A New Fast Multipole Boundary Element Method for Multi-Domain Problems

***Yijun Liu[1,2], and Shuo Huang[1]**

[1]Mechanical Engineering, University of Cincinnati, Cincinnati, Ohio, USA.
[2]Institute for Computational Mechanics and Its Applications (NPUiCMA),
Northwestern Polytechnical University, Xi'an, Shaanxi, China.

*Corresponding author: Yijun.Liu@uc.edu

A new implementation of the boundary element method (BEM) for multi-domain problems is presented. In the traditional BEM for multi-domain problems, equations from each subdomain are assembled and one half of the variables on interfaces between two domains are eliminated by using interface conditions. Though smaller systems of equations are formed, this approach is problem dependent and is tedious in implementation for different configurations of the subdomains. In this work, we propose to use a straightforward approach for multi-domain problems. That is, we simply list the BEM equations from each subdomain one-by-one in the final system of equations, and then list all the interface conditions as additional equations in the system. This can be done systematically regardless of the configurations of the subdomains. Therefore, it will facilitate easy implementation of the fast multipole BEM for multi-domain problems. Applications of this simple approach to solving multi-domain problems will be presented.

Keywords: Boundary element method, fast multipole method, multi-domain problems