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Second order accurate asynchronous scheme for modeling linear partial differential equations

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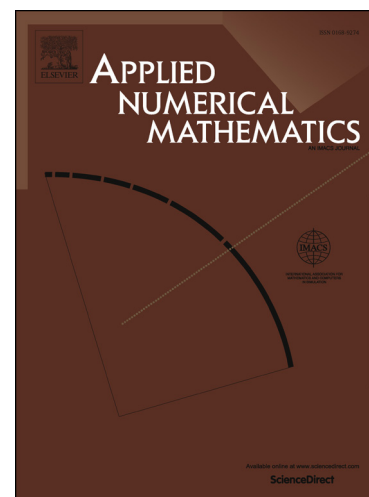
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Second order accurate asynchronous scheme for modeling linear partial differential equations

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Abstract We propose an asynchronous method for the explicit integration of multi-scale partial differential equations. This method is restricted by a local CFL (Courant Friedrichs Lewy) condition rather than the traditional global CFL condition. Moreover, contrary to other local time-stepping (LTS) methods, the asynchronous algorithm permits the selection of independent time steps in each mesh element. We derived an asynchronous Runge-Kutta 2 (ARK2) scheme from a standard explicit Runge-Kutta method and we proved that the ARK2 scheme is second order convergent. Comparing with the classical integration, the asynchronous scheme is effective in terms of computation time.

Keywords Asynchronous numerical scheme · second order · linear partial differential equations

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