Source Positioning Using Vector Base Amplitude Panning", Journal of AES, vol.45, no.6, pp.456-466, 1997

SUMMARY OF THE INVENTION

PROBLEMS TO BE SOLVED BY THE INVENTION

[0009]

In both of the channel-based audio and the object-based audio described above, however, localization of sound is determined by the content creator, and users can only hear the sound of the content as provided. For example, at the content reproduction side, such a reproduction of the way in which sounds are heard when the listening point is moved from a back seat to a front seat in a live music club cannot be provided.

[0010]

With the aforementioned technologies, as described above, it cannot be said that audio reproduction can be achieved with sufficiently high flexibility.

[0011]

Embodiments of the present invention disclose audio reproduction with increased flexibility.

SOLUTIONS TO PROBLEMS

[0012]

According to a first aspect, there is provided an audio processing device, including: a position information correction unit configured to calculate corrected position information indicating a position of a sound source relative to a listening position at which sound from the sound source is heard, wherein the calculation is based on position information indicating the position of the sound source and listening position information indicating the listening position; and a generation unit configured to generate a reproduction signal that reproduces sound from the sound source to be heard at the listening position by using vector base amplitude panning (VBAP), based on a waveform signal of

the sound source and the corrected position information.

[0013]

In an embodiment, the position information correction unit may be further configured to calculate the corrected position information based on modified position information indicating a modified position of the sound source and the listening position information.

[0014]

In an embodiment, the audio processing device may further be provided with a correction unit configured to execute at least one of gain correction or frequency characteristic correction on the waveform signal based on a distance from the sound source to the listening position.

[0015]

In an embodiment, the audio processing device may further be provided with a spatial acoustic characteristic addition unit configured to add a spatial acoustic characteristic to the waveform signal, based on the listening position information and the modified position information.

[0016]

In an embodiment, the spatial acoustic characteristic addition unit may be further configured to add at least one of early reflection or a reverberation characteristic as the spatial acoustic characteristic to the waveform signal.

[0017]

In an embodiment, the audio processing device may further be provided with a spatial acoustic characteristic addition unit configured to add a spatial acoustic characteristic to the waveform signal, based on the listening position information and the position information.

[0018]

In an embodiment, the audio processing device may further be provided with a convolution processor configured to execute a convolution process on the reproduction signal on at least two channels generated by the generation unit to generate

reproduction signals on the at least two channels.

[0019]

According to a second aspect, there is provided an audio processing method, including: calculating corrected position information indicating a position of a sound source relative to a listening position at which sound from the sound source is heard, the calculation being based on position information indicating the position of the sound source and listening position information indicating the listening position; and generating a reproduction signal reproducing sound from the sound source to be heard at the listening position by using vector base amplitude panning (VBAP), based on a waveform signal of the sound source and the corrected position information.

[0019a]

According to a third aspect, there is provided a non-transitory computer readable storage medium having stored thereon computer readable instructions, which when executed by a computer, cause the computer to execute operations, the operations including: calculating corrected position information indicating a position of a sound source relative to a listening position at which sound from the sound source is heard, the calculation being based on position information indicating the position of the sound source and listening position information indicating the listening position; and generating a reproduction signal reproducing sound from the sound source to be heard at the listening position by using vector base amplitude panning (VBAP), based on a waveform signal of the sound source and the corrected position information

[0020]

In one embodiment of the present invention, corrected position information indicating a position of a sound source relative to a listening position at which sound from the sound source is heard is calculated based on position information

indicating the position of the sound source and listening position information indicating the listening position, and a reproduction signal reproducing sound from the sound source to be heard at the listening position is generated based on a waveform signal of the sound source and the corrected position information.

EFFECTS OF THE INVENTION

[0021]

According to embodiments of the present invention, audio reproduction with increased flexibility is achieved.

[0022]

The effects mentioned herein are not necessarily limited to those mentioned here, but may be any effect mentioned in the present disclosure.

BRIEF DESCRIPTION OF DRAWINGS

[0023]

Fig. 1 is a diagram illustrating a configuration of an audio processing device.

Fig. 2 is a graph explaining assumed listening position and corrected position information.

Fig. 3 is a graph showing frequency characteristics in frequency characteristic correction.

Fig. 4 is a diagram explaining VBAP.

Fig. 5 is a flowchart explaining a reproduction signal generation process.

Fig. 6 is a diagram illustrating a configuration of an audio processing device.

Fig. 7 is a flowchart explaining a reproduction signal generation process.

Fig. 8 is a diagram illustrating an example

CLAIMS

1. An audio processing device, comprising:

a position information correction unit configured to calculate corrected position information indicating a position of a sound source relative to a listening position at which sound from the sound source is heard,

wherein the calculation is based on position information indicating the position of the sound source and listening position information indicating the listening position; and

a generation unit configured to generate a reproduction signal that reproduces sound from the sound source to be heard at the listening position by using vector base amplitude panning (VBAP), based on a waveform signal of the sound source and the corrected position information.

2. The audio processing device according to claim 1, wherein

the position information correction unit is further configured to calculate the corrected position information based on modified position information indicating a modified position of the sound source and the listening position information.

3. The audio processing device according to claim 1, further comprising

a correction unit configured to execute at least one of gain correction or frequency characteristic correction on the waveform signal based on a distance from the sound source to the listening position.

4. The audio processing device according to claim 2, further comprising

a spatial acoustic characteristic addition unit configured to add a spatial acoustic characteristic to the waveform signal, based on the listening position information and the modified position information.

5. The audio processing device according to claim 4, wherein

the spatial acoustic characteristic addition unit is further configured to add at least one of early reflection or a reverberation characteristic as the spatial acoustic characteristic to the waveform signal.

6. The audio processing device according to claim 1, further comprising

a spatial acoustic characteristic addition unit configured to add a spatial acoustic characteristic to the waveform signal, based on the listening position information and the position information.

7. The audio processing device according to claim 1, further comprising

a convolution processor configured to execute a convolution process on the reproduction signal on at least two channels generated by the generation unit to generate reproduction signals on the at least two channels.

8. An audio processing method, comprising:

calculating corrected position information indicating a position of a sound source relative to a listening position at which sound from the sound source is heard, the calculation being based on position information indicating the position of the sound source and listening position information indicating the listening position; and

generating a reproduction signal reproducing sound from the sound source to be heard at the listening position by using vector base amplitude panning (VBAP), based on a waveform signal of the sound source and the corrected position information.

9. A non-transitory computer readable storage medium having stored thereon computer readable instructions, which when executed by a computer, cause the computer to execute

operations, the operations comprising:

calculating corrected position information indicating a position of a sound source relative to a listening position at which sound from the sound source is heard, the calculation being based on position information indicating the position of the sound source and listening position information indicating the listening position; and

generating a reproduction signal reproducing sound from the sound source to be heard at the listening position by using vector base amplitude panning (VBAP), based on a waveform signal of the sound source and the corrected position information.

10. The audio processing device according to claim 1, wherein the position information of the sound source is expressed by spherical coordinates.

11. The audio processing device according to claim 10, wherein the spherical co-ordinates correspond to at least one of an azimuth angle, an elevation angle or a radius with respect to a position on a spherical surface having a center at a standard listening position.

12. The audio processing device according to claim 10, wherein the position information of the sound source is further expressed by coordinates of an orthogonal coordinate system that has an origin at a standard listening position.

13. The audio processing device according to claim 6, wherein based on the corrected position information supplied from the position information correction unit, a mapping is executed on the waveform signal supplied from the spatial acoustic characteristic addition unit.