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A formulation of general shell elements - The use of mixed interpolation of tensorial components. (English) [Zbl 0585.73123](#)

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Summary: We briefly discuss the requirements on general shell elements for linear and nonlinear analysis in practical engineering environments, and present our approach to meet these needs. We summarize and give further insight into our formulation of a 4-node shell element using a mixed interpolation of tensorial components, and present a new 8-node element using this approach. Specific attention is given to the general applicability of the elements and their efficient use in practice.

MSC:

74S05 Finite element methods applied to problems in solid mechanics

74K15 Membranes

Cited in **1** Review
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Keywords:

bending patch test; transverse shear-strain interpolation; general shell elements; linear and nonlinear analysis; 4-node shell element; mixed interpolation of tensorial components; 8-node element

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References:

- [1] Ahmad, *Int. j. numer. methods eng.* 2 pp 419– (1970)
- [2] Atluri, *J. Struct. Mech.* 1 pp 1– (1972). doi:10.1080/03601217208905331
- [3] *Finite Element Procedures in Engineering Analysis*, Prentice-Hall, Englewood Cliffs, New Jersey, 1982.
- [4] Bathe, *J. Com. Struct.* 11 pp 23– (1979)
- [5] and , 'On the convergence of a four-node plate bending element based on Mindlin/Reissner plate theory and a mixed interpolation', *Proc. Conf. on Mathematics of Finite Elements and Applications V*, Brunel University, England, 1984.
- [6] Bathe, *Int. j. numer. methods eng.* 21 pp 367– (1985)
- [7] Bathe, *J. Comp. Struct.* 17 pp 871– (1983)
- [8] Bathe, *J. Comp. Struct.* 16 pp 89– (1983)
- [9] and , 'Some results in the analysis of thin shell structures', in *Nonlinear Finite Element Analysis in Structural Mechanics* (et al. Eds.), Springer-Verlag, Berlin, 1981.
- [10] Crisfield, *J. Comp. Struct.* 18 pp 833– (1984)
- [11] Dvorkin, *Eng. Comput.* 1 pp 77– (1984)
- [12] and , 'An evaluation of finite difference and finite element techniques for analysis of general shells', *Symp. on High Speed Computing of Elastic Structures*, I.U.T.A.M., Liège, 1970.
- [13] *Stresses in Shells*, 2nd edn, Springer-Verlag, Berlin, 1973. doi:10.1007/978-3-642-88291-3
- [14] Huang, *Eng. Comput.* 1 pp 369– (1984)
- [15] Hughes, *ASME, J. Appl. Mech.* 46 pp 587– (1981)
- [16] and , *Techniques of Finite Elements*, Ellis Horwood, Chichester, U.K., (1980).
- [17] 'Nonlinear analysis of shells using degenerate isoparametric elements', in *Finite Elements in Nonlinear Mechanics*, Vol. 1 (et al. Eds.), Tapir Publishers (Norwegian Inst. of Tech. Trondheim, Norway), 1978.
- [18] and , 'New developments in the finite element analysis of shells', *Q. Bull. Div. Mech. Eng. and Nat. Aeronaut. Establishment*, National Research Council of Canada, Vol. 4, 1969.
- [19] MacNeal, *J. Nucl. Eng. Design.* 70 pp 3– (1982)
- [20] *Skew Plates and Structures*, Pergamon Press, Oxford, 1963. · Zbl 0124.17704
- [21] and , 'A curved C{\(\deg\)} shell element based on assumed natural-coordinate strains', Report No, LMSC-F035235, Applied Mech. Lab., Lockheed Palo Alto Research Lab. (1984).
- [22] Pian, *Int. j. numer. methods eng.* 1 pp 3– (1969)

- [23] 'A plate/shell element for large deflections and rotations', in Formulations and Computational Algorithms in Finite Element Analysis, (et al. Eds.), M.I.T. Press, 1977.
- [24] Reissner, ASME, J. Appl. Mech. 47 pp 101– (1980)
- [25] Stolarski, ASME, J. Appl. Mech. 49 pp 172– (1982)
- [26] and , An Analysis of the Finite Element Method, Prentice-Hall, Englewood Cliffs, New Jersey, 1973.
- [27] and , Theory of Plates and Shells, 2nd edn, McGraw-Hill, New York, 1959.
- [28] Variational Methods in Elasticity & Plasticity, 3rd edn, Pergamon Press, London, 1982.
- [29] Wempner, ASME, J. Appl. Mech. 49 pp 115– (1982)
- [30] 'Incremental formulations for geometrically-nonlinear problems', in Formulations and Computational Algorithms in Finite Element Analysis (et al. Eds.), M.I.T. Press, 1977.
- [31] The Finite Element Method, 3rd edn, McGraw-Hill, London, 1977.

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