THE COUPLING METHOD OF FINITE ELEMENTS
AND BOUNDARY ELEMENTS FOR RADIATION PROBLEMS

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Abstract The paper presents the variational formulation and well posedness of the coupling method of finite elements and boundary elements for radiation problem. The convergence and optimal error estimates for the approximation solution and numerical experiment are provided.

1. Introduction

Many scattering and radiation problems in mathematical physics are reduced to the problem of Helmholtz equation

\[ \Delta u + K^2 u = f \quad x \in \mathbb{R}^2 \text{ (or } \mathbb{R}^3) \]

It is important in many areas of applications e.g. the design of waveguide, exploring for mineral material and the study of the biological effects of microwave radiation, and so on. The difficulty is that the domain is whole space. Many people present various method which are used for this problem, e.g. FEM. BE and infinite element ([2]-[5], [29], [10]). Each method is of its characterization. However, the coupling method of FE and BE most attracts one' attention.

2. Variational Formulation

Let us consider the following radiation problem.

\[ \Delta K + K^2 u = f \quad \text{in } \mathbb{R}^2 \]

\[ u = O(r^{-1}) \quad r = |x| + 1^\circ \]

\[ \frac{\partial u}{\partial n} + iKu = O(r^{-1/2}) \quad r \rightarrow \infty \]

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