Towards mitigating Asynchronous Computing effects in largescale simulations

ANKITA MITTAL, SHARATH GIRIMAJI, Texas AM Univ — Synchronization of processing elements (PEs) in massively parallel simulations has shown to significantly affect scalability of scientific applications. Relaxing this synchronization among PEs (asynchronous) conserves the stability condition but severely affects the accuracy reducing the average error to first-order regardless of the original scheme. At the present time, several approaches are under consideration to improve the order of asynchronous computations. In this work, we propose to modify the original governing equation to obtain a Proxy-Equation which when solved asynchronously recovers the order of accuracy of the original numerical scheme. Performing 1D simulations for the Advection Diffusion Equation, we observe that the wave speed and the viscosity must be increased in the vicinity of PE boundaries in order to counteract the effect of asynchrony. In addition to recovering accuracy, this method shows lower magnitudes of average error when compared to existing asynchronytolerant methods. Similar results are also presented for a 1D viscous Burgers equation.

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