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Ray-tracing prediction of sound-pressure and sound-intensity fields in empty and fitted rooms

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A Monte-Carlo ray-tracing model has been adapted to the prediction of sound-pressure and sound-intensity fields in rooms with surfaces of arbitrary surface impedance, and containing parallelepiped obstacles. Phase changes due to propagation distance and wall reflection were accounted for. Diffraction around obstacle edges was modeled by the Unified Theory of Diffraction. The model was also extended to include the out-of-phase secondary sound source of a single-channel, global active-noise-control (ANC) system. The new model was validated in comparison with predictions by reference models (e.g. FEM) and with the results of experiments in an anechoic chamber and in real rooms. It was used to predict the effectiveness of ANC. This paper discusses the development of the new models, the results of the validation tests and ANC predictions.