \times (n+1)$ Toeplitz system of linear equations on a one-dimensional systolic architecture is studied. Our implementation of an algorithm of Bareiss is shown to require only $O(n)$ time and $O(n)$ storage, i.e. constant storage per systolic processor.

Comments

Only the Abstract is given here. The full paper appeared as [1] (there are some unfortunate printer's errors such as omitting parentheses in displayed matrices; the corrections should be self-evident). For related work, see [2]. The numerical stability of the Bareiss and Levinson algorithms (in the symmetric positive-definite case) is considered in [3].

References

[1] R. P. Brent and F. T. Luk, "A systolic array for the linear-time solution of Toeplitz systems of equations", *J. of VLSI and Computer Systems* 1, 1 (1983), 1–23. CR 8405-0339. Also appeared as Report TR 82-526, Department of Computer Science, Cornell University, November 1982; and as Report TR-CS-83-02, Department of Computer Science, ANU, January 1983, 29 pp. rpb078.

[2] R. P. Brent, H. T. Kung and F. T. Luk, "Some linear-time algorithms for systolic arrays" (invited paper), in *Information Processing 83* (edited by R. E. A. Mason), North-Holland, Amsterdam, 1983, 865–876. Preliminary version appeared as rpb079.

[3] A. W. Bojanczyk, R. P. Brent and F. R. de Hoog, "Stability analysis of fast Toeplitz linear system solvers", Report CMA-MR17-91, CMA, ANU, August 1991, 23 pp. rpb126.

(Brent) Department of Computer Science, Australian National University, Canberra

(Luk) Department of Computer Science, Cornell University, Ithaca, New York

1991 *Mathematics Subject Classification.* Primary 65Y10; Secondary 47B35, 65Y05, 68Q22, 68Q25, 68Q35.

Key words and phrases. Systolic arrays, Toeplitz matrices, linear equations, Bareiss algorithm, VLSI.

Supported in part by US Army Research Office Grant DAAG 29-79-0124 and in part by the Centre for Mathematical Analysis and the Mathematical Sciences Research Centre at the Australian National University.

 rpb078a typeset using $\mathcal{AMS}$-LaTeX.