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Acoustic array interactions in the time domain

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In this paper I discuss the computation of acoustic array interactions in the time domain. Acoustic array interactions in the time domain are expressed in terms of mutual impulse response functions. The mutual impulse response between a pair of array elements is the acoustic force on the first element of the pair due to an acceleration impulse of the second with all other elements held rigid. The mutual response functions are calculated in the frequency domain using the boundary element program CHIEF and then Fourier transformed to the time domain. As the convergence in the frequency domain can be very slow, I introduce modified impulse response functions that converge much faster in the frequency domain and are simply related to the desired impulse response functions. This approach reduces the range of frequencies required in the CHIEF computations and gives better accuracy in the initial time period. Transient results are presented for an array of simple transducer elements. The mutual impulse response functions are combined with the transducer element equations to yield a system of differential-integral equations of delay type. A solution procedure for equations of this type is presented.