86 | A solution for the superabundant unknown problem in the boundary element analysis of plates

Hiroyuki Kisu (Nagasaki University, Japan)
Guiming Rong (Nagasaki University, Japan)
Takanori Tozawa (Nagasaki University, Japan)
Toru Takase (Nagasaki University, Japan)

In the analysis by the Boundary Element Method (BEM), a well-known problem, which is called the superabundant unknown problem will occur at a point such as a corner where the traction or the flux is discontinuous. In that case, the number of unknown value is more than that of the equations. The situation is caused by the shape of the boundary and may occur in various fields. It is very troublesome to solve this problem and may be one of the factors obstructing the wide application of the BEM. In order to solve this problem, several techniques were proposed. However, they either reduce the precision or complicate the calculation due to the hyper singularity. In this study, we propose a method using a new kernel function that is comprised of the solution of a semi-infinite media at the discontinuous point of traction or flux. By this way, equations with necessary number can be constructed without any drop of precision, since the source point keeps at the original position, and the order of singularity does not be increased. We examined the present method for solving the superabundant unknown problem through a number of simple analysis examples and compared the numerical results with those by several conventional methods. The results from the present method were in the best precision. It is expectable to extend this technique to the three-dimensional analysis, as well as to fields other than the elastic plate problem.

90 | Free vibration analysis of rotating FGM beams using the p-FEM

Ouinis, Mohammed N. (University of Tlemcen, Algeria)
Hamza Cherif, Sidi M. (University of Tlemcen, Algeria)

The functionally graded materials (FGMs) are inhomogeneous composite materials where the properties of FGM constituents vary gradually and smoothly. The smooth variation of the material properties overcomes the adverse effect of the laminate and sandwich composites structure such as the delamination mode of failure caused by the large interlaminar stresses. In