NUMERICAL ANALYSIS SEMINAR

Computational scales of Sobolev norms with applications to preconditioners and domain decomposition

Speaker: Joseph E. Pasciak

September 17, 1997
3:00-4:00pm
503 Blocker

Abstract

In this talk, abstract results concerning representations of norms on scales of Sobolev spaces will be presented. These representations are defined in terms of a sum of differences of linear operators which map into neighboring multilevel spaces.

We apply these results to define efficient computational Sobolev norms for $H^s(\Omega)$ when $-3/2 < s < 3/2$. This immediately gives rise to efficient preconditioners for discretizations of differential and pseudo-differential operators of positive and negative order. The preconditioners also extend to sums of operators. For example, singularly perturbed problems such as $I - k\Delta$ can be preconditioned uniformly independently of the parameter k. Finally, the technique provides computationally efficient H^1-bounded discrete extensions which have applications to domain decomposition.