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A new ParaDiag time-parallel time integration method

Wednesday, 3 April 2024 11:30 (30 minutes)

Many parallel-in-time (PinT) paradigms have been developed in the last decades to efficiently solve time-dependent partial differential equations (PDEs). In this talk we focus on the ParaDiag scheme whose most peculiar feature consists in the explicit diagonalization of the matrix stemming from the adopted time integrator. However, certain classes of time integrators lead to a discrete operator which is not diagonalizable. For instance, this is the case of Backward Differentiation Formulas (BDFs) like the backward Euler scheme. With the aim of overcoming such a drawback, different approaches have been developed in the literature. In this talk, we illustrate a novel technique. In particular, we show how to exploit the possible circulant-plus-low-rank structure of the discrete time integrator to design a new, successful implementation of the ParaDiag paradigm. Notice that this peculiar structure arises in many different families of time integrators. The efficiency of our original scheme is displayed by several numerical examples.

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