

Free Field Analysis by FEM and CIP Combined Method

Nagayuki. Yoshida¹

¹ Professor, Department of Architecture, Faculty of Engineering and Design, Hosei University
2-33 Ichigayatamachi, Shinjuku, Tokyo 162-0843, Japan,
nyoshida@hosei.ac.jp and <http://www.design.hosei.ac.jp/gs/english/faculty/architecture.html>

Key Words: *Elastic Wave, Transmitting Boundary, CIP Method, FEM.*

In recent years, the nonlinear dynamic behavior of the foundation and soil has been studied actively. When dealing with a nonlinear problem, the Finite Element Method (FEM) is an effective and flexible technique. When applying this to the wave propagation problem of infinity or a semi-infinite elastic body, the transmission processing is needed on the boundary of an analytical area at the same time for both of the incident wave, which is incoming from the exterior to an inside, and the reflected wave which is outgoing from an inside to the exterior.

Although a viscous boundary is typical as a transmission processing in the elastic wave field, it is an approximate method for more than one dimensional field. The Cubic Interpolated Propagation (CIP) method is an outstanding method which can separate the incident wave and the reflected wave through the transformation of a wave equation to a number of advection ones. By applying this technique to the transmission processing at the boundary of FEM domain, we can formulate a new method with high precision for the wave analysis named by FEM and CIP Combined Method.

A computational procedure is described for one dimensional problem and the analytical examples of one and two dimension are shown for the validity of a proposed method.

When we analyze wave propagation in the limited analytical region, we could model the ground by FEM and CIP Combined Method as if it were extended infinitely.

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