Paradox, paradise and parasite of the BEM/BIEM

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**ABSTRACT**

It is well known that BEM/BIEM is an acceptable approach for solving engineering problems. It is a paradise in several aspects, dimension reduction of mesh, infinite domain, stress concentration and crack problems. The role why dual BEM is necessary will be demonstrated. However, it also results in paradox and parasites in some cases. Rank-deficient matrix appears due to the degenerate scale, degenerate boundary, spurious eigenvalue and fictitious frequency once the BIEM/BEM is used for solving boundary value problems. Focus on infinite domain with two circular holes and cracks will be emphasized. Based on the well-posed dual formulation of the BEM/BIEM, full rank promotion can be achieved.. Besides, the TwSIAM will be introduced. The history of Taiwan BEM activities will be addressed. Finally, recent works of NTOU/MSV group on the BEM applications to Steklov eigenproblems as well as the quaternion and the Clifford BEM will be presented.

**Key words:** *rank deficiency, degenerate scale, Steklov eigenproblem, BEM/BIEM*

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