

Method for Solving Nonlinear Problems on Unsteady Free-Boundary Flows

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A direct method of finding a flow potential of 2-D inverse boundary-value problems is proposed. The method makes it possible to construct the expressions of a complex velocity and a derivative of the complex potential defined in the parameter domain. These expressions contain in explicit form the functions determined from boundary conditions. They are the time dependent functions of the velocity modulus and the velocity angle to the boundary including the free surface. The dynamic and kinematic boundary conditions lead to a system of the integral and integro-differential equations for determination of these unknown functions. The method has been evaluated when solving the new self-similar water impact problems: vertical entry of an asymmetric wedge; oblique entry of a wedge; oblique entry of a flat plate, a liquid wedge impacting the solid wall.

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