Department of Mathematical and Computer Sciences

A SPECTRAL-ELEMENT METHOD FOR MODELING CAVITATION IN TRANSIENT FLUID-STRUCTURE INTERACTION

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Friday, October 19, 2007
Chauvenet Hall, Room 143, 3:00 pm

Abstract: In the underwater-shock environment that may be experienced by a marine structure, cavitation (boiling) occurs as a result of reflection of the shock wave from the free surface and/or wetted structure, which causes the pressure in the water to fall to its vapor pressure. In 1984, a cavitating acoustic finite element method was developed to model this phenomenon, which, although robust, was found too expensive for realistic 3-D simulations. Recently, four improvements were introduced to improve the efficiency and flexibility of the method in order to make it useful for engineering computations on modern PCs. These improvements are (1) three-fold field separation, (2) spectral finite elements, (3) non-conformal coupling, and (4) time-integration subcycling. These improvements are described and the resulting impact on computational performance is demonstrated by means of 1-D and 3-D benchmark problems. Most recent paper: *Comp. Methods Appl. Mech. Engrg*, Vol. 195, pp. 2149 – 2167 (2006).

BIO: Thomas L. Geers is currently Professor of Mechanical Engineering at the University of Colorado, Boulder. He received his B.S. (Physics), M.S. (Mechanical Engineering) and Ph.D. (Applied Mechanics) degrees from MIT. His interest in underwater-shock science and technology goes back to the early 1960s, when he was a naval officer stationed at the David Taylor Model Basin. He is perhaps best known in this field as the originator of doubly asymptotic approximations for transient fluid-structure-interaction analysis. Professional recognition includes Fellow of the American Society of Mechanical Engineers, Fellow of the Acoustical Society of America, ASME Hess Award, SAVIAC Baron Award, ONT Chair at the U.S. Naval Postgraduate School, Erskine Fellow at the University of Canterbury, and listing in *Who's Who in America*.

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