

Dispersion properties of conservative discretizations for wave equations

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Abstract

The dispersion properties of multisymplectic box schemes are contrasted with those of more traditional symmetric finite difference methods. We show that MS box schemes (and more generally symmetric Runge-Kutta box schemes) preserve the sign of group velocity, implying that energy always flows in the right direction. This has important consequences for adaptivity, since grid nonuniformities inevitably lead to an exchange of energy between characteristic modes in finite difference methods, and this is responsible for the generation of numerical reflections. We show that all symmetric RK box schemes are reflection-free, whereas only some cell-centered FD schemes are, and all such methods are necessarily implicit.

This is joint work with Brian Moore and Sebastian Reich.