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On the use of diffusion equations to model the acoustics of coupled rooms

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The acoustics of coupled rooms are characterized by energy exchanges through apertures and/or partition walls. The use of systems of diffusion equations allows to predict the temporal and spatial energy distributions in these configurations quite accurately. In this presentation, the diffusion formalism for room acoustics-prediction is summarized. The systems of equations to be solved in the case of coupling through an aperture and through a partition wall are presented. For two rooms coupled through an aperture (two classrooms connected through an open door), the results obtained with the diffusion model are compared to experimental data, in terms of sound pressure levels and sound decays. On the other hand, for the case of two classrooms connected through a partition wall, the diffusion model is compared to experimental data in terms of sound pressure level difference only. Finally, an engineering application is presented in the configuration involving a workroom including multiple sound sources (e.g. machines) connected to offices through open and closed doors.