Claims

1. A renderer for rendering an acoustic scene,

wherein the renderer is configured to render an acoustic impact of a diffuse sound, which originates in a first spatial region, in a second spatial region, using a spatially extended sound source.

2. Renderer according to claim 1,

wherein the renderer is configured to render a direct-sound acoustic impact of a given sound source, which is located in the first spatial region, in the second spatial region using a direct-sound rendering, and

wherein the renderer is configured to render a diffuse-sound acoustic impact of the given sound source in the second spatial region using the spatially extended sound source.

3. Renderer according to one of claims 1 to 2,

wherein the renderer is configured to apply a direct source rendering to a sound source signal of a given sound source, which is located in the first spatial region, in order to obtain a rendered direct sound source response at a listener position which is located in the second spatial region;

wherein the renderer is configured to apply a reverberation processing to the sound source signal of the given sound source, in order to obtain one or more reverberated versions of the sound source signal of the given sound source, and

wherein the renderer is configured to apply a spatially extended sound source rendering to the one or more reverberated versions of the sound source signal of the given sound source, in order to obtain a rendered diffuse sound response at the listener position which is located in the second spatial region.

4. Renderer according to one of claims 1 to 3,

wherein the renderer is configured to render an acoustic impact of a late reverberation, which is excited by a sound source located in the first spatial region, in the second spatial region, using the spatially extended sound source that reproduces the late reverberation.

5. Renderer according to one of claims 1 to 4,

wherein the renderer is configured to render the acoustic impact of the diffuse sound using a spatially extended sound source that has similar spectral content in each spatial region.

6. Renderer according to one of claims 1 to 5,

wherein the renderer is configured to render the acoustic impact of the diffuse sound using a spatially extended sound source which is placed at a portal between the first spatial region and the second spatial region and which reproduces the diffuse sound which originates from the first spatial region.

7. Renderer according to one of claims 1 to 6,

wherein the renderer is configured to render the acoustic impact of the diffuse sound using a spatially extended sound source which takes a geometric extent of the first spatial region and which reproduces the diffuse sound which originates from the first spatial region, taking into consideration an occlusion of the spatially extended sound source at a listener position located within the second spatial region.

8. Renderer according to one of claims 1 to 7,

wherein the first spatial region is a first acoustically homogenous space, and/or

wherein the second spatial region is a second acoustically homogenous space.

9. Renderer according to one of claims 1 to 8,

wherein the first spatial region and the second spatial region are rooms which are acoustically coupled via a portal

10. Renderer according to one of claims 1 to 9,

wherein the renderer is configured to render a plurality of spatially extended sound sources comprising one or more spatially extended sources, which are distant from a listener position, and one or more spatially extended sources, inside of which the listener position is located, using a same rendering algorithm, taking into account occlusions between the listener position and the one or more spatially extended sources which are distant from the listener position.

11. Renderer according to one of claims 1 to 10,

wherein the renderer is configured to perform a binaural rendering.

12. Renderer according to one of claims 1 to 11,

wherein the renderer is configured to determine in which spatial region relative to a listener's position and/or a listener's orientation, the spatially extended sound source for the reproduction of the diffuse sound lies, and to render the spatially extended sound source in dependence thereon.

13. Renderer according to one of claims 1 to 12,

wherein the renderer is configured to determine in which spatial region relative to a listener's position and/or a listener's orientation, the spatially extended sound source for the reproduction of the diffuse sound is occluded, and to render the spatially extended sound source in dependence thereon.

14. Renderer according to one of claims 1 to 13,

wherein the renderer is configured to determine in which spatial region relative to a listener's position and/or a listener's orientation, the spatially extended sound source for the reproduction of the diffuse sound lies using a ray-tracing based approach.

15. Renderer according to one of claims 1 to 14,

wherein the renderer is configured to determine in which spatial region relative to a listener's position and/or a listener's orientation, the spatially extended sound source for the reproduction of the diffuse sound is occluded using a ray-tracing based approach.

16. Renderer according to one of claims 1 to 15,

wherein the renderer is configured to determine, for a plurality of areas, whether a ray associated with a respective area and extending away from a listener's position hits the spatially extended sound source, to thereby determine in which spatial region relative to a listener's position and/or a listener's orientation, the spatially extended sound source for the reproduction of the diffuse sound lies.

17. Renderer according to one of claims 1 to 16,

wherein the renderer is configured to determine one or more auditory cue information items in dependence on the spatial region in which the spatially extended sound source for the reproduction of the diffuse sound lies, and

wherein the renderer is configured to process one or more audio signals representing the diffuse sound using the one or more auditory cue information items, in order to obtain a rendered version of the diffuse sound.

