The Sparse Finite Difference Time Domain Algortihm for Acoustically Large Problems

Simon Durbridge

University of Derby, Dept. Electronics, Computing & Mathematics, Derby, UK
s.durbridge1@unimail.derby.ac.uk.com

Abstract. Ray-tracing provides a scalable method for analyzing room acoustics, though much acoustical wave behavior particualrly at low frequencies is not implicit to this method[1]. Though generally computationally intensive, wave based acoustical modelling may provide more accurate results than ray based methods for low frequency room analysis[2]. The Finite-Difference Time-Domain [FDTD] method for solving partial differential equations presents a highly parallelizable geometric method for modelling room acoustics[3]. A hybrid method that combines FDTD and ray-tracing may be employed to utilise the benefits of both algorithms, though this may present complexities when combining data sets[4]. Generic FDTD implementation for acoustics generally requires full discretization of the geometric domain, though a potential area for new research may be the implementation of a sparse matrices based FDTD algorith[5]. This would be analogous to using a moving window to mask the relevant wave propagation area, only computing cells with relevant information.

Keywords: Acoustic Simulation, computational modelling, numerical wave modelling, sparse finite difference time domain (FDTD), large computational models.

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