Claims

1. Apparatus for generating an enhanced sound field description, comprising:

a sound field generator for generating at least one sound field description indicating a sound field with respect to at least one reference location; and

a meta data generator for generating meta data relating to spatial information of the sound field,

wherein the at least one sound field description and the meta data constitute the enhanced sound field description,

wherein the sound field generator is configured to generate a DirAC (DirAC = Directional Audio Coding) description of a sound field having one or more downmix signals and individual direction data ~~and optionally diffuseness data~~ for different time-frequency bins and optionally diffuseness data for the different time-frequency bins, and wherein the meta data generator is configured to generate additional individual ~~position or~~ depth information for the different time-frequency bins as the meta data.

2. Apparatus of claim 1,

wherein the sound field generator is configured to estimate the additional individual depth information from audio signals used by the sound field generator or from video signals associated with the audio signals or from a depth map used in stereoscopic (three dimensional) imaging/video or light field technology or from geometric information of a computer graphics scene.

3. Apparatus of ~~one of the preceding~~ claim~~s~~ 1,

wherein the meta data generator is configured to generate, as the additional individual ~~position or~~ depth information, a depth map comprising, for the individual direction data ~~-~~indicating different directions, corresponding distance information.

4. Apparatus of one of the preceding claims, further comprising an output interface for generating an output signal for transmission or storage, the output signal comprising, for a time frame, one or more audio signals derived from the sound field and the spatial information for the time frame.

5. Apparatus in accordance with one of the preceding claims,

wherein the sound field generator is configured to derive the individual direction data from the sound field, the individual direction data referring to a direction of arrival of sound for a time period or a frequency bin, and, wherein the meta data generator is configured to derive the spatial information as data items associating a distance information to the individual direction data.

6. Apparatus of claim 5,

wherein the sound field generator is configured to derive the individual direction data for the different time-frequency bins per time frame of the sound field description,

wherein the meta data generator is configured to derive the data items associating a distance information to the individual direction data for the time frame, and

wherein an output interface is configured to generate the output signals so that the data items for the time frame are linked to the individual direction data for the different time-frequency bins.

7. Apparatus of one of the ~~preceding~~ claims 1, 5, or 6,

wherein the additional individual ~~position or~~ depth information comprises a depth map comprising a plurality of direction of arrival data items as the individual direction data, and a plurality of associated distances, so that each direction of arrival of the plurality of direction of arrival data items has an associated distance.

8. Apparatus of one of the preceding claims,

wherein the sound field generator is configured to generate diffuseness information for a plurality of time-frequency bins of a time frame of the sound field, and

wherein the meta data generator is configured to only generate a distance information for a time-frequency bin, when the diffuseness value for the time-frequency bin is lower than a diffuseness threshold, or wherein the meta data generator is configured to only generate a distance meta data being different from a predetermined value, when the diffuseness value for the time-frequency bin is lower than a threshold diffuseness value.

~~9. Apparatus for generating a modified sound field description from a sound field description and meta data relating to spatial information of the sound field description, comprising:~~

~~a sound field calculator for calculating the modified sound field using the spatial information, the sound field description and a translation information indicating a translation from a reference location to a different reference location,~~

~~wherein the sound field description comprises a plurality of sound field components, the plurality of sound field components comprising an omnidirectional component and at least one directional component, wherein the sound field calculator comprises:~~

~~a sound field analyzer for analyzing the sound field components to derive, for different time-frequency bins, direction of arrival;~~

~~a translation transformer for calculating modified direction of arrival information per frequency bin using the direction data and meta data, the meta data comprising a depth map associating a distance information to the direction of arrival information for a time-frequency bin; and~~

~~a distance compensator for calculating the modified sound field using a distance compensation information depending on the distance provided by the depth map for the time-frequency bin, and a new distance associated with the time-frequency bin being related to the modified direction of arrival information,~~

~~or~~

wherein the sound field calculator is configured:

to determine sources from the sound field description and directions for the sources by a sound field analysis;

to determine, for each source, a distance of the source from the reference location using the meta data;

to determine a new direction of the source related to the different reference location using the direction for the source and the translation information;

to determine a new distance information for the source related to the different reference location; and

to generate the modified sound field using the new direction of the source, the new distance information, and the sound field description or source signals corresponding to the sources derived from the sound field description,

or

wherein the sound field calculator is configured

to calculate, for a DirAC (DirAC = Directional Audio Coding) description as the sound field description, modified direction data for different time-frequency bins using the direction data, depth information and the translation information, and

to render the DirAC description using the modified direction data to a sound description comprising a plurality of audio channels or to transmit or store the DirAC description using the modified direction data instead of the direction data for the time-frequency bins, and optionally the same diffuseness data as included in the DirAC description.

