

AUTOMATIC ERROR ESTIMATION AND VERIFICATION USING AN ADAPTIVE WAVELET METHOD

Steven R. Brill^{1*}, Temistocle Grenga², Joseph M. Powers³ and Samuel
Paolucci⁴

Department of Aerospace and Mechanical Engineering, University of Notre Dame,
Notre Dame, Indiana 46556-5637, USA

¹ sbrill@nd.edu, <http://www.nd.edu/~sbrill>

² tgrenga@nd.edu, <http://www.nd.edu/~tgrenga>

³ powers@nd.edu, <http://www.nd.edu/~powers>

⁴ paolucci@nd.edu, <http://www.nd.edu/~paolucci>

Key words: *Verification, Multiscale, Adaptive, Wavelet.*

A Wavelet Adaptive Multiresolution Representation (WAMR) method is used to demonstrate the algorithm's ability to adaptively capture all scales necessary to satisfy a user-prescribed error criterion. In the method, all dependent variables are projected onto a multiscale wavelet basis. In the dynamically adaptive algorithm, the only collocation points of the grid that are retained are those whose amplitude is sufficiently large to satisfy the error criterion. Thus, the method effectively and automatically provides a verified solution for multiscale problems. This is demonstrated on a set of benchmark problems defined in the Enhanced Verification Test Suite (EVTS) [1].

REFERENCES

- [1] J. R. Kamm, J. S. Brock, S. T. Brandon, D. L. Cotrell, B. M. Johnson, P. Knupp, W. J. Rider, T. G. Trucano, and V. G. Weirs, 2009, Enhanced verification test suite for physics simulation codes, Sandia National Laboratories, SAND2008-7813