

**Joint application of small parameter method and boundary integral equation method to mathematical model construction**

D.V. Yevdokymov, M.V. Polyakov  
Dniepropetrovsk National University, Naukova str.,13  
49050 Dniepropetrovsk, Ukraine  
devd@mail.ru

**Abstract**

Usually mathematical model in many applied sciences is boundary-value problem for partial differential equation. Another way of mathematical model construction is transition from partial differential equations to boundary integral equations. If there is some small parameter in the problem or such parameter can be introduced artificially, the problem can be reduced by small parameter method to series of more simple problems. It can be applied as to initial partial differential equation, as to boundary integral formulation. If it is applied to initial partial differential equation, the following solution of series of boundary-value problems can be obtained by boundary integral equation method. Equivalence, advantages and disadvantages of both mentioned approaches are considered in the present work. Application of small parameter method to boundary integral equations is more complex and difficult, but it is more universal and gives an opportunity to include into consideration additional effects, for example, boundary variation, which is practically impossible to consider in differential form. However for boundary condition disturbance results of both approaches are similar. The considered questions are illustrated by several examples of solution of applied problems, arising in hydrodynamics and heat transfer, in particular, solution of Stefan problem for slow phase transition and solution of the problem about growth of biological tissue.

**Keywords:** Boundary integral equations, Small parameter method, Boundary-value problem