

## DISCRETE WAVELET TRANSFORMS ACCELERATED SPARSE PRECONDITIONERS FOR DENSE BOUNDARY ELEMENT SYSTEMS\*

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**Abstract.** We consider a construction of efficient preconditioners, using discrete and fast wavelet transforms, for dense and unsymmetric linear systems that arise from boundary elements. The wavelet compression property combined with operator splitting result in much improved preconditioners, in terms of both eigenspectra clustering and inverse approximations, taking the form of band matrices with wrap-around boundaries. With our new non-standard wavelet transform, the transformed matrix is permuted to band forms. It is shown that, to have band matrices, one has to use a smaller number of wavelet levels. Numerical experiments using the iterative methods of conjugate gradients based on the normal equations (CGN) and generalised minimal residuals (GMRES) are reported.

**Key words.** fast wavelet transforms, dense linear systems, sparse preconditioners, conjugate gradient, boundary elements.

**AMS subject classifications.** 65F10, 65N38, 45E05.

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