998-65-170 **Marc Garbey*** (mgarbet@uh.edu), Department of Computer Science, University of Houston, Houston, TX 77204-3010, and **Wei Shyy** (wss@mae.ufl.edu), Dept of Mechanical & Aerospace Engineering, University of Florida, Gainesville, FL 32611-6250. *A Least Square Extrapolation Method for the A Posteriori Error Estimate of the Incompressible Navier-Stokes Problem.* Preliminary report.

A Posteriori error estimators are fundamental tools for providing confidence in the numerical computation of PDEs. The main theories of a posteriori estimators have been developed largely in the finite element framework, for either linear elliptic operators or nonlinear PDEs in the absence of disparate length scales. But there is a strong interest in using grid refinement combined with Richardson extrapolation to produce CFD solutions with improved accuracy and a posteriori error estimates on coarse grid solutions. But the effective order of a numerical method often depends on space location and is not uniform, rendering the Richardson extrapolation method unreliable. We have introduced [Garbey 13^{th} international conference on domain decomposition and Garbey & Shyy JCP 2003] a new method which estimates the order of convergence of a computation as the solution of a least square minimization problem on the residual. This method, called least square extrapolation, introduces a framework facilitating multi-level extrapolation, improves accuracy, provides a posteriori error estimate and can accommodate different grid arrangements. We will present an investigation of the power and limits of the method via incompressible Navier Stokes flow computations. (Received February 24, 2004)