

## LOOK-AHEAD LEVINSON- AND SCHUR-TYPE RECURRENCES IN THE PADÉ TABLE\*

MARTIN H. GUTKNECHT<sup>†</sup> AND MARLIS HOCHBRUCK<sup>‡</sup>

*Dedicated to Professor W. Niethammer on the occasion of his 60th birthday*

**Abstract.** For computing Padé approximants, we present presumably stable recursive algorithms that follow two adjacent rows of the Padé table and generalize the well-known classical Levinson and Schur recurrences to the case of a nonnormal Padé table. Singular blocks in the table are crossed by look-ahead steps. Ill-conditioned Padé approximants are skipped also. If the size of these look-ahead steps is bounded, the recursive computation of an  $(m, n)$  Padé approximant with either the look-ahead Levinson or the look-ahead Schur algorithm requires  $O(n^2)$  operations. With recursive doubling and fast polynomial multiplication, the cost of the look-ahead Schur algorithm can be reduced to  $O(n \log^2 n)$ .

**Key words.** Padé approximation, Toeplitz matrix, Levinson algorithm, Schur algorithm, look-ahead, fast algorithm, biorthogonal polynomials, Szegő polynomials.

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<sup>†</sup>Interdisciplinary Project Center for Supercomputing, ETH Zurich, ETH-Zentrum, CH-8092 Zurich, Switzerland. (mhg@ips.ethz.ch).

<sup>‡</sup>Mathematisches Institut, Universität Tübingen, Auf der Morgenstelle 10, D-72076 Tübingen, Germany. (marlis@na.uni-tuebingen.de).