TEMPLE UNIVERSITY
Department of Mathematics

Applied Mathematics and Scientific Computing Seminar

Wednesday, 1 May 2013, 4:00 p.m.
Room 617 Wachman Hall

(refreshments and social at 3:45 p.m)

A mathematical analysis of linearized peridynamics

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Abstract. We present a mathematical analysis of the basic equations of continuum mechanics given in the peridynamic formulation. Peridynamics (PD) is a nonlocal integral-type continuum model that is found to be suitable for modeling materials that naturally form discontinuities such as cracks when deformed. The focus of this work is on the linearized PD model for isotropic materials where the corresponding integral PD operator allows a sign changing kernel. We analyze this operator and the function spaces associated with it. We prove the wellposedness of both the equilibrium equations, given as nonlocal boundary value problems with volume constraints, and the Cauchy problem of the time dependent equations of motion. In the event of vanishing nonlocality solutions of the nonlocal system are shown to converge to the Navier system of classical elasticity. Our analysis is based on some nonlocal Poincaré-type inequalities and compactness of corresponding nonlocal operators.

Joint work with Qiang Du.