CLAIMS

[Claim 1] An audio signal processing device comprising:

a discontinuity detector configured to determine an occurrence of a discontinuity of decoded audio from a sudden increase of amplitude of the decoded audio, the decoded audio being obtained by decoding a first audio packet that is received correctly after an occurrence of a packet loss; and

a discontinuity corrector configured to correct the discontinuity of the decoded audio.

[Claim 2] The audio signal processing device according to claim 1, wherein the discontinuity detector is configured to use a power of an excitation signal to determine an occurrence of a discontinuity of the decoded audio.

[Claim 3] The audio signal processing device according to claim 1, wherein the discontinuity detector is configured to use quantized codebook gains used for calculation of an excitation signal to determine an occurrence of a discontinuity of the decoded audio.

[Claim 4] The audio signal processing device according to claim 1, further comprising:

an auxiliary information decoder configured to decode auxiliary information for determination on an occurrence of a discontinuity transmitted from an encoder and output the decoded auxiliary information as an auxiliary information code,

wherein the discontinuity detector is configured to use the decoded auxiliary information to determine an occurrence of a discontinuity of the decoded audio.

[Claim 5] The audio signal processing device according to any one of claims 1 to 4, wherein the discontinuity corrector is configured to correct ISF/LSF parameters according to a result of determination on an occurrence of a discontinuity made by the discontinuity detector.

[Claim 6] The audio signal processing device according to claim 5, wherein the discontinuity corrector is configured to change, according to a result of determination on an occurrence of a discontinuity made by the discontinuity detector, a distance between elements of the ISF/LSF parameters, the distance being given for ensuring stability of a synthesis filter.

[Claim 7] The audio signal processing device according to claim 6, wherein the discontinuity corrector is configured to extend the distance for ensuring the stability of the synthesis filter to become larger than an ordinary distance between the elements of the ISF/LSF parameters given for ensuring stability.

[Claim 8] The audio signal processing device according to claim 6, wherein the discontinuity corrector is configured to use, as the distance between the elements of the ISF/LSF parameters given for ensuring the stability of the synthesis filter, a distance obtained by equally dividing the ISF/LSF parameters into those of a predetermined length.

[Claim 9] The audio signal processing device according to claim 6, wherein the discontinuity corrector is configured to replace a part of or all of the ISF/LSF parameters with predetermined vectors.

[Claim 10] An audio signal processing device comprising:

an ISF/LSF quantizer configured to quantize ISF/LSF parameters;

an ISF/LSF concealer configured to generate concealment ISF/LSF parameters representative of concealment information about the ISF/LSF parameters;

a discontinuity detector configured to determine an occurrence of a discontinuity which occurs in a first audio packet which is received correctly after an occurrence of a packet loss, the discontinuity detector being configured to use distances between quantized ISF/LSF parameters obtained by the ISF/LSF quantizer and the concealment ISF/LSF parameters generated by the ISF/LSF concealer to determine an occurrence of a discontinuity; and

an auxiliary information encoder configured to encode auxiliary information for determination on an occurrence of a discontinuity.

[Claim 11] An audio signal processing device comprising:

a discontinuity detector configured to determine an occurrence of a discontinuity which occurs in a first audio packet which is received correctly after an occurrence of a packet loss;

an auxiliary information encoder configured to encode auxiliary information for determination on an occurrence of a discontinuity; and

an ISF/LSF quantizer configured to use past quantized ISF/LSF residual parameters for ISF/LSF quantization of a given frame when the discontinuity detector does not determine an occurrence of a discontinuity, and avoid using the past quantized ISF/LSF residual parameters for the ISF/LSF quantization of the given frame when the discontinuity detector determines an occurrence of a discontinuity.

[Claim 12] An audio signal processing device comprising:

an auxiliary information decoder configured to decode and

output auxiliary information for determination on an occurrence of a discontinuity of a decoded audio which occurs in a first audio packet which is received correctly after an occurrence of a packet loss;

a discontinuity corrector configured to correct the discontinuity of the decoded audio; and

an ISF/LSF decoder configured to use past quantized ISF/LSF residual parameters for ISF/LSF calculation of a given frame when the auxiliary information output by the auxiliary information decoder does not indicate an occurrence of a discontinuity and avoid using the past quantized ISF/LSF residual parameters for the ISF/LSF calculation of the given frame when the auxiliary information output by the auxiliary information decoder indicates an occurrence of a discontinuity.

