Electronic Transactions on Numerical Analysis.
Volume 31, pp. 12-24, 2008.

ISSN 1068-9613.

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A FAST ALGORITHM FOR SOLVING REGULARIZED TOTAL LEAST SQUARES PROBLEMS*

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Abstract. The total least squares (TLS) method is a successful approach for linear problems if both the system matrix and the right hand side are contaminated by some noise. For ill-posed TLS problems Renaut and Guo [SIAM J. Matrix Anal. Appl., 26 (2005), pp. 457–476] suggested an iterative method based on a sequence of linear eigenvalue problems. Here we analyze this method carefully, and we accelerate it substantially by solving the linear eigenproblems by the Nonlinear Arnoldi method (which reuses information from the previous iteration step considerably) and by a modified root finding method based on rational interpolation.

Key words. Total least squares, regularization, ill-posedness, Nonlinear Arnoldi method.

AMS subject classifications. 15A18, 65F15, 65F20, 65F22.

* Received December 17, 2007. Accepted April 25, 2008. Published online on September 10, 2008. Recommended by Zdeněk Strakoš.

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