THE PARALLEL EVALUATION OF ARITHMETIC EXPRESSIONS WITHOUT DIVISION

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ABSTRACT

As computers become capable of executing more arithmetic operations simultaneously, the question of compiling for such machines becomes more important. In this correspondence we consider arbitrary arithmetic expressions of n distinct variables with operations restricted to addition, subtraction, and multiplication. We first construct a scheme whereby any such expression can be evaluated in at most $3 \log_2 n + O(1)$ steps if sufficiently many processors are available. We then improve this result and reduce $3 \log_2 n$ to $2.465 \log_2 n$. Finally, we deduce some results that apply when a fixed number of processors is available.

COMMENTS

Only the Abstract is given here. The full paper appeared as [1] and was reprinted in [3, pages 30–35]. For a more general result which allows division, and requires less processors, see [2].

REFERENCES

[1] R. P. Brent, D. J. Kuck and K. Maruyama, "The parallel evaluation of arithmetic expressions without division", *IEEE Transactions on Computers* C-22 (1973), 532–534. MR 50#11843. rpb015.

[2] R. P. Brent, "The parallel evaluation of general arithmetic expressions", *Journal of the ACM* 21 (1974), 201–206. CR 15#27055, MR 58#31996, Zbl 276.68010. rpb022.

[3] R. P. Brent, *Topics in computational complexity and the analysis of algorithms*, Report TR-CS-80-14, DCS, ANU, October 1980, 375 pp. (D. Sc. thesis). rpb062.

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