

Domain decomposition-based nonlinear preconditioning for elliptic PDEs

Wednesday, July 11, 2018 10:00 AM (1 hour)

One way to accelerate the numerical solution of a nonlinear elliptic problem is to use nonlinear preconditioning, which replaces the original discretized problem by an equivalent but easier one. In this talk, we discuss how a fixed point iteration for a nonlinear system can be used in combination of Newton's method to yield highly efficient, nonlinearly preconditioned methods. Our starting point is the Restricted Additive Schwarz Preconditioned Exact Newton (RASPEN) method by Dolean et al. (2016), which is derived from the nonlinear Restricted Additive Schwarz method. We then show how to extend this method to include a coarse component, as well as how to incorporate optimized transmission conditions of the Robin type. Finally, we will show some applications demonstrating the effectiveness of our approach.

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