

Two-level Convergence Bounds: Differences and Similitudes

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To understand Parareal and its convergence, many bounds have been developed. An early superlinear bound (Gander, Vandewalle; Gander, Hairer) was recently refined (Gander, Lunet, Ruprecht, Speck) and the linear bound (Dobrev, Kolev, Petersson, Schroder) is very prominent in the Multigrid Reduction-in-Time (MGRIT) community.

We will explain the solution of the recurrence on the error and the bounding process in each of these bounds in a common framework using the ideas of Gander and Vandewalle. This will then allow us to compare them and introduce a nearly exact bound for finite-time convergence. Finally, we will discuss the usefulness of each of those bounds.

The bounds will be presented for the Parareal algorithm, but we will explain how they can be easily generalized to the two-level MGRIT algorithm.