Claims

1. Linear prediction based audio decoder comprising:

a probability distribution estimator ~~(102)~~ configured to determine, for each of a plurality of spectral components, a probability distribution estimation ~~(28)~~ from linear prediction coefficient information contained in a data stream ~~(22)~~ into which an audio signal is encoded; ~~and~~

an entropy decoding and dequantization stage ~~(104)~~ configured to entropy decode and dequantize a spectrum ~~(26)~~ composed of the plurality of spectral components from the data stream ~~(22)~~ using the probability distribution estimation as determined for each of the plurality of spectral components; and

~~2. Linear prediction based audio decoder according to claim 1, further comprising:~~

a filter configured to shape the spectrum ~~(26)~~ according to a transfer function depending on a linear prediction synthesis filter defined by the linear prediction coefficient information.

~~7.~~ ~~Linear prediction based audio decoder according to any of claims 2 to 5,~~ wherein the probability distribution estimator is configured to determine a spectral fine structure from long-term prediction parameters contained in the data stream and determine, for each of the plurality of spectral components, a probability distribution parameter such that the probability distribution parameters spectrally follow a function which multiplicatively depends on the spectral fine structure, wherein, for each of the plurality of spectral components, the probability distribution estimation is a parameterizable function parameterized with the probability distribution parameter of the respective spectral component.

~~3~~2. Linear prediction based audio decoder according to claim 1 ~~or 2~~, further comprising:

a scale-factor determiner ~~(110)~~ configured to determine scale factors based on the linear prediction coefficient information; and

a spectral shaper ~~(112)~~ configured to spectrally shape the spectrum by scaling the spectrum using the scale factors,

wherein the scale factor determiner is configured to determine the scale factors such that same represent a transfer function depending on a linear prediction synthesis filter defined by the linear prediction coefficient information.

43. Linear prediction based audio decoder according to claim ~~2~~ 1 or ~~3~~2, wherein

the transfer function's dependency on the linear prediction synthesis filter defined by the linear prediction coefficient information is such that the transfer function is perceptually weighted.

~~5~~4. Linear prediction based audio decoder according to any of claims ~~2~~ 1 to 43, wherein

the transfer function's dependency on the linear prediction synthesis filter 1/A(z) defined by the linear prediction is such that the transfer function is a transfer function of 1/A(k·z), where k is a constant.

~~6. Linear prediction based audio decoder according to any of claims 2 to 5, wherein the probability distribution estimator is configured to determine, for each of the plurality of spectral components, a probability distribution parameter such that the probability distribution parameters spectrally follow a function which depends on a product of a transfer function of the linear prediction synthesis filter and an inverse of a transfer function of a perceptually weighted modification of the linear prediction synthesis filter, wherein, for each of the plurality of spectral components, the probability distribution estimation is a parameterizable function parameterized with the probability distribution parameter of the respective spectral component.~~

~~7. Linear prediction based audio decoder according to any of claims 2 to 5, wherein the probability distribution estimator is configured to determine a spectral fine structure from long-term prediction parameters contained in the data stream and determine, for each of the plurality of spectral components, a probability distribution parameter such that the probability distribution parameters spectrally follow a function which multiplicatively depends on the spectral fine structure, wherein, for each of the plurality of spectral components, the probability distribution estimation is a parameterizable function parameterized with the probability distribution parameter of the respective spectral component.~~

85. Linear prediction based audio decoder according to any of the previous claims~~claim 7~~, wherein the probability distribution estimator is configured such that the spectral fine structure is a comb-like structure defined by the long-term prediction parameters.

96. Linear prediction based audio decoder according to any of the previous claims~~claim 7 or 8~~, wherein the long-term prediction parameters comprise a long-term prediction gain and a long-term prediction pitch.

~~10~~7. Linear prediction based audio decoder according to any of claims ~~6~~1 to 96, wherein, for each of the plurality of spectral components, the parameterizable function is defined such that the probability distribution parameter is a measure for a dispersion of the probability distribution estimation.

~~11~~8. Linear prediction based audio decoder according to any of claims ~~6~~1 to ~~10~~7, wherein, for each of the plurality of spectral components, the parameterizable function is a Laplace distribution, and the probability distribution parameter of the respective spectral component forms a scale parameter of the respective Laplace distribution.

~~12~~9. Linear prediction based audio decoder according to any of the claims ~~2~~1 to ~~11~~8, further comprising a de-emphasis filter.

~~13~~10. Linear prediction based audio decoder according to any of the preceding claims, wherein the entropy decoding and dequantization stage ~~(104)~~ is configured to, in dequantizing and entropy decoding the spectrum of the plurality of spectral components, treat sign and magnitude at the plurality of spectral components separately with using the probability distribution estimation as determined for each of the plurality of spectral components for the magnitude.

