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Computer tools for architectural acoustics education

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Calculating/simulating acoustic performance of architectural spaces and building elements plays an important role in architectural education. Unfortunately, architectural students often hesitate to use theoretical formulae/models commonly applied by acousticians. This study aims to develop simple calculation/simulation tools to help architectural students to understand basic acoustic principles. Focusing on the effectiveness of various key parameters, as well as on scientific visualisation way of presenting teaching materials, five tools have been developed: (1) sound distribution behind an environmental noise barrier, with parameters including barrier height, source-barrier distance, and source height; (2) sound distribution in a rectangular street canyon, with parameters including street length, width, building height, boundary absorption coefficient, air absorption, and the height of receiver plane; (3) reverberation time calculation in a rectangular space, with parameters including room dimensions and boundary absorption coefficients, where a database of absorption coefficients is also included; (4) absorption of perforated panel absorbers, especially micro-perforated panel absorbers, with parameters including hole size, hole spacing, panel thickness, and depth of airspace; (5) digital audio animation for urban soundscape design, considering idealised cross-streets and squares in a 2D environment, where the sound file with multiple sources can be played back, with reverberation effects. [Work supported by the Theodore John Schultz Grant]