

Abstract Submitted
for the DFD13 Meeting of
The American Physical Society

Richardson Extrapolation using DNAD ISMAIL B. CELIK, HAYRI SEZER, SURYANARAYANA R. PAKALAPATI, Department of Mechanical and Aerospace Engineering, West Virginia University, P.O. Box 6106, Morgantown, WV, USA, WVU-CFD TEAM — Dual Number Automatic Derivation (DNAD) is a technique whereby a computer code can be executed with additional variable declarations to extend real number to a two dimensional space which is then used to evaluate derivatives to machine accuracy. In the literature this technique is usually applied to study sensitivities of calculations to model parameters, but not the mesh size. The current study explores possibilities of using the same technique to evaluate the derivative of the numerical solution with respect to mesh size which in turn can be used in the Taylor series expansion of the discretization error to calculate the error itself by way of extrapolation. Thus the new method enables explicit Richardson extrapolation by using only one set of calculations on a single grid. The extrapolation can be improved if an additional set of calculations are performed on a finer or a coarser mesh. The concept is demonstrated using one-dimensional example problems. Possible extension to multi-dimensions is discussed.

Hayri Sezer
Department of Mechanical and Aerospace Engineering,
West Virginia University, P.O. Box 6106, Morgantown, WV, USA

Date submitted: 02 Aug 2013

Electronic form version 1.4