1056-65-2033 **Michael Holst** (mholst@math.ucsd.edu), Department of Mathematics, University of California San Diego, La Jolla, CA 92093, **Gantumur Tsogtgerel** (gantumur@math.ucsd.edu), Department of Mathematics, University of California San Diego, La Jolla, CA 92093, and **Yunrong Zhu*** (zhu@math.ucsd.edu), Department of Mathematics, University of California San Diego, La Jolla, CA 92093. *Convergence of Adaptive Finite Element Methods for Nonlinear Partial Differential Equations.* Preliminary report.

In this talk, we present a convergence theory for a general class of adaptive approximation algorithms for abstract nonlinear operator equations on Banach spaces, and then use the theory to obtain convergence results for practical adaptive finite element methods (AFEM) applied to a large class of nonlinear elliptic equations. We develop a weak* convergence framework for nonlinear operators which are locally Lipschitz and satisfy a local inf-sup condition. The convergence result for the abstract adaptive algorithm is then applied to a sequence of examples using standard residual-type AFEM algorithms, a semilinear problem with polynomial nonlinearity, the steady Navier-Stokes equations, and a more general quasilinear problem. We also present a contraction framework for general semilinear elliptic PDEs, and give some examples. (Received September 23, 2009)