NONLOCAL MATERIAL AND VIRTUAL INTERFACE PROBLEMS FOR THE SIMULATION OF HETEROGENEOUS MATERIALS AND MEDIA

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ABSTRACT

Nonlocal models such as peridynamics and fractional equations can capture effects that classical partial differential equations (PDEs) fail to capture. These effects include multiscale behavior, material discontinuities such as cracks, and anomalous behavior such as superdiffusion and subdiffusion. For this reason, nonlocal models provide an improved predictive capability for a large class of complex engineering and scientific applications, including fracture mechanics, subsurface flow, and turbulence, to mention a few. In many of these applications, the system under consideration exhibits heterogeneity, either in its physical composition or in its response to external stimuli. These cases often result in the need to introduce physical or virtual interfaces (such as for domain-decomposition purposes) between different parts of the domain. The case of heterogeneity in the physical composition, such as two- or multi-material systems, normally requires the treatment of nonlocal-to-nonlocal coupling across physical interfaces. The case of small-scale heterogeneity in the system properties may benefit from variable nonlocal parameter such as variable fractional orders. These settings require the treatment of nonlocal-to-nonlocal in an accurate and physically consistent manner. The goal of this minisymposium is to bring together researchers working on the relatively new field of nonlocal interfaces, whose treatment still presents challenges. As such, this minisymposium will be a way for researchers working in this field to benefit from each other's results and define new research directions.