Pseudo-linear Convergence of an Additive Schwarz Method for the Dual Rudin–Osher–Fatemi Model

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ABSTRACT

In this talk, we propose an overlapping additive Schwarz method for the dual Rudin–Osher–Fatemi (ROF) model, which is a standard problem in mathematical image processing. The $O(1/n)$-energy convergence of the proposed method is proven, where $n$ is the number of iterations. In addition, we introduce an interesting convergence property called pseudo-linear convergence of the proposed method; the energy of the proposed method decreases as fast as linearly convergent algorithms until it reaches a particular value. It is shown that such the particular value depends on the overlapping width $\delta$, and the proposed method becomes as efficient as linearly convergent algorithms if $\delta$ is large. As the latest domain decomposition methods for the ROF model are sublinearly convergent, the proposed method outperforms them in the sense of the energy decay. Numerical experiments which support our theoretical results are provided.