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# EVALUATION OF ATTACHMENTS FOR ACOUSTIC BARRIERS WITH THE BOUNDARY ELEMENT METHOD

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## ABSTRACT

The boundary element method is widely used for the analysis of acoustic barriers and attachments [1, 2]. Their efficiency is normally evaluated in two-dimensional analyses. The collocation of attachments on the top of the barriers is a recent technique which aims the improvement of the barrier performance and is an alternative to increasing the barrier height. Attachments can be quite effective for the sound attenuation and their geometry and materials can vary from simple to very complex [3].

This paper focuses the numerical analysis of different types of attachments. In special, attachments composed by a series of thin panels are analysed. The boundary element method is used for this purpose. It is seen that modeling of complex attachments is not an easy task, even though this is more evident in three-dimensional analyses.

It is proposed in this paper the use of the dual boundary element method [4] to simplify the modeling of the more complex attachments. This formulation is geometrically represented by the use of thickless meshes in the thin bodies. The numerical approach basically consists on the simultaneous application of the standard and hypersingular boundary integral equations to the mesh nodes of these thin panels.

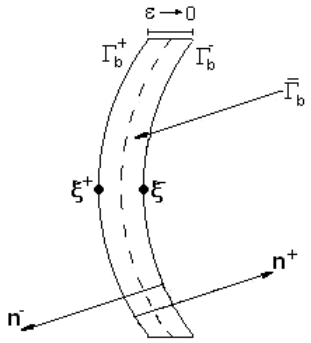


Figure 1. Thin body with its thickness tending to zero.

Boundary element formulations are briefly reviewed taking into account the method of images and different boundary conditions. The standard and hypersingular boundary integral

equations are analyzed via a limiting process when the thickness of the bodies are neglected.

Comparisons between results are made when attachments are modeled with the standard and dual formulations. It is seen that differences are more pronounced at frequencies whose wavelengths are directly related to the neglected or changed dimensions. However, it is seen that the overall performance is not affected. Therefore, the dual method is an appropriate approach for this type of analysis since it simplifies modeling and reduces computing effort.

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