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A nonlocal biharmonic operator and its connection with the classical analogue.

We consider a nonlocal operator as a natural generalization to the biharmonic operator that arises in thin plate theory. The operator is built in the nonlocal calculus framework and connects with the recent theory of peridynamics. This framework enables us to consider non-smooth approximations to fourth-order elliptic boundary value problems. For these systems we introduce nonlocal formulations of the clamped and hinged boundary conditions that are well-defined even for irregular domains. We will also explore results on existence and uniqueness of solutions to these nonlocal problems and demonstrate their L^2 -strong convergence to functions in $W^{1,2}$ as the nonlocal interaction horizon goes to zero. For regular domains we identify these limits as the weak solutions of the corresponding classical elliptic boundary value problems. (Received July 28, 2015)