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A time domain boundary element method for compliant surfaces

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The best way of representing compliant surfaces in time domain prediction models, such as the transient Boundary Element Method (BEM), is currently unresolved. This is not true of frequency-domain, time-invariant models, where the common practice is to represent the characteristics of a material by its surface impedance.
A BEM may be used to predict the scattering of sound, and reduces the problem of modelling a volume of air to one involving surfaces conformal to the obstacles. Surface impedance is a convenient concept for inclusion in the frequency domain BEM as it abstracts the obstacle's characteristics into a property of the conformal surface.
The time domain BEM predicts transient scattering of sound, and is usually solved in an iterative manner by marching on in time from known initial conditions. For surface impedance data to be utilised it must be Fourier transformed from a frequency dependent multiplication into a temporal convolution. This approach typically yields convolution kernels which involve future sound, hence is not compatible with time-marching solvers. In this paper an alternative time domain representation of compliant locally reacting materials is proposed to overcome this problem, and its implementation and limitations discussed.