Claims
(Clean version)

1. Parametric frequency-domain audio decoder, configured to

identify (12) first scale factor bands of a spectrum of a first channel of a current frame of a multichannel audio signal, within which all spectral lines are quantized to zero, and second scale factor bands of the spectrum, within which at least one spectral line is quantized to non-zero;

fill (16) the spectral lines within a predetermined scale factor band of the first scale factor bands with noise generated using

spectral lines of a downmix of a previous frame of the multichannel audio signal,

with adjusting a level of the noise using a scale factor of the predetermined scale factor band;

dequantize (14) the spectral lines within the second scale factor bands using scale factors of the second scale factor bands; and

inverse transform (18) the spectrum obtained from the first scale factor bands filled with the noise the level of which is adjusted using the scale factors of the first scale factor bands, and the second scale factor bands dequantized using the scale factors of the second scale factor bands, so as to obtain a time domain portion of the first channel of the multichannel audio signal.

2. Parametric frequency-domain audio decoder according to claim 1, further configured to, in the filling,

adjust a level of a co-located portion of a spectrum of the downmix of the previous frame, spectrally co-located to the predetermined scale factor band, using the scale factor of the predetermined scale factor band, and add the co-located portion having its level adjusted, to the predetermined scale factor band.

3. Parametric frequency-domain audio decoder according to claim 2, further configured to predict a subset of the scale factor bands from a different channel or downmix of the current frame to obtain an inter-channel prediction, and use the predetermined scale factor band filled with the noise, and the second scale factor bands dequantized using the scale factors of the second scale factor bands as a prediction residual of the inter-channel prediction to obtain the spectrum.

4. Parametric frequency-domain audio decoder according to claim 3, further configured to, in predicting the subset of the scale factor bands, perform an imaginary part estimation of the different channel or downmix of the current frame using the spectrum of the downmix of the previous frame.

5. Parametric frequency-domain audio decoder according to any of claims 1 to 4, wherein the current channel and the other channel are subject to MS coding in the data stream, and the parametric frequency-domain audio decoder is configured to subject the spectrum to MS decoding.

6. Parametric frequency-domain audio decoder according to any of the previous claims, further configured to sequentially extract the scale factors of the first and second scale factor bands from a data stream using context-adaptive entropy decoding with context determination depending on, and/or using predictive decoding with spectral prediction depending on, already extracted scale factors in a spectral neighborhood of a currently extracted scale factor, with the scale factors spectrally arranged according to a spectral order among the first and second scale factor bands.

7. Parametric frequency-domain audio decoder according to any of the previous claims, further configured such that the noise is additionally generated using pseudorandom or random noise.

8. Parametric frequency-domain audio decoder according to claim 7, further configured to adjust a level of the pseudorandom or random noise equally for the first scale factor bands, according to a noise parameter signaled in a data stream for the current frame.

9. Parametric frequency-domain audio decoder according to any of the previous claims, further configured to equally modify the scale factors of the first scale factor bands relative to the scale factors of the second scale factor bands using a modifying parameter signaled in a data stream for the current frame.

10. Parametric frequency-domain audio encoder, configured to

quantize spectral lines of a spectrum of a first channel of a current frame of a multichannel audio signal using preliminary scale factors of scale factor bands within the spectrum;

identify first scale factor bands in the spectrum within which all spectral lines are quantized to zero, and second scale factor bands of the spectrum within which at least one spectral line is quantized to non-zero,

within a prediction and/or rate control loop,

fill the spectral lines within a predetermined scale factor band of the first scale factor bands with noise generated using

spectral lines of a downmix of a previous frame of the multichannel audio signal, or
spectral lines of a different channel of the current frame of the multichannel audio signal,

with adjusting a level of the noise using an actual scale factor of the predetermined scale factor band; and

signal the actual scale factor for the predetermined scale factor band instead of the preliminary scale factor.

11. Parametric frequency-domain audio encoder according to claim 10, further configured to calculate the actual scale factor for the predetermined scale factor band based on a level of an un-quantized version of the spectral lines of the spectrum of the first channel within the predetermined scale factor band and additionally based on the spectral lines of the downmix of the previous frame of the

multichannel audio signal or spectral lines of a different channel of the current frame of the multichannel audio signal.

