

Chen, Harn C.; Taylor, Robert L.

Vibration analysis of fluid-solid systems using a finite element displacement formulation.
(English) [Zbl 0724.73173](#)

[Int. J. Numer. Methods Eng.](#) 29, No. 4, 683-698 (1990).

Summary: This report presents a finite element solution for the vibration interaction between an inviscid fluid and a solid. The equation of motion governing the inviscid fluid is expressed in terms of the displacements. This ensures that compatibility and equilibrium will be satisfied automatically along the interface of the coupled systems. To suppress circulation modes with nonzero energy, reduced integration is used when computing the element stiffness matrix contributed by the fluid. In addition, a projection is used on the element mass matrix in order to remove the spurious modes which result from the use of reduced integration. Numerical examples for both fluid and coupled fluid-solid systems are performed and the results are shown.

Reviewer: [Reviewer \(Berlin\)](#)

MSC:

- 74F10** Fluid-solid interactions (including aero- and hydro-elasticity, porosity, etc.)
- 74S05** Finite element methods applied to problems in solid mechanics
- 74H45** Vibrations in dynamical problems in solid mechanics

Cited in **1** Review
Cited in **22** Documents

Keywords:

[inviscid fluid](#); [reduced integration](#); [projection](#)

Full Text: [DOI](#)

References:

- [1] Belytschko, *Comp. Methods Appl. Mech. Eng.* 54 pp 279– (1986)
- [2] Bicanic, *Int. j. numer. methods eng.* 14 pp 1545– (1979)
- [3] Hamdi, *Int. j. numer. methods eng.* 13 pp 139– (1978)
- [4] Kiefling, *AIAA J.* 14 pp 199– (1976)
- [5] and , 'Comparative numerical studies of hydrodynamic effects on dam structures', *Proc. 8th European Conference on Earthquake Engineering, Lisbon, 1986*, pp. 6.8/25-6.8/32.
- [6] Olson, *Comp. Struct.* 21 pp 21– (1985)
- [7] Petyt, *J. Sound Vib.* 45 pp 495– (1976)
- [8] Tabarrok, *Int. j. numer. methods eng.* 13 pp 197– (1978)
- [9] Wilson, *Int. j. numer. methods eng.* 19 pp 1657– (1983)
- [10] *The Finite Element Method*, 3rd edn, McGraw-Hill, London, 1977.
- [11] Zienkiewicz, *Int. j. numer. methods eng.* 13 pp 1– (1978)

This reference list is based on information provided by the publisher or from digital mathematics libraries. Its items are heuristically matched to zbMATH identifiers and may contain data conversion errors. It attempts to reflect the references listed in the original paper as accurately as possible without claiming the completeness or perfect precision of the matching.