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Real-time 3D audio for digital cinema

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We present a real-time 3D audio system with a number of nice features: it is suited for plausible reference with the visual environment, it is real-time capable, it can process multiple moving sound sources and listeners in a normal CPU. In our approach, a database of pressure and velocities impulse-responses (IRs) is computed offline for each (architectural) environment using physically based ray-tracing techniques. During playback, the real-time system retrieves IRs corresponding to the sources and target positions, performs a low-latency partitioned convolution and smoothes IR transitions with cross-fades. Finally, the system is flexible enough to decode to any surround exhibition setup. The software has been developed within the CLAM open-source audio framework. We present a real scenario where these techniques were successfully applied: an augmented-reality film with 3D audio within the context of the IP-RACINE project for digital cinema. The shooting was done with a high-end prototype camera with zoom and position tracking which enabled the real-time motion of a subjective listener within the scene. Our technology enabled the film director to both pre-hear surround audio of an augmented-reality scene shooting and fine-tune audio rendering in post-production.