12. Parametric frequency-domain audio decoding method comprising

identify first scale factor bands of a spectrum of a first channel of a current frame of a multichannel audio signal, within which all spectral lines are quantized to zero, and second scale factor bands of the spectrum, within which at least one spectral line is quantized to non-zero;

fill the spectral lines within a predetermined scale factor band of the first scale factor bands with noise generated using

spectral lines of a downmix of a previous frame of the multichannel audio signal,

with adjusting a level of the noise using a scale factor of the predetermined scale factor band;

dequantize the spectral lines within the second scale factor bands using scale factors of the second scale factor bands; and

inverse transform the spectrum obtained from the first scale factor bands filled with the noise the level of which is adjusted using the scale factors of the first scale factor bands, and the second scale factor bands dequantized using the scale factors of the second scale factor bands, so as to obtain a time domain portion of the first channel of the multichannel audio signal.

13. Parametric frequency-domain audio encoding method comprising

quantize spectral lines of a spectrum of a first channel of a current frame of a multi-channel audio signal using preliminary scale factors of scale factor bands within the spectrum;

identify first scale factor bands in the spectrum within which all spectral lines are quantized to zero, and second scale factor bands of the spectrum within which at least one spectral line is quantized to non-zero,

within a prediction and/or rate control loop,

fill the spectral lines within a predetermined scale factor band of the first scale factor bands with noise generated using

spectral lines of a downmix of a previous frame of the multichannel audio signal, or
spectral lines of a different channel of the current frame of the multichannel audio signal,

with adjusting a level of the noise using an actual scale factor of the predetermined scale factor band,

signal the actual scale factor for the predetermined scale factor band instead of the preliminary scale factor.

14. Computer program having a program code for performing, when running on a computer, a method according to claim 12 or 13.

Claims

1. Parametric frequency-domain audio decoder, configured to

identify first scale factor bands of a spectrum of a first channel of a current frame of a multichannel audio signal, within which all spectral lines are quantized to zero, and second scale factor bands of the spectrum, within which at least one spectral line is quantized to non-zero;

fill the spectral lines within a predetermined scale factor band of the first scale factor bands with noise generated using

spectral lines of a downmix of a previous frame of the multichannel audio signal,

with adjusting a level of the noise using a scale factor of the predetermined scale factor band;

dequantize the spectral lines within the second scale factor bands using scale factors of the second scale factor bands; and

inverse transform the spectrum obtained from the first scale factor bands filled with the noise the level of which is adjusted using the scale factors of the first scale factor bands, and the second scale factor bands dequantized using the scale factors of the second scale factor bands, so as to obtain a time domain portion of the first channel of the multichannel audio signal.

2. Parametric frequency-domain audio decoder according to claim 1, further configured to, in the filling,

adjust a level of a co-located portion of a spectrum of the downmix of the previous frame, spectrally co-located to the predetermined scale factor band, using the scale factor of the predetermined scale factor band, and add the co-located portion having its level adjusted, to the predetermined scale factor band.

3. Parametric frequency-domain audio decoder according to claim 2, further configured to predict a subset of the scale factor bands from a different channel or downmix of the current frame to obtain an inter-channel prediction, and use the predetermined scale factor band filled with the noise, and the second scale factor bands dequantized using the scale factors of the second scale factor bands as a prediction residual of the inter-channel prediction to obtain the spectrum.

4. Parametric frequency-domain audio decoder according to claim 3, further configured to, in predicting the subset of the scale factor bands, perform an imaginary part estimation of the different channel or downmix of the current frame using the spectrum of the downmix of the previous frame.

5. Parametric frequency-domain audio decoder according to any of claims 1 to 4, wherein the current channel and the other channel are subject to MS coding in the data stream, and the parametric frequency-domain audio decoder is configured to subject the spectrum to MS decoding.

6. Parametric frequency-domain audio decoder according to any of the previous claims, further configured to sequentially extract the scale factors of the first and second scale factor bands from a data stream using context-adaptive entropy decoding with context determination depending on, and/or using predictive decoding with spectral prediction depending on, already extracted scale factors in a spectral neighborhood of a currently extracted scale factor, with the scale factors spectrally arranged according to a spectral order among the first and second scale factor bands.

7. Parametric frequency-domain audio decoder according to any of the previous claims, further configured such that the noise is additionally generated using pseudorandom or random noise.

8. Parametric frequency-domain audio decoder according to claim 7, further configured to adjust a level of the pseudorandom or random noise equally for the first scale factor bands, according to a noise parameter signaled in a data stream for the current frame.

