SOUND ENERGY EVOLUTION IN TWO-DIMENSIONAL ENCLOSURES

AS DETERMINED WITH A FINITE DIFFERENCE TIME DOMAIN METHOD

By

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ABSTRACT

Measurements and simulations conducted for the purpose of extracting or constructing impulse responses are inextricably dependent on a limited number of receiver locations. Wave based simulations offer an opportunity to discard this dependency and assess an entire evolving sound field. In this work, a finite difference time domain method is implemented to simulate an evolving sound field in a range of enclosure geometries with reflective boundaries. The distribution of energy is monitored statistically as mixing and ergodic states are approached, and evidence is presented for the predictability of this evolution based on room geometry alone. A system for importing geometries from the Rhinoceros 3D CAD software, using the Grasshopper parametric environment, is also presented. A form known as the Barnett Billiard Table in mathematics is included in this study, as is a related form introduced as the Divergent Concert Hall, both of which exhibit exceptional behavior even without the presence of diffusive treatment