INCORPORATING LOCAL BOUNDARY CONDITIONS INTO NONLOCAL THEORIES

BURAK AKSOYLU, HORST R. BEYER, AND FATIH CELIKER

Abstract. We study nonlocal equations from the area of peridynamics on bounded domains. In our companion paper, we discover that, on $\mathbb{R}^n$, the governing operator in peridynamics, which involves a convolution, is a bounded function of the classical (local) governing operator. Building on this, we define an abstract convolution operator on bounded domains which is a generalization of the standard convolution based on integrals. The abstract convolution operator is a function of the classical operator, defined by a Hilbert basis available due to the purely discrete spectrum of the latter. As governing operator of the nonlocal equation we use a function of the classical operator, this allows us to incorporate local boundary conditions into nonlocal theories.

Department of Mathematics, TOBB University of Economics and Technology, Ankara, 06560, Turkey. Department of Mathematics, Wayne State University, Detroit, MI 48202, USA.
E-mail address: baksoylu@etu.edu.tr

Department of Mathematics, TOBB University of Economics and Technology, Ankara, 06560, Turkey. Theoretical Astrophysics, IAAT, Eberhard Karls University of Tübingen, Tübingen 72076, Germany.
E-mail address: hbeyer@etu.edu.tr

Department of Mathematics, Wayne State University, Detroit, MI 48202, USA.
E-mail address: celiker@wayne.edu