

Three detecting indexes and five regularization techniques for degenerate scales in the BEM/BIEM

Jeng-Tzong Chen^{1,2}, Shing-Kai Kao¹ and Shyh-Rong Kuo¹

¹*Department of Harbor and River Engineering,
National Taiwan Ocean University, Keelung, Taiwan*

²*Department of Mechanical and Mechatronic Engineering,
National Taiwan Ocean University, Keelung, Taiwan*

Abstract

It is well known that BEM/BIEM results in degenerate scale for a two-dimensional Laplace problem subjected to the Dirichlet boundary condition. In this paper, we reviewed three indexes for detecting the degenerate scale in BEM/BIEM and five regularization techniques to ensure the unique solution, the hypersingular formulation rank promotion by adding the boundary flux equilibrium, CHEEF method, (direct BEMs), Fichera's method (indirect BEM) and method of adding a rigid body mode. In the numerical implementation, the BEM program developed by the NTOU/MSV group is employed to see the validity of the above formulation. Finally, a general shape of a regular triangle is numerically implemented to check the uniqueness solution of BEM.

Keywords: BEM, BIEM, degenerate scale, ill-conditioned.