10. Apparatus of claim 9, wherein the sound field calculator is configured to determine, for a time-frequency bin, to maintain the direction data or to calculate the modified direction data based on the diffuseness data for the time-frequency bin, wherein the modified direction data is only calculated for a diffuseness data indicating a diffuseness being lower than a predefined or adaptive diffuseness level.

11. Apparatus of one of claims 9 to 10, further comprising:

a translation interface for providing the translation information or rotation information indicating a rotation of an intended listener for the modified sound field;

a meta data supplier for supplying the meta data to the sound field calculator;

a sound field supplier for supplying the sound field description to the sound field calculator; and

an output interface for outputting the modified sound field comprising the modified sound field description and modified meta data, the modified meta data being derived from the meta data using the translation information, or for outputting a plurality of loudspeaker channels, each loudspeaker channel being related to a predefined loudspeaker position, or for outputting a binaural representation of the modified sound field.

12. Apparatus of one of claims 9 to 11, wherein the sound field calculator is configured

for calculating a first vector pointing from the reference location to a sound source obtained by the analysis of the sound field;

for calculating a second vector pointing from the different reference location to the sound source using the first vector and the translation information, the translation information defining a translation vector from the reference location to the different reference location; and

for calculating a distance modification value using the different reference location, a location of the sound source, and the second vector, or using a distance from the

different reference location to the location of the sound source and the second vector.

13. Apparatus of one of claims 9 to 12,

wherein a first vector is calculated by multiplying a direction of arrival unit vector as the direction data by a distance included in the meta data, or

wherein a second vector is calculated by subtracting the translation vector from the first vector, or

wherein the distance modification value is calculated by dividing the second vector by a norm of the first vector.

14. Apparatus of one of claims 9 to 13,

wherein the sound field calculator is configured to receive, in addition to the translation information, a rotation information, and

wherein the sound field calculator is configured to perform a rotation transformation to rotate a direction of arrival data for a sound field using the rotation information, wherein the direction of arrival data is derived from a direction of arrival data obtained by a sound field analysis of the sound field description and using the translation information.

15. Apparatus of one of claims 9 to 14, wherein the sound field calculator is configured:

to determine source signals from the sound field description and, as the direction data, directions of the source signals related to the reference location by a sound analysis;

to calculate, as the modified direction data, new directions of the source signals related to the different reference location using the translation information;

to calculate distance information for the sound sources related to the different reference location; and

to synthesize the modified sound field using the distance information, the source signals and the new directions.

16. Apparatus of claim 15, wherein the sound field calculator is configured:

to synthesize the modified sound field by panning a sound source signal to a direction given by the new direction in relation to a replay setup, and

by scaling the sound source signal using the distance information before performing the panning or subsequent to performing the panning.

17. Apparatus of claim 15 or 16,

wherein the sound field calculator is configured to add a diffuse signal to a direct part of the sound source signal, the direct part being modified by the distance information before being added to the diffuse signal.

18. Apparatus of one of claims 15 to 17, wherein the sound field calculator is configured

to perform a time-frequency conversion of the sound field description and to calculate a direction of arrival for a plurality of time-frequency bins of a time frame, as the direction data;

to calculate the new direction for each time-frequency bin, as the modified direction data,

to calculate the distance information for each time-frequency bin, and

to perform a direct synthesis for each frequency bin using an audio signal for a time-frequency bin, a panning gain for the time-frequency bin being derived from the new direction for the time-frequency bin and a scaling vector for the time-frequency bin derived from the distance information for the time-frequency bin.

19. Apparatus of claim 18, wherein the sound field calculator is configured

to perform a diffuse synthesis using a diffuse audio signal derived from the audio signal for the time-frequency bin and using a diffuseness parameter derived by the sound analysis for the time-frequency bin and to combine the direct part and the diffuse part to obtain a synthesized audio signal for the time-frequency bin; and

to perform a frequency-time conversion using the audio signals for the time-frequency bins for a time frame to obtain a time domain synthesized audio signal as the modified sound field.

