

**Azevedo, J. P. S.; Wrobel, L. C.**

**Nonlinear heat conduction in composite bodies: A boundary element formulation.** (English)

Zbl 0633.65117

Int. J. Numer. Methods Eng. 26, No. 1, 19-38 (1988).

The paper discusses the numerical solution of the steady state nonlinear heat conduction problem by the boundary element method. Temperature- dependent conductivities are treated by the Kirchhoff transformation. The resulting nonlinear boundary conditions and also those of radiative type are approximated using piecewise constant boundary elements giving rise to a system of nonlinear equations which are solved by a modified Newton- Raphson method. In numerical examples the method compares favourably with finite elements.

Reviewer: J.D.P.Donnelly

**MSC:**

**65N35** Spectral, collocation and related methods for boundary value problems involving PDEs

Cited in **19** Documents

**35K60** Nonlinear initial, boundary and initial-boundary value problems for linear parabolic equations

**Keywords:**

composite material; steady state nonlinear heat conduction problem; boundary element method; Kirchhoff transformation; nonlinear boundary conditions; Newton-Raphson method; numerical examples

**Full Text:** [DOI](#)

**References:**

- [1] Comini, Int. j. numer methods eng. 8 pp 613– (1974)
- [2] Bathe, Nucl. Eng. Des 31 pp 389– (1979)
- [3] and , Conduction of Heat in Solids, 2nd edn., Clarendon Press, Oxford, 1959.
- [4] Donea, Nucl. Eng. Des. 30 pp 205– (1974)
- [5] Khader, Trans. ASME J. Heat Transfer 103 pp 26– (1981)
- [6] Bialecki, Appl. Math. Modelling 5 pp 417– (1981)
- [7] and , 'Nonlinear potential problems', in (ed.), Progress in Boundary Element Methods, Vol. 2, Pentech Press, London. 1982.
- [8] and , 'A boundary element analysis of nonlinear heat conduction', in and , (eds.), Proc. Fourth Int. Conf. on Numerical Methods in Thermal Problems, Pineridge Press, Swansea, 1985.
- [9] and , 'Boundary element method in singular and nonlinear heat transfer', in (ed.), Proc. Fourth Int. Conf. on Boundary Element Methods, Springer-Verlag, Berlin, 1982.
- [10] and , Boundary Element Techniques: Theory and Applications in Engineering, Springer-Verlag, Berlin, 1984. · doi:10.1007/978-3-642-48860-3
- [11] 'Analysis of nonlinear heat conduction problems by the boundary element method', M. Sc. Thesis (in Portuguese), COPPE/UFRJ, 1985.
- [12] Lyness, Comp. Struct. 5 pp 65– (1975)
- [13] Barrer, Proc. Phys. Soc. 58 pp 321– (1946)
- [14] and , 'The dual reciprocity boundary element formulation for nonlinear diffusion problems', to appear in Comp. Methods Appl. Mech. Eng.

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.