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Abstracts of Papers to Appear in Future Issues

RAPID SOLUTION OF INTEGRAL EQUATIONS OF SCATTERING THEORY IN TWO DIMENSIONS. V. Rokhlin, *Yale University, New Haven, Connecticut, USA.*

The present paper describes an algorithm for rapid solution of boundary value problems for the Helmholtz equation in two dimensions based on iteratively solving integral equations of scattering theory. CPU time requirements of previously published algorithms of this type are of the order n^2, where n is the number of nodes in the discretization of the boundary of the scatterer. The CPU time requirements of the algorithm of the present paper are $n^{4/3}$, and they can be further reduced, making it considerably more practical for large scale problems.

NUMERICAL SOLUTION OF TWO-POINT BOUNDARY VALUE PROBLEMS. L. Quartapelle and S. Rebay, *Politecnico di Milano, Milan, ITALY.*

This paper presents an original formulation of two-point boundary value and eigenvalue problems expressed as a system of first-order equations. The fundamental difference between the new method and other methods based on a first-order approach is the introduction of conditions of an integral character to supplement the simultaneous set of first-order equations, which are hence never regarded as an initial value problem. The consideration of integral conditions leads to establish a class of *linear multipoint* schemes for the numerical solution of boundary value problems for ordinary differential equations. Furthermore, the global character of the integral conditions (nonlocality) combined with the block structure of the system of algebraic equations allow to deal with stiff problems by means of the classical procedure of iterative refinement introduced by Wilkinson. The properties of the numerical schemes are illustrated by the solution of linear and nonlinear problems and by the accurate and efficient determination of some eigensolutions of a difficult problem of hydrodynamic stability. The proposed method is conceptually simpler and numerically more convenient than existing initial value methods, while still retaining all the advantages of a formulation based on a first-order system.

TWO-PHASE FLOW IN POROUS MEDIA WITH MULTICOMPONENT TRANSPORT: FORMULATION AND HIGHER ORDER NUMERICAL SOLUTION. Lawrence J. Roberts, *AEE Winfrith, Dorchester, ENGLAND*; Kenneth S. Sorbie, *Heriot-Watt University, Edinburgh, SCOTLAND.*

This paper presents a novel formulation of the two-phase multicomponent transport equations including reaction and adsorption of the transported chemical components. The equations describing the phase saturation and the components transport within the phase are written and treated in a very similar way. The resulting set of coupled non-linear convection–dispersion equations is posed as an initial-boundary value problem which is conveniently formulated for numerical solution using an extended method of lines approach. The method of lines offers two main advantages for the solution of this system of equations when compared with lower order methods. The non-linear terms are treated in a straightforward manner and the spatial derivatives can be represented with greater accuracy to high order without undue complication. Highly accurate results are obtained for single and two phase problems for which analytical results are known.

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