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Multithreaded Implicity Dealiased Convolutions for Pseudospectral Simulations MALCOLM ROBERTS, Aix-Marseille University, JOHN C. BOWMAN, University of Alberta — Convolutions form the crux of the pseudospectral method for direct numerical simulations of nonlinear PDEs such as the Navier–Stokes equations and magnetohydrodynamic flows. The computation of convolutions is an expensive task that is facilitated by the use of the convolution theorem and FFTs. However, input data must be zero-padded in order to remove aliased terms and recover a linear convolution. Here, we present a multithreaded version of the method of implicit dealiasing (Bowman and Roberts, SIAM J. Sci. Comput. 33, 2011). Implicit dealiasing has computational complexity identical to the conventional zero-padding technique, but is twice as fast in practice and requires $(2/3)^{d-1}$ the memory of a conventional d-dimensional centred convolution. High-performance implicitly dealiased convolution routines are available under the LGPL at `fftwpp.sourceforge.net`.

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