



Directional database for musical instruments to be used for acoustical VR

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ABSTRACT

Room acoustics is commonly evaluated by measuring the room impulse responses measured with omnidirectional sound sources. Musical instruments, however, have specific radiation patterns that are part of their distinct sound characteristics. Having measured with an omnidirectional source this part of their characteristic is inevitably lost and therefore these impulse responses are not adequate for auralization of rooms with natural sound sources such as speech or music.

In order to include the directivity of musical instruments, the measurement can be done with a sound source of certain radiation pattern. An example for a flexible approach for variable directivities of technical sound sources is the twelve-channel dodecahedron loudspeaker. By applying suitable filters, the radiation pattern can be formed to match the pattern of musical instruments as closely as possible.

To evaluate the directivity of orchestral instruments, a comprehensive database was created, using anechoic recordings of clean steady tones. Hereby, the microphones were positioned to be distributed spherically around the musician to equally cover all directions of radiation. The multi-channel recording is processed to obtain a directivity function of frequency, combining the radiation of fundamentals and higher harmonics.

Now, measuring the room impulse response with the applied directivity of the instrument of interest is feasible. This is done by matching the radiation pattern of the dodecahedron loudspeaker to the specific instrument. Basis for the 12-channel processing can be spherical harmonics and magnitude and phase optimization. Pros and cons of the methods will be discussed.