~~14~~11. Linear prediction based audio decoder according to any of the previous claims, wherein the entropy decoding and dequantizing stage ~~(104)~~ is configured to use the probability distribution estimation in entropy decoding a magnitude level of the spectrum per spectral component and dequantize the magnitude levels equally for all spectral components so as to obtain the spectrum.

~~15~~12. Linear prediction based audio decoder according to claim ~~14~~11, wherein the entropy decoding and quantization stage ~~(104)~~ is configured to use a constant quantization step size for dequantizing the magnitude levels.

~~16~~13. Linear prediction based audio decoder according to any of the previous claims, further comprising

an inverse transformer configured to subject the spectrum to a real-valued critically sampled inverse transform so as to obtain an aliasing-suffering time-domain signal portion; and

an overlap-adder configured to subject the aliasing-suffering time-domain signal portion to an overlap-and-add process with a preceding and/or succeeding time-domain portion so as to reconstruct the audio signal.

~~17~~14. Linear prediction based audio encoder comprising:

a linear prediction analyzer ~~(12)~~ configured to determine linear prediction coefficient information;

a probability distribution estimator ~~(14)~~ configured to determine, for each of a plurality of spectral components, a probability distribution estimation from the linear prediction coefficient information; and

a spectrum determiner ~~(16)~~ configured to determine a spectrum composed of the plurality of spectral components from an audio signal;

a quantization and entropy encoding stage ~~(18)~~ configured to quantize and entropy encode the spectrum using the probability distribution estimation as determined for each of the plurality of spectral components.

~~18. Linear prediction based audio encoder according to claim 16,~~ wherein the spectrum determiner ~~(16)~~ is configured to shape an original spectrum of the audio signal according to a transfer function which depends on an inverse of a linear prediction synthesis filter defined by the linear prediction coefficient information, and

~~23.~~ wherein the ~~L~~linear prediction based audio encoder ~~according to any of claims 18 to 22,~~ further comprise~~s~~~~ing~~ a long-term predictor configured to determine long-term prediction parameters and the probability distribution estimator is configured to determine a spectral fine structure from the long-term prediction parameters and determine, for each of the plurality of spectral components, a probability distribution parameter such that the probability distribution parameters spectrally follow a function which depends on a product of a transfer function of the linear prediction synthesis filter, an inverse of a transfer function of a perceptually weighted modification of the linear prediction synthesis filter, and the spectral fine structure, wherein, for each of the plurality of spectral components, the probability distribution estimation is a parameterizable function parameterized with the probability distribution parameter of the respective spectral component.

~~19~~15. Linear prediction based audio encoder according to claim ~~17~~ 14~~or 18~~, wherein the spectrum determiner ~~(16)~~ comprises:

a scale-factor determiner ~~(34)~~ configured to determine scale factors based on the linear prediction coefficient information;

a transformer ~~(36)~~ configured to spectrally decompose the audio signal to obtain the original spectrum; and

a spectral shaper ~~(38)~~ configured to spectrally shape the original spectrum by scaling the spectrum using the scale factors,

wherein the scale factor determiner ~~(34)~~ is configured to determine the scale factors such that the spectral shaping by the spectral shaper using the scale factors corresponds to a transfer function which depends on an inverse of a linear prediction synthesis filter defined by the linear prediction coefficient information.

~~20~~16. Linear prediction based audio encoder according to claim ~~18~~ 14 or ~~19~~15, wherein

the transfer function's dependency on the inverse of the linear prediction synthesis filter defined by the linear prediction is such that the transfer function is perceptually weighted.

~~21~~17. Linear prediction based audio encoder according to any of claims ~~18~~ 14 to ~~20~~16, wherein

the transfer function's dependency on the inverse of the linear prediction synthesis filter 1/A(z) defined by the linear prediction coefficient information such that the transfer function is an inverse of a transfer function of 1/A(k·z), where k is a constant.

~~22. Linear prediction based audio encoder according to any of claims 18 to 21, wherein the probability distribution estimator is configured to determine, for each of the plurality of spectral components, a probability distribution parameter such that the probability distribution parameters spectrally follow a function which depends on a product of a transfer function of the linear prediction synthesis filter and an inverse of a transfer function of a perceptually weighted modification of the linear prediction synthesis filter, wherein, for each of the plurality of spectral components, the probability distribution estimation is a parameterizable function parameterized with the probability distribution parameter of the respective spectral component.~~

~~23. Linear prediction based audio encoder according to any of claims 18 to 22, further comprising a long-term predictor configured to determine long-term prediction parameters and the probability distribution estimator is configured to determine a spectral fine structure from the long-term prediction parameters and determine, for each of the plurality of spectral components, a probability distribution parameter such that the probability distribution parameters spectrally follow a function which depends on a product of a transfer function of the linear prediction synthesis filter, an inverse of a transfer function of a perceptually weighted modification of the linear prediction synthesis filter, and the spectral fine structure, wherein, for each of the plurality of spectral components, the probability distribution estimation is a parameterizable function parameterized with the probability distribution parameter of the respective spectral component.~~

~~24~~18. Linear prediction based audio encoder according to any of claims 14 to ~~23~~17, wherein the probability distribution estimator is configured such that the spectral fine structure is a comb-like structure defined by the long-term prediction parameters.