9. Parametric frequency-domain audio decoder according to any of the previous claims, further configured to equally modify the scale factors of the first scale factor bands relative to the scale factors of the second scale factor bands using a modifying parameter signaled in a data stream for the current frame.

10. Parametric frequency-domain audio encoder, configured to

quantize spectral lines of a spectrum of a first channel of a current frame of a multichannel audio signal using preliminary scale factors of scale factor bands within the spectrum;

identify first scale factor bands in the spectrum within which all spectral lines are quantized to zero, and second scale factor bands of the spectrum within which at least one spectral line is quantized to non-zero,

within a prediction and/or rate control loop,

fill the spectral lines within a predetermined scale factor band of the first scale factor bands with noise generated using

spectral lines of a downmix of a previous frame of the multichannel audio signal,

with adjusting a level of the noise using an actual scale factor of the predetermined scale factor band; and

signal the actual scale factor for the predetermined scale factor band instead of the preliminary scale factor.

11. Parametric frequency-domain audio encoder according to claim 10, further configured to calculate the actual scale factor for the predetermined scale factor band based on a level of an un-quantized version of the spectral lines of the spectrum of the first channel within the predetermined scale factor band and additionally based on the spectral lines of the downmix of the previous frame of the multichannel audio signal or spectral lines of a different channel of the current frame of the multichannel audio signal.

12. Parametric frequency-domain audio decoder, configured to

Identify first scale factor bands of a spectrum of a first channel of a current frame of a multichannel audio signal, within which all spectral lines are quantized to zero, and second scale factor bands of the spectrum, within which at least one spectral line is quantized to non-zero;

Fill the spectral lines within a predetermined scale factor band of the first scale factor bands with noise generated using

spectral lines of a different channel of the current frame of the multichannel audio signal,

with adjusting a level of the noise using a scale factor of the predetermined scale factor band;

dequantize the spectral lines within the second scale factor bands using scale factors of the second scale factor bands; and

inverse transform the spectrum obtained from the first scale factor bands filled with the noise the level of which is adjusted using the scale factors of the first scale factor bands, and the second scale factor bands dequantized using the scale factors of the second scale factor bands, so as to obtain a time domain portion of the first channel of the multichannel audio signal.

13. Parametric frequency-domain audio decoder according to claim 12, further configured to, in the filling,

adjust a level of a co-located portion of a spectrum of the downmix of the previous frame, spectrally co-located to the predetermined scale factor band, using the scale factor of the predetermined scale factor band, and add the co-located portion having its level adjusted, to the predetermined scale factor band.

14. Parametric frequency-domain audio decoder according to claim 13, further configured to predict a subset of the scale factor bands from a different channel or

downmix of the current frame to obtain an inter-channel prediction, and use the predetermined scale factor band filled with the noise, and the second scale factor bands dequantized using the scale factors of the second scale factor bands as a prediction residual of the inter-channel prediction to obtain the spectrum.

15. Parametric frequency-domain audio decoder according to claim 14, further configured to, in predicting the subset of the scale factor bands, perform an imaginary part estimation of the different channel or downmix of the current frame using the spectrum of the downmix of the previous frame.

16. Parametric frequency-domain audio decoder according to any of claims 12 to 15, wherein the current channel and the other channel are subject to MS coding in the data stream, and the parametric frequency-domain audio decoder is configured to subject the spectrum to MS decoding.

17. Parametric frequency-domain audio decoder according to any of claims 12 to 16, further configured to sequentially extract the scale factors of the first and second scale factor bands from a data stream using context-adaptive entropy decoding with context determination depending on, and/or using predictive decoding with spectral prediction depending on, already extracted scale factors in a spectral neighborhood of a currently extracted scale factor, with the scale factors spectrally arranged according to a spectral order among the first and second scale factor bands.

18. Parametric frequency-domain audio decoder according to any of claims 12 to 17, further configured such that the noise is additionally generated using pseudorandom or random noise.

19. Parametric frequency-domain audio decoder according to claim 18, further configured to adjust a level of the pseudorandom or random noise equally for the first scale factor bands, according to a noise parameter signaled in a data stream for the current frame.

20. Parametric frequency-domain audio decoder according to any of claims 12 to 19, further configured to equally modify the scale factors of the first scale factor bands

relative to the scale factors of the second scale factor bands using a modifying parameter signaled in a data stream for the current frame.

