INTERPOLATION OPERATOR ON NEGATIVE SOBOLEV SPACES

L. DIENING, J. STORN*, T. TSCHERPEL

ABSTRACT

This talk summarizes a joint project with Lars Diening and Tabea Tscherpel, where we introduce a Scott–Zhang type projection operator Π mapping to Lagrange elements of arbitrary polynomial order. In addition to the usual properties, the operator Π is stable in the $H^{-1}(\Omega)$ norm and allows for optimal rates of convergence. Moreover, we discuss alternative operators with similar properties.

The novel operator Π allows us to design a local interpolation operator for semi-discretizations and tensor-product spaces for parabolic problems with optimal rates of convergence. Moreover, it allows us to smoothen rough right-hand sides in least-squares finite element methods which leads to quasi-optimality with respect to the energy norm plus some higher-order data-approximation error.

* Department of Mathematics, Bielefeld University, Postfach 10 01 31, 33501 Bielefeld, Germany, jstorn@math.uni-bielefeld.de