Three-Step Multi-Domain BEM for Solving Transient Multi-Media Heat Conduction Problems

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A three-step BEM analysis technique is proposed for solving 2D and 3D transient heat conduction problems consisting of multiple non-homogeneous media. The discretized boundary element formulation is written for each medium. The first step is to eliminate internal variables at the individual medium level; the second step is to eliminate boundary unknowns defined over nodes used only by the medium itself; and the third step is to establish the system of equations according to the continuity conditions of the temperature and heat flux at common interface nodes. Thus, only the interface temperatures are taken as unknowns in the final system of equations. Based on the central finite difference technique, an implicit time marching solution scheme is developed for solving the time-dependent system of equations. Three numerical examples are given to demonstrate the accuracy and effectiveness of the presented method.

Keywords: Transient heat conduction, Multi-domain BEM, Three-step variable condensation technique, Non-homogeneous