20. Apparatus of one of claims 16 to 19, wherein the sound field calculator is configured to synthesize, for each sound source, a sound field related to the different reference location, the synthesis comprising:

for each source, processing a source signal using the new direction for the source signal to obtain a sound field description of the source signal related to the different reference location;

modifying the source signal before processing the source signal or modifying the sound field description using the direction information; and

adding the sound field descriptions for the sources to obtain a modified sound field related to the different reference location.

21. Apparatus of one of claims 16 to 20,

wherein the sound analysis is configured to obtain, in addition to a source signal, a diffuse signal, and

wherein the sound field calculator is configured to add the diffuse signal to a direct part calculated using the new direction and the distance information.

22. Apparatus of claim 21,

~~wherein the sound analysis is configured to determine the source signals by a source separation algorithm and to subtract at least some of the source signals from the sound field description to obtain the diffuse signal.~~

~~23~~9. Method of generating an enhanced sound field description, comprising:

generating at least one sound field description indicating a sound field with respect to at least one reference location; and

generating meta data relating to spatial information of the sound field,

wherein the at least one sound field description and the meta data constitute the enhanced sound field description,

wherein the generating the at least one sound field description comprises generating a DirAC (DirAC = Directional Audio Coding) description of a sound field having one or more downmix signals and individual direction data ~~and optionally diffuseness data~~ for different time-frequency bins and optionally diffuseness data for different time-frequency bins, and wherein the generating the meta data comprises generating additional individual ~~position or~~ depth information for the different time-frequency bins as the meta data.

~~24. Method of generating a modified sound field description from a sound field description and meta data relating to spatial information of the sound field description, the method comprising:~~

~~calculating the modified sound field using the spatial information, the sound field description and a translation information indicating a translation from a reference location to a different reference location,~~

~~wherein the sound field description comprises a plurality of sound field components, the plurality of sound field components comprising an omnidirectional component and at least one directional component, wherein the calculating comprises:~~

~~analyzing the sound field components to derive, for different time-frequency bins, direction of arrival;~~

calculating modified direction of arrival information per frequency bin using the direction data and meta data, the meta data comprising a depth map associating a distance information to the direction of arrival information for a time-frequency bin; and

calculating the modified sound field using a distance compensation information depending on the distance provided by the depth map for the time-frequency bin, and a new distance associated with the time-frequency bin being related to the modified direction of arrival information,

or

wherein the calculating comprises:

determining sources from the sound field description and directions for the sources by a sound field analysis;

determining, for each source, a distance of the source from the reference location using the meta data;

determining a new direction of the source related to the different reference location using the direction for the source and the translation information;

determining a new distance information for the source related to the different reference location; and

generating the modified sound field using the new direction of the source, the new distance information, and the sound field description or source signals corresponding to the sources derived from the sound field description,

or

wherein the calculating the modified sound field comprises

~~calculating, for a DirAC description as the sound field description, modified direction data for different time-frequency bins using the direction data, the depth information and the translation information, and~~

~~rendering the DirAC description using the modified direction data to a sound description comprising a plurality of audio channels or transmitting or storing the DirAC description using the modified direction data instead of the direction data for the time-frequency bins, and optionally the same diffuseness data as included in the DirAC description.~~

~~25~~10. Computer program for performing, when running on a computer or a processor, the method of claim ~~23 or the method of claim 24~~9.

~~26~~11. Enhanced sound field description, comprising:

at least one sound field description indicating a sound field with respect to at least one reference location and meta data relating to spatial information of the sound field, ~~—~~

wherein the at least one sound field description comprises a DirAC description of a sound field having one or more downmix signals and individual direction data ~~and optionally diffuseness data~~ for different time-frequency bins and optionally diffuseness data for different time-frequency bins, and wherein the meta data comprises additional individual ~~position or~~ depth information for the different time-frequency bins.

~~27~~12. Enhanced sound field description of claim ~~26~~11, wherein the meta data comprises, as the additional individual ~~position or~~ depth information, a depth map associating distance data information items to direction data items.