LOCAL BOUNDARY CONDITIONS IN NONLOCAL PROBLEMS

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We present novel governing operators inspired by the theory of peridynamics (PD). They agree with the original PD operator in the bulk of the domain and simultaneously enforce local boundary conditions (BC). We present pure and mixed combinations of Neumann, Dirichlet, periodic, and antiperiodic BC. Our construction is systematic and easy to follow. We provide numerical experiments that validate our theoretical findings. The operators had been introduced in [1, 2, 3]. We extend the construction to more general inhomogeneous BC.

We had proved that the nonlocal diffusion operator is a function of the classical operator. This observation opened a gateway to incorporate local BC to nonlocal problems on bounded domains. The main tool we use to define the novel governing operators is functional calculus, in which we replace the classical governing operator by a suitable function of it. We present how to apply functional calculus to general nonlocal problems in a methodical way.

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