Claims

1. A method for generating a reconstructed audio signal having a baseband portion and a highband portion, the method comprising:

deformatting an encoded audio signal into a first part and a second part;

extracting, from the first part, temporal envelope information, wherein the temporal envelope information includes coefficients representing a reconstruction filter;

extracting, from the first part, spectral components of the baseband portion, wherein the spectral components of the baseband portion do not include spectral components of the highband portion;

decoding the first part to obtain a decoded baseband audio signal, wherein the decoding includes filtering in a frequency domain at least some of the spectral components of the baseband portion with the reconstruction filter using the temporal envelope information to shape a temporal envelope of the baseband portion;

extracting, from the second part, a noise parameter and an estimated spectral envelope of the highband portion;

obtaining a plurality of subband signals by filtering the decoded baseband audio signal;

generating a high-frequency reconstructed signal by copying, in a circular manner, a number of consecutive subband signals of the plurality of subband signals;

obtaining an envelope adjusted high-frequency signal by adjusting, based on the estimated spectral envelope of the highband portion, a spectral envelope of the highfrequency reconstructed signal;

generating a noise component based on the noise parameter, wherein the noise parameter indicates a level of noise contained in the highband portion;

obtaining a combined high-frequency signal by adding the noise component to the envelope adjusted high-frequency signal; and

obtaining a time-domain reconstructed audio signal by combining the decoded baseband audio signal and the combined high-frequency signal;

wherein the method is implemented by an audio decoding device comprising one or more hardware elements.

2. The method of claim 1 wherein the plurality of subband signals is generated with one or more Quadrature Mirror Filters (QMF).

3. The method of claim 1 wherein the encoded audio signal is decoded using an inverse modified Discrete Cosine Transform (DCT).

4. The method of claim 1 wherein the noise parameter is represented in a form of a normalized ratio.

5. The method of claim 4 further comprising converting the normalized~~)~~ ratio to an amplitude value.

6. The method of claim 1 further comprising limiting an amount of envelope adjustment of the high-frequency reconstructed signal.

~~7. The method of claim 6 further comprising compensating for the limiting by boosting the combined high-frequency signal.~~

~~8~~7. The method of claim 1 further comprising ~~smoothing~~modulating, based on a parameter extracted from the encoded audio signal, an amount of envelope adjustment of the high-frequency reconstructed signal.

~~9~~8. An audio decoding device comprising one or more hardware elements that implement the method of claim 1 by executing a sequence of instructions.

~~10~~9. A non-transitory computer-readable medium containing instructions that when executed by an audio decoding device comprising one or more hardware elements, cause the audio decoding device to implement the method of claim 1.

~~11~~10. An audio decoder generating a reconstructed audio signal having a baseband portion and a highband portion, the audio decoder comprising:

a deformatter for extracting a first part and a second part from an encoded audio signal;

an extractor for obtaining, from the first part, temporal envelope information, wherein the temporal envelope information includes coefficients representing a reconstruction filter;

an extractor for obtaining, from the first part, spectral components of the baseband

portion, wherein the spectral components of the baseband portion do not include spectral components of the highband portion;

a decoder for obtaining a decoded baseband audio signal from the first part, wherein the decoder includes a reconstruction filter for processing at least some of the spectral components of the baseband portion using the temporal envelope information to shape a temporal envelope of the baseband portion;

an extractor for obtaining, from the second part, a noise parameter and an estimated spectral envelope of the highband portion;

a filter for obtaining a plurality of subband signals from the decoded baseband audio signal;

a generator for creating a high-frequency reconstructed signal by copying, in a circular manner, a number of consecutive subband signals of the plurality of subband signals;

an envelope adjuster for obtaining an envelope adjusted high-frequency signal by adjusting, based on the estimated spectral envelope of the highband portion, a spectral envelope of the high-frequency reconstructed signal;

a noise generator for generating a noise component based on the noise parameter, wherein the noise parameter indicates a level of noise contained in the highband portion;

a combiner for obtaining a combined high-frequency signal by adding the noise component to the envelope adjusted high-frequency signal; and

a synthesizer for obtaining a time-domain reconstructed audio signal by combining the decoded baseband audio signal and the combined high-frequency signal;

wherein the audio decoder comprises one or more hardware elements.