~~25~~19. Linear prediction based audio encoder according to any of claims ~~23~~-14 to ~~18~~24, wherein the long-term prediction parameters comprise a long-term prediction gain and a long-term prediction pitch.

2620. Linear prediction based audio encoder according to any of claims 22-14 to 2519, wherein, for each of the plurality of spectral components, the parameterizable function is defined such that the probability distribution parameter is a measure for a dispersion of the probability distribution estimation.

2721. Linear prediction based audio encoder according to any of claims 22-14 to 2620, wherein, for each of the plurality of spectral components, the parameterizable function is a Laplace distribution, and the probability distribution parameter of the respective spectral component forms a scale parameter of the respective Laplace distribution.

2822. Linear prediction based audio encoder according to any of the claims 19-14 to 2721, further comprising a pre-emphasis filter (24) configured to subject the audio signal to a pre-emphasis.

2923. Linear prediction based audio encoder according to any of claims 18-14 to 2822, wherein the quantization and entropy encoding stage is configured to, in quantizing and entropy encoding the spectrum of the plurality of spectral components, treat sign and magnitude at the plurality of spectral components separately with using the probability distribution estimation as determined for each of the plurality of spectral components for the magnitude.

3024. Linear prediction based audio encoder according to any of claims 18-14 to 2923, wherein the quantization and entropy encoding stage (18) is configured to quantize the spectrum equally for all spectral components so as to obtain magnitude levels for the spectral components and use the probability distribution estimation in entropy encoding the magnitude levels of the spectrum per spectral component.

3125. Linear prediction based audio encoder according to claim 3024, wherein the quantize and entropy encoding stage is configured to use a constant quantization step size for the quantizing.

3226. Linear prediction based audio encoder according to any of claims 18-14 to 3125, wherein the transformer is configured to perform a real-valued critically sampled transform

3327. Method for linear prediction based audio decoding, comprising:

determining, for each of a plurality of spectral components, a probability distribution estimation ~~(28)~~ from linear prediction coefficient information contained in a data stream ~~(22)~~ into which an audio signal is encoded; and

entropy decoding and dequantizing a spectrum ~~(26)~~ composed of the plurality of spectral components from the data stream ~~(22)~~ using the probability distribution estimation as determined for each of the plurality of spectral components.

~~2. Linear prediction based audio decoder according to claim 1, further comprising:~~

the method also comprising ~~a filter configured to~~ shapinge the spectrum ~~(26)~~ according to a transfer function depending on a linear prediction synthesis filter defined by the linear prediction coefficient information.

~~7. Linear prediction based audio decoder according to any of claims 2 to 5,~~ wherein the determination of the probability distribution estimationr ~~is configured to~~ comprises determininge a spectral fine structure from long-term prediction parameters contained in the data stream and determininge, for each of the plurality of spectral components, a probability distribution parameter such that the probability distribution parameters spectrally follow a function which multiplicatively depends on the spectral fine structure, wherein, for each of the plurality of spectral components, the probability distribution estimation is a parameterizable function parameterized with the probability distribution parameter of the respective spectral component.

~~34~~28. Method for linear prediction based audio encoding, comprising:

determining linear prediction coefficient information;

determining, for each of a plurality of spectral components, a probability distribution estimation from the linear prediction coefficient information; and

determining a spectrum composed of the plurality of spectral components from an audio signal;

quantizing and entropy encoding the spectrum using the probability distribution estimation as determined for each of the plurality of spectral components,.

~~18.~~ ~~Linear prediction based audio encoder according to claim 16,~~ wherein the determination of the spectrum ~~determiner (16) is configured to~~ comprises shaping~~e~~ an original spectrum of the audio signal according to a transfer function which depends on an inverse of a linear prediction synthesis filter defined by the linear prediction coefficient information, and.

~~23.~~ wherein the ~~Linear prediction based audio encoder according to any of claims 18~~method ~~to 22,~~ further comprise~~s~~ing ~~a long-term predictor configured to~~ determining~~e~~ long-term prediction parameters and the determination of the probability distribution ~~estimator is configured to~~ comprises determining~~e~~ a spectral fine structure from the long-term prediction parameters and determining~~e~~, for each of the plurality of spectral components, a probability distribution parameter such that the probability distribution parameters spectrally follow a function which depends on a product of a transfer function of the linear prediction synthesis filter, an inverse of a transfer function of a perceptually weighted modification of the linear prediction synthesis filter, and the spectral fine structure, wherein, for each of the plurality of spectral components, the probability distribution estimation is a parameterizable function parameterized with the probability distribution parameter of the respective spectral component.

~~35~~29. Computer program having a program code for performing, when running on a computer, a method according to claim ~~33~~ 27 or ~~34~~28.