[Claim 13] The audio signal processing device according to any one of claims 1 to 9 and 12, further comprising:

a reception state determiner configured to determine packet reception states of a predetermined number of past frames,

wherein the discontinuity corrector is configured to correct the discontinuity using the packet reception states determined by the reception state determiner and a result of determination on an occurrence of a discontinuity made by the discontinuity detector.

[Claim 14] An audio signal processing method to be executed by an audio signal processing device, comprising:

determining an occurrence of a discontinuity of decoded audio from a sudden increase of an amplitude of the decoded audio, the decoded audio being obtained by decoding a first audio packet which is received correctly after an occurrence of a packet loss; and

correcting the discontinuity of the decoded audio.

[Claim 15] An audio signal processing method to be executed by an audio signal processing device, comprising:

quantizing ISF/LSF parameters;

generating concealment ISF/LSF parameters being representative of concealment information about the ISF/LSF parameters;

determining an occurrence of a discontinuity which occurs in a first audio packet which is received correctly after an occurrence of a packet loss, determining an occurrence of a discontinuity comprising using distances between quantized ISF/LSF parameters and the generated concealment ISF/LSF parameters; and

encoding auxiliary information for determination on an occurrence of a discontinuity.

[Claim 16] An audio signal processing method to be executed by an audio signal processing device, comprising:

determining an occurrence of a discontinuity which occurs in a first audio packet which is received correctly after an occurrence of a packet loss;

encoding auxiliary information for determination on an occurrence of a discontinuity; and

using past quantized ISF/LSF residual parameters for ISF/LSF quantization of a given frame when an occurrence of a discontinuity is not determined and avoiding using the past quantized ISF/LSF residual parameters for the ISF/LSF quantization of the given frame when an occurrence of a discontinuity is determined.

[Claim 17] An audio signal processing method to be executed by an audio signal processing device, comprising:

decoding and outputting auxiliary information for determination on an occurrence of a discontinuity of a decoded audio which occurs in a first audio packet which is received correctly after an occurrence of a packet loss;

correcting the discontinuity of the decoded audio; and

using past quantized ISF/LSF residual parameters for ISF/LSF calculation of a given frame when the auxiliary information does not indicate an occurrence of a discontinuity, and avoiding using the past quantized ISF/LSF residual parameters for the ISF/LSF calculation in the given frame when the auxiliary information indicates an occurrence of a discontinuity.

[Claim 18] A non-transitory storage medium that stores an audio signal processing program that programs a computer to operate as:

a discontinuity detector operable to determine an occurrence of a discontinuity of a decoded audio from a sudden increase of an amplitude of the decoded audio, the decoded audio being obtained by decoding a first audio packet which is received correctly after an occurrence of a packet loss; and

a discontinuity corrector operable to correct the discontinuity of the decoded audio.

[Claim 19] A non-transitory storage medium that stores an audio signal processing program that programs a computer to operate as:

an ISF/LSF quantizer operable to quantize ISF/LSF parameters;

an ISF/LSF concealer operable to generate concealment

ISF/LSF parameters being representative of concealment information about the ISF/LSF parameters;

a discontinuity detector operable to determine an occurrence of a discontinuity which occurs in a first audio packet which is received correctly after an occurrence of a packet loss, the discontinuity detector being operable to use distances between quantized ISF/LSF parameters obtained by the ISF/LSF quantizer and the concealment ISF/LSF parameters generated by the ISF/LSF concealer in order to determine an occurrence of a discontinuity; and

an auxiliary information encoder operable to encode auxiliary information for determination on an occurrence of a discontinuity.

[Claim 20] A non-transitory storage medium that stores an audio signal processing program that programs a computer to operate as:

a discontinuity detector operable to determine an occurrence of a discontinuity which occurs in a first audio packet which is received correctly after an occurrence of a packet loss;

an auxiliary information encoder operable to encode auxiliary for determination on an occurrence of a discontinuity; and

an ISF/LSF quantizer operable to use past quantized ISF/LSF residual parameters for ISF/LSF quantization of a given frame when the discontinuity detector does not determine an occurrence of a discontinuity, and avoid using the past quantized ISF/LSF residual parameters for the ISF/LSF quantization of the given frame when the discontinuity detector determines an occurrence of a discontinuity.

