

## MATRIX EXPONENTIALS AND INVERSION OF CONFLUENT VANDERMONDE MATRICES \*

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**Abstract.** For a given matrix  $A$  we compute the matrix exponential  $e^{tA}$  under the assumption that the eigenvalues of  $A$  are known, but without determining the eigenvectors. The presented approach exploits the connection between matrix exponentials and confluent Vandermonde matrices  $V$ . This approach and the resulting methods are very simple and can be regarded as an alternative to the Jordan canonical form methods. The discussed inversion algorithms for  $V$  as well as the matrix representation of  $V^{-1}$  are of independent interest also in many other applications.

**Key words.** matrix exponential, Vandermonde matrix, fast algorithm, inverse.

**AMS subject classifications.** 34A30, 65F05, 15A09, 15A23.

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\*Received August 4, 2003. Accepted for publication June 28, 2004. Recommended by L. Reichel.

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