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(54) Title: METHODS, APPARATUS, AND SYSTEMS FOR EARLY REFLECTION ESTIMATION FOR VOXEL-BASED GEOMETRY REPRESENTATION(S)

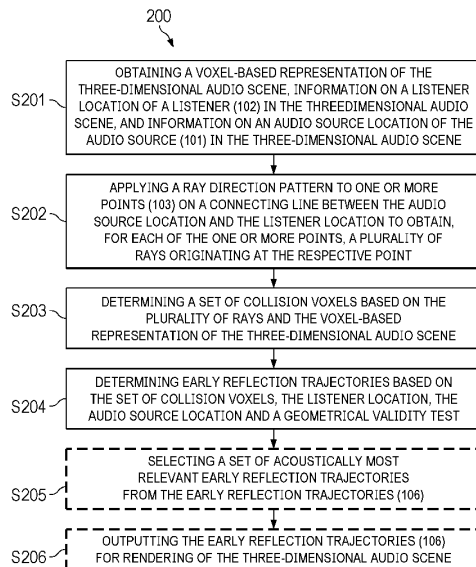


FIG. 14

(57) Abstract: Methods, apparatus, programs, and storage media for improving estimation of early reflection trajectories of an audio source in a three-dimensional audio scene are described. The method includes obtaining a voxel-based representation of the audio scene, information on a listener location in the audio scene, and information on an audio source location in the audio scene. A ray direction pattern is applied to one or more points on a connecting line between the audio source location and the listener location to obtain, for each of these points, a plurality of rays originating at the respective point. A set of collision voxels is determined based on the rays and the voxel-based representation of the audio scene. Early reflection trajectories are determined based on the set of collision voxels, the listener location, the audio source location and a geometrical validity test.

WO 2023/227544 A1

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