[Claim 21] A non-transitory storage medium that stores an audio signal processing program that programs a computer to operate as:

an auxiliary information decoder operable to decode and output auxiliary information for determination on an occurrence of a discontinuity of a decoded audio which occurs in a first audio packet which is received correctly after an occurrence of a packet loss;

a discontinuity corrector operable to correct the discontinuity of the decoded audio; and

an ISF/LSF decoder operable to use past quantized ISF/LSF residual parameters for ISF/LSF calculation of a given frame when the auxiliary information does not indicate an occurrence of a discontinuity, and avoid using the past quantized ISF/LSF residual parameters for the ISF/LSF calculation of the given frame when the auxiliary information indicates an occurrence of a discontinuity.

Claims

1. An audio signal processing method to be executed by an audio signal processing device, comprising:

determining an occurrence of a discontinuity of decoded audio, the discontinuity occurring with a sudden increase of an amplitude of the decoded audio, the decoded audio being obtained by decoding a first audio packet which is received correctly after an occurrence of a packet loss; and

correcting the discontinuity of the decoded audio,

wherein the step of correcting changes, according to a result of determination on an occurrence of a discontinuity, a distance between elements of ISF/LSF parameters.

2. An audio signal processing device comprising:

a discontinuity detector configured to determine an occurrence of a discontinuity of decoded audio, the discontinuity occurring with a sudden increase of amplitude of the decoded audio, the decoded audio being obtained by decoding a first audio packet that is received correctly after an occurrence of a packet loss; and

a discontinuity corrector configured to correct the discontinuity of the decoded audio,

wherein the discontinuity corrector changes, according to a result of determination on an occurrence of a discontinuity, a distance between elements of ISF/LSF parameters,

3. An audio signal processing method to be executed by an audio signal processing device, comprising:

quantizing ISF/LSF parameters;

generating concealment ISF/LSF parameters being representative of concealment information about the ISF/LSF parameters;

determining an occurrence of a discontinuity which occurs in a first audio packet which is received correctly after an occurrence of a packet loss, determining an occurrence of a discontinuity comprising using distances between quantized ISF/LSF parameters obtained in a quantization process of the ISF/LSF parameters and the generated concealment ISF/LSF parameters; and

encoding auxiliary information for determination on an occurrence of a discontinuity

4. An audio signal processing device comprising:

an ISF/LSF quantizer configured to quantize ISF/LSF parameters;

an ISF/LSF concealer configured to generate concealment ISF/LSF parameters representative of concealment information about the ISF/LSF parameters;

a discontinuity detector configured to determine an occurrence of a discontinuity which occurs in a first audio packet which is received correctly after an occurrence of a packet loss, the discontinuity detector being configured to use distances between quantized ISF/LSF parameters obtained in a quantization process of the ISF/LSF quantizer and the concealment ISF/LSF parameters generated by the ISF/LSF concealer to determine an occurrence of a discontinuity; and

an auxiliary information encoder configured to encode auxiliary information for determination on an occurrence of a discontinuity.

5. An audio signal processing program that programs a computer to operate as:

a discontinuity detector operable to determine an occurrence of a discontinuity of a decoded audio, the discontinuity occurring with a sudden increase of an amplitude of the decoded audio, the decoded audio being obtained by decoding a first audio packet which is received correctly after an occurrence of a packet loss; and

a discontinuity corrector operable to correct the discontinuity of the decoded audio,

wherein the discontinuity corrector changes, according to a result of determination on an occurrence of a discontinuity, a distance between elements of the ISF/LSF parameters.

6. An audio signal processing program that programs a computer to operate as:

an ISF/LSF quantizer operable to quantize ISF/LSF parameters;

an ISF/LSF concealer operable to generate concealment ISF/LSF parameters being representative of concealment information about the

ISF/LSF parameters;

a discontinuity detector operable to determine an occurrence of a discontinuity which occurs in a first audio packet which is received correctly after an occurrence of a packet loss, the discontinuity detector being operable to use distances between quantized ISF/LSF parameters obtained in a quantization process of the ISF/LSF quantizer and the concealment ISF/LSF parameters generated by the ISF/LSF concealer in order to determine an occurrence of a discontinuity; and

an auxiliary information encoder operable to encode auxiliary information for determination on an occurrence of a discontinuity.