JOURNAL OF COMPUTATIONAL PHYSICS 119, 390 (1995)

Abstracts of Papers to Appear in Future Issues

A BEM-BDF SCHEME FOR CURVATURE DRIVEN MOVING STOKES FLOWS. G. A. L. van de Vorst and R. M. M. Mattheij. *Department of Mathematics and Computing Science, Eindhoven University of Technology, P.O. Box 513, 5600 MB Eindhoven, The Netherlands.*

A backward differences formulae (BDF) scheme, is proposed to simulate the deformation of a viscous incompressible Newtonian fluid domain in time, which is driven solely by the boundary curvature. The boundary velocity field of the fluid domain is obtained by writing the governing Stokes equations in terms of an integral formulation that is solved by a boundary element method. The motion of the boundary is modelled by considering the boundary curve as material points. The trajectories of those points are followed by applying the Lagrangian representation for the velocity. Substituting this representation into the discretized version of the integral equation yields a system of nonlinear ODEs. Here the numerical integration of this system of ODEs is outlined. It is shown that, depending on the geometrical shape, the system can be *stiff*. Hence, a BDF-scheme is applied to solve those equations. Some important features with respect to the numerical implementation of this method are highlighted, like the approximation of the Jacobian matrix and the continuation of integration after a mesh redistribution. The usefulness of the method for both two-dimensional and axisymmetric problems is demonstrated.

A HYPERASYMPTOTIC PERTURBATIVE METHOD FOR COMPUTING THE RADIATION COEFFICIENT FOR WEAKLY NONLOCAL SOLITARY WAVES. John P. Boyd. *Department of Atmospheric, Oceanic & Space Sciences, University of Michigan, 2455 Hayward Avenue, Ann Arbor, Michigan 48109, U.S.A.*

We offer a new computational method to calculate the radiation coefficient α of a weakly nonlocal solitary wave in the limit that the amplitude ε of the core of the structure tends to zero. (A weakly nonlocal solitary wave is a finite amplitude, nondissipative wave which decays to a sinusoidal oscillation of amplitude α at large distance from the core.) The multiple scales series for the solitary wave in powers of ε is asymptotic but divergent. When truncated at optimal order ("superasymptotic" approximation), the series gives no information about the radiation coefficient α (except order-of-magnitude) because the absolute error is $O(\alpha)$. We describe two "hyperasymptotic" approximations which add a second, *different* asymptotic series to the multiple scales expansion so as to compute α itself. The zeroth order hyperasymptotic approximation has a relative error of $O(\varepsilon)$ in α; the sequence of approximations may be extrapolated to give the proportionality constant in the limiting asymptotic expression for α as $\varepsilon \Rightarrow 0$. The first-order hyperasymptotic approximation has a relative error of only $O(\varepsilon^2)$; its extrapolation gives the $O(\varepsilon)$ correction to the limit as $\varepsilon \Rightarrow 0$.

0021-9991/95 $12.00