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 enable audio reproduction with increased flexibility.

SOLUTIONS TO PROBLEMS

[0011a]

According to a first aspect of the present invention, there is provided an audio processing device including: a position information correction unit configured to calculate corrected position information that indicates a first position of a sound source relative to a listening position at which sound from the sound source is heard, wherein the corrected position information is calculated based on position information and listening position information, the position information indicating a second position of the sound source relative to a standard listening position and the listening position information indicating the listening position, the second position of the sound source is expressed by a spherical coordinate and the listening position is expressed by xyz coordinate, and a generation unit configured to generate a reproduction signal that reproduces sound from the sound source to be heard at the listening position, wherein the reproduction signal is generated based on vector base amplitude panning (VBAP), a waveform signal of the sound source, and the corrected position information.

[0012]

Disclosed herein is an audio processing device that includes: 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, the calculation being 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 reproducing sound from the sound source to be heard at the listening position, based on a waveform signal of the sound source and the corrected position information.

[0013]

The position information correction unit may be 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]

The audio processing device may further be provided with a correction unit configured to perform at least one of gain correction and frequency characteristic correction on the waveform signal depending on a distance from the sound source to the listening position.

[0015]

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]

The spatial acoustic characteristic addition unit may be configured to add at least one of early reflection and a reverberation characteristic as the spatial acoustic characteristic to the waveform signal.

[0017]

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]

The audio processing device may further be provided with a convolution processor configured to perform a convolution process on the reproduction signals on two or more channels generated by the generation unit to generate reproduction signals on two channels.

[0018a]

According to a second aspect of the present invention, there is provided audio processing method, including: in an audio processing device: calculating corrected position information that indicates a first position of a sound source relative to a listening position at which sound from the sound source is heard, wherein the corrected position information is calculated based on position information and listening position information, the position information indicating a second position of the sound source relative to a standard listening position and the listening position information indicating the listening position, the second position of the sound source is expressed by a spherical coordinate and the listening position is expressed by xyz coordinate, and generating a reproduction signal that reproduces sound from the sound source to be heard at the listening position, wherein the reproduction signal is generated based on vector base amplitude panning (VBAP), a waveform signal of the sound source, and the corrected position information.

[0018b]

According to a third aspect of the present invention, there is provided a non-transitory computer readable storage medium having stored thereon computer-executable instructions, which when executed by a computer, cause the computer to execute operations including: calculating corrected position information that indicates a first position of a sound source relative to a listening position at which sound from the sound source is heard, wherein the corrected position information is calculated based on position information indicating the position of the sound source and listening position information, the position information indicating a second position of the sound source relative to a standard listening position and the listening position information indicating the listening position, the second position of the sound source is expressed by a spherical coordinate and the listening position is expressed by xyz coordinate, and generating a reproduction signal that reproduces sound from the sound source to be heard at the listening position, wherein the reproduction signal is generated based on three-dimensional vector base amplitude panning (VBAP), a waveform signal of the sound source, and the corrected position information.

[0019]

Disclosed herein is an audio processing method or program that includes the steps of: 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, 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 that indicates a first position of a sound source relative to a listening position at which sound from the sound source is heard, wherein

the corrected position information is calculated based on position information and listening position information, the position information indicating a second position of the sound source relative to a standard listening position and the listening position information indicating the listening position,

the second position of the sound source is expressed by a spherical coordinate and the listening position is expressed by xyz coordinate, and

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

2. An audio processing method, comprising:

in an audio processing device:

calculating corrected position information that indicates a first position of a sound source relative to a listening position at which sound from the sound source is heard, wherein

the corrected position information is calculated based on position information and listening position information, the position information indicating a second position of the sound source relative to a standard listening position and the

listening position information indicating the listening position,

the second position of the sound source is expressed by a spherical coordinate and the listening position is expressed by xyz coordinate, and

generating a reproduction signal that reproduces sound from the sound source to be heard at the listening position, wherein the reproduction signal is generated based on vector base amplitude panning (VBAP), a waveform signal of the sound source, and the corrected position information.

3. A non-transitory computer readable storage medium having stored thereon computer-executable instructions, which when executed by a computer, cause the computer to execute operations comprising:

calculating corrected position information that indicates a first position of a sound source relative to a listening position at which sound from the sound source is heard, wherein

the corrected position information is calculated based on position information indicating the position of the sound source and listening position information, the position information indicating a second position of the sound source relative to a standard listening position and the listening position information indicating the listening position,

the second position of the sound source is expressed by a spherical coordinate and the listening position is expressed by xyz coordinate, and

generating a reproduction signal that reproduces sound from the sound source to be heard at the listening position, wherein the reproduction signal is generated based on three-dimensional vector base amplitude panning (VBAP), a waveform signal of the sound source, and the corrected position information.