Three dimensional acoustic shape sensitivity analysis accelerated by fast multipole boundary element method

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Summary

A fast multipole boundary element method is presented for three dimensional acoustic shape sensitivity analysis in this study. The Burton-Miller formula which is a linear combination of the conventional boundary integral equation and the normal derivative boundary integral equation is adopted to conquer the fictitious eigenfrequency problem associated with the conventional boundary integral equation method in solving exterior acoustic problems. The continuous adjoint variable method is implemented in the sensitivity analysis and the concept of material derivative is used in the derivation. Constant elements are employed to discretize the boundary so that the hypersingular boundary integrals contained in the formulae can be evaluated explicitly and the numerical process becomes more efficient than that of any other singularity subtraction technique. Numerical examples are given to demonstrated the accuracy and efficiency of the present method.