INTEGRATION OF *hp*-ADAPTIVITY WITH A TWO GRID SOLVER: APPLICATIONS TO ELECTROMAGNETICS

David Pardo

Supervisor: Prof. L. Demkowicz
C0600,
The University of Texas at Austin
Austin, Tx
dzubiaur@yahoo.es

A fully automatic *hp*-adaptive strategy has been recently developed at the Texas Institute for Computational and Applied Mathematics (TICAM). The method produces automatically a sequence of optimal *hp*-meshes that deliver *exponential convergence rates*. Given an arbitrary (coarse) *hp*-mesh, the mesh is first refined globally in *both h* and *p* to yield a *fine mesh, i.e.* each element is broken into four element sons (eight in 3D), and the discretization order is raised uniformly by one. Then, we solve the problem of interest on the fine mesh. The next *optimal coarse mesh* is then determined by minimizing the *projection based interpolation error* of the fine mesh solution with respect to the optimally refined coarse mesh. Critical to the success of the adaptive strategy is the solution of the fine grid problem. Typically, in 3D, the global *hp*-refinement increases the problem size at least by one order of magnitude, making the use of iterative solvers inevitable. We will present a convergence study and implementation of an efficient two grid solver algorithm for *hp*-FE that is suitable for a large class of problems in 2D and 3D, including elliptic and electromagnetic boundary value problems, for both real and complex valued operators, with applications to Radar Cross Section (RCS) analysis and modeling of Logging While Drilling EM measuring devices.