A robust WENO scheme for nonlinear waves in a moving reference frame - DTU Orbit

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For robust nonlinear wave simulation in a moving reference frame, we recast the free surface problem in Hamilton-Jacobi form and propose a Weighted Essentially Non-Oscillatory (WENO) scheme to automatically handle the upwinding of the convective term. A new automatic procedure for deriving the linear WENO weights based on a Taylor series expansion is introduced. A simplified smoothness indicator is proposed and is shown to perform well. The scheme is combined with high-order explicit Runge-Kutta time integration and a dissipative Lax-Friedrichs-type flux to solve for nonlinear wave propagation in a moving frame of reference. The WENO scheme is robust and less dissipative than the equivalent order upwind-biased finite difference scheme for all ratios of frame of reference to wave propagation speed tested. This provides the basis for solving general nonlinear wave-structure interaction problems at forward speed.

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