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Non-reflective planar boundary condition based on Gauss filter

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SUMMARY

A non-reflecting boundary condition based on the Gauss filter is employed for the determination of scattered potential governed by the Helmholtz equation. A filtering layer is used for closing infinite domain calculations. An expression for the reflection coefficient is derived and an optimal filtering layer is designed. Numerical results validate the performance of this method for unbounded wave guide problems. Copyright © 2000 John Wiley & Sons, Ltd.

KEY WORDS: outgoing boundary condition; Helmholtz; filtering layer; scattering; Gauss filter; unbounded domain

1. INTROD TION

Numerous techniques are in use for the solution of a stic wave radiation and scattering problems governed by the Helmholtz equation. A common ture to many of these methods is to get an approximate solution on a bounded domain. The papers by Givoli [1] and Moore *et al.* [2] provide good summaries of much of the work that has been done in this direction. Several non-local procedure has been developed in the last 10 years, such as the DtN method proposed by Givoli [3] and Giou and Keller [4] and developed by Harari and Hughes [5] and Harari *et al.* [6]. The DtN boundary condition is exact and non-reflecting at the continuum medium, but it is dependent of the operator and the dimensional space where this is defined, then, when you apply this boundary condition do you need to know the fundamental solutions in question.

A discrete non-local DNL method has been developed for the study of water waves radiation and scattering problems [7, 8] and for ship wave resistance problem [9].

A Gaussian filtering layer in rectangular co-ordinates is used to obtain non-reflecting boundary condition for unbounded wave guides in two dimensions, defining problems that can be solved by finite element method.

The Gaussian filter has a large utility in engineering applications. In image processing; for instance, the Gaussian outputs a 'weighted average' of each pixel's neighbourhood, with the

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