

## A potpourri of prediction methods in room acoustics

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### ABSTRACT

Computerized prediction in room acoustics has for decades used methods from three very different categories: diffuse-field methods, geometrical acoustics in the form of ray tracing, and wave-based methods in terms of finite element modeling. Are there any methods that will challenge these three in the near future? We will look at developments in these three categories of methods and discuss what they have to offer compared to today's state. For diffuse-field methods, Barron's revised formula has gained acceptance as a more accurate alternative to the classical diffuse-field formulas, and the diffusion equation can offer even more detailed variations in space.

For geometrical acoustics, the introduction of diffraction has overcome one of the most important limitations with geometrical acoustics. Another development is to solve the underlying radiosity equation, or even more generally, the room acoustical rendering equation, with other methods than the "Monte-Carlo" approach that we know as ray tracing.

Finally, the "exact" wave-based approach has at least four up-and-coming competitors: FDTD has been a researchers' tool for several decades but is still not available in some commercial software. Will that change? A second alternative is PSTD, which, like FDTD might be on the way from the research labs to be more generally available. A third alternative to FEM is BEM, which is well-established but not widely used in room acoustics. Finally, the "adaptive rectangular decomposition" uses a decomposition into shoebox subdomains, which can be solved analytically. Will that become a common tool? A last aspect that affects all these various methods will be discussed briefly: the uncertainty in the input data.

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