21. Parametric frequency-domain audio encoder, configured to

quantize spectral lines of a spectrum of a first channel of a current frame of a multichannel audio signal using preliminary scale factors of scale factor bands within the spectrum;

identify first scale factor bands in the spectrum within which all spectral lines are quantized to zero, and second scale factor bands of the spectrum within which at least one spectral line is quantized to non-zero,

within a prediction and/or rate control loop,

fill the spectral lines within a predetermined scale factor band of the first scale factor bands with noise generated using

spectral lines of a different channel of the current frame of the multichannel audio signal,

with adjusting a level of the noise using an actual scale factor of the predetermined scale factor band; and

signal the actual scale factor for the predetermined scale factor band instead of the preliminary scale factor.

22. Parametric frequency-domain audio encoder according to claim 21, further configured to calculate the actual scale factor for the predetermined scale factor band based on a level of an un-quantized version of the spectral lines of the spectrum of the first channel within the predetermined scale factor band and additionally based on the spectral lines of the downmix of the previous frame of the multichannel audio signal or spectral lines of a different channel of the current frame of the multichannel audio signal.

23. Parametric frequency-domain audio decoding method comprising

identify first scale factor bands of a spectrum of a first channel of a current frame of a multichannel audio signal, within which all spectral lines are quantized to zero, and second scale factor bands of the spectrum, within which at least one spectral line is quantized to non-zero;

fill the spectral lines within a predetermined scale factor band of the first scale factor bands with noise generated using

spectral lines of a downmix of a previous frame of the multichannel audio signal,

with adjusting a level of the noise using a scale factor of the predetermined scale factor band;

dequantize the spectral lines within the second scale factor bands using scale factors of the second scale factor bands; and

inverse transform the spectrum obtained from the first scale factor bands filled with the noise the level of which is adjusted using the scale factors of the first scale factor bands, and the second scale factor bands dequantized using the scale factors of the second scale factor bands, so as to obtain a time domain portion of the first channel of the multichannel audio signal.

24. Parametric frequency-domain audio encoding method comprising

quantize spectral lines of a spectrum of a first channel of a current frame of a multi-channel audio signal using preliminary scale factors of scale factor bands within the spectrum;

identify first scale factor bands in the spectrum within which all spectral lines are quantized to zero, and second scale factor bands of the spectrum within which at least one spectral line is quantized to non-zero,

within a prediction and/or rate control loop,

fill the spectral lines within a predetermined scale factor band of the first scale factor bands with noise generated using

spectral lines of a downmix of a previous frame of the multichannel audio signal,

with adjusting a level of the noise using an actual scale factor of the predetermined scale factor band;

signal the actual scale factor for the predetermined scale factor band instead of the preliminary scale factor.

25. Parametric frequency-domain audio decoding method comprising

identify first scale factor bands of a spectrum of a first channel of a current frame of a multichannel audio signal, within which all spectral lines are quantized to zero, and second scale factor bands of the spectrum, within which at least one spectral line is quantized to non-zero;

fill the spectral lines within a predetermined scale factor band of the first scale factor bands with noise generated using

spectral lines of a different channel of the current frame of the multichannel audio signal,

with adjusting a level of the noise using a scale factor of the predetermined scale factor band;

dequantize the spectral lines within the second scale factor bands using scale factors of the second scale factor bands; and

inverse transform the spectrum obtained from the first scale factor bands filled with the noise the level of which is adjusted using the scale factors of the first scale factor bands, and the second scale factor bands dequantized using the scale factors of the second scale factor bands, so as to obtain a time domain portion of the first channel of the multichannel audio signal.

26. Parametric frequency-domain audio encoding method comprising

quantize spectral lines of a spectrum of a first channel of a current frame of a multi-channel audio signal using preliminary scale factors of scale factor bands within the spectrum;

identify first scale factor bands in the spectrum within which all spectral lines are quantized to zero, and second scale factor bands of the spectrum within which at least one spectral line is quantized to non-zero,

within a prediction and/or rate control loop,

fill the spectral lines within a predetermined scale factor band of the first scale factor bands with noise generated using

spectral lines of a different channel of the current frame of the multichannel audio signal,

with adjusting a level of the noise using an actual scale factor of the predetermined scale factor band;

signal the actual scale factor for the predetermined scale factor band instead of the preliminary scale factor.

27. Computer program having a program code for performing, when running on a computer, a method according to any of claims 23 to 26.