18. Renderer according to one of claims 1 to 17,

wherein the renderer is configured to update the determination, in which spatial region relative to a listener's position and/or a listener's orientation, the spatially extended sound source for the reproduction of the diffuse sound lies, in response to a movement of the listener, and/or

Wherein the renderer is configured to update the determination of the one or more auditory cue information items in response to a movement of the listener, and/or

wherein the renderer is configured to update the determination of the one or more cue information items in response to a change of the spatial region in which the spatially extended sound source for the reproduction of the diffuse sound lies.

19. An audio decoder, comprising:

a renderer according to one of claims 1 to 18,

wherein the audio decoder is configured to obtain a geometry description of a portal from a bitstream and to map the geometry of the portal onto a listener-centered coordinate system, in order to obtain a geometry description of the spatially extended sound source for the reproduction of the diffuse sound.

20. Audio decoder according to claim 19,
wherein the audio decoder is configured to obtain two or more signals, which are at least partially decorrelated, for the rendering of the spatially extended sound source derived from the output of a late reverb generator.

21. Audio decoder according to claim 19 or 20,

wherein the audio decoder is configured to obtain two or more signals for the rendering of the spatially extended sound source using a feedback delay network reverberator.

22. Audio decoder according to one of claims 19 to 21,

wherein the decoder is configured to use a sound source signal and a decorrelated version of the sound source signal for the rendering of the spatially extended sound source

23. Audio decoder according to one of claims 19 to 22,

wherein the decoder is configured to exclude or attenuate occluded spatial regions when rendering the spatially extended sound source.

24. Audio decoder according to one of claims 19 to 23,

wherein the decoder is configured to allow for a smooth transition in-and-out of and in-between multiple spatial regions.

25. An audio encoder for encoding an audio scene,

wherein the audio encoder is configured to provide an encoded representation of one or more audio signals ;

wherein the audio encoder is configured to identify a plurality of acoustically homogenous spaces and to provide definitions of spatially extended sound sources on the basis thereof, wherein geometrical characteristics of the spatially extended sound sources are identical to geometrical characteristics of the identified acoustically homogenous spaces.

26. An audio encoder according to claim 25,

wherein the audio encoder is configured to provide definitions of acoustic obstacles between the acoustically homogenous spaces.

27. An audio encoder for encoding an audio scene,

wherein the audio encoder is configured to provide an encoded representation of one or more audio signals ;

wherein the audio encoder is configured to provide definitions of one or more spatially extended sound sources, wherein geometrical characteristics of the spatially extended sound sources are based on geometrical characteristics of portals between acoustically homogenous spaces.

28. Audio encoder according to claim 27,

wherein the audio encoder is configured to identify a plurality of acoustically homogenous spaces and one or more portals between the acoustically homogenous spaces, and to provide definitions of one or more spatially extended sound sources

on the basis thereof, wherein geometrical characteristics of the one or more spatially extended sound sources are based on dimensions of the identified portals. .

29. A method for rendering an acoustic scene,

wherein the method comprises rendering an acoustic impact of a diffuse sound, which originates in a first spatial region, in a second spatial region, using a spatially extended sound source.

30. A method for encoding an audio scene,

wherein the method comprises providing an encoded representation of one or more audio signals ;

wherein the method comprises identifying a plurality of acoustically homogenous spaces and providing definitions of spatially extended sound sources on the basis thereof, wherein geometrical characteristics of the spatially extended sound sources are identical to geometrical characteristics of the identified acoustically homogenous spaces.

31. A method for encoding an audio scene,

wherein the method comprises providing an encoded representation of one or more audio signals ;

wherein the method comprises providing definitions of one or more spatially extended sound sources, wherein geometrical characteristics of the spatially extended sound sources are based on geometrical characteristics of portals between acoustically homogenous spaces.

32. A computer program for performing the method of one of claims 29 to 31 when the computer program runs on a computer.

33. An audio bitstream, comprising:

an encoded representation of one or more audio signals; and

an encoded representation of one or more spatially extended sound sources for rendering an acoustic impact of a diffuse sound, which originates in a first spatial region, and is rendered in a second spatial region.

34. An audio bitstream, comprising:

an encoded description of one or more spatial regions; and

an encoded representation of an information describing an acoustic relation between at least two spatial regions.

35. Audio bitstream according to claim 34,

wherein the encoded representation of spatial regions comprises a description of a portal between two spatial regions.

36. Audio bitstream according to one of claims 34 to 35,

wherein the audio bitstream comprises an encoded representation of a propagation factor describing an acoustic propagation from the first spatial region to the second acoustic region.

37. Audio bitstream according to one of claims 34 to 36,

wherein the audio bitstream comprises a propagation factor describing the amount/fraction of acoustic energy of a first spatial region is radiated into a second spatial region.

38. Audio bitstream according to one of claims 34 to 37,

wherein the audio bitstream comprises a propagation factor describing a ratio between a connected surface area between a first space and a second space and an entire absorption surface area of the first space.

39. Audio bitstream according to one of claims 34 to 38,

Wherein the audio bitstream comprises a parameter describing a range of a transition zone between two spatial regions.