

What is claimed is:

CLAIMS

1. A method of converting a set of frequency-domain input audio signals to a set of frequency-domain output audio signals, the method comprising:
 - 5 computing, using one or more processors, each frequency-domain output audio signal as a sum of filtered frequency-domain input audio signals, wherein each filter used to filter the frequency-domain input audio signals is characterized by a complex gain function over a respective sub-band frequency range of the frequency-domain input audio signal, wherein
 - 10 contributions of the frequency-domain input audio signals to the frequency-domain output audio signal are determined by a composite frequency-domain gain vector, and the composite frequency-domain gain vector is obtained by:
 - computing, using the one or more processors, a set of component frequency-domain gain vectors, wherein at least one of the component frequency domain gain vectors is a
 - 15 decorrelating component frequency domain gain vector formed by augmenting the component frequency domain gain vector with additional component frequency-domain gain vectors having modified frequency responses to create a decorrelation effect; and
 - summing, using the one or more processors, the component frequency-domain gain vectors to form the composite frequency-domain gain vector.
- 20 2. The method of claim 1, wherein the decorrelating component frequency-domain gain vector is formed by scaling the at least one of the component frequency domain vectors by a component gain value.
- 25 3. The method of any one of the preceding claims 1 or 2, wherein one or more of the component frequency-domain gain vectors includes a phase response that varies over the sub-band frequency range, thereby providing a group-delay that is substantially constant over the sub-band frequency, and where the group-delay is substantially constant if a fluctuation in the group-delay is small enough to be perceptually insignificant for a listener.
- 30 4. The method of any one of the preceding claims 1-3, wherein one or more of the component frequency-domain gain vectors includes a phase response that varies over the sub-band

frequency range, thereby providing a group-delay that varies over the sub-band frequency range to provide the decorrelation effect.

5 5. The method of any one of the preceding claims 1-4, wherein the decorrelating component frequency domain gain vector is formed by multiplying the component frequency domain gain vector by a decorrelation function.

6. A system comprising:
 one or more processors; and
10 a non-transitory computer-readable medium storing instructions that, upon execution by the one or more processors, cause the one or more processors to perform operations of any one of the method claims 1-5.

7. A non-transitory, computer-readable medium storing instructions that, upon execution by
15 one or more processors, cause the one or more processors to perform operations of any one of the method claims 1-5.

8. An audio filterbank with decorrelating components, comprising:
 a converter configured to convert a set of time-domain input audio signals into a set of
20 frequency-domain input audio signals; and
 a linear mixer configured to convert the set of frequency-domain input audio signals into a set of frequency-domain output audio signals, wherein each frequency-domain output audio signal is a sum of filtered frequency-domain input audio signals, wherein each filter used to filter the frequency-domain input audio signals is characterized by a complex gain function
25 over a respective sub-band frequency range of the frequency-domain input audio signal, and contributions of the frequency-domain input audio signals to the frequency-domain output audio signal are determined by a composite frequency-domain gain vector.

9. The audio filterbank of claim 8, wherein the composite frequency-domain gain vector is
30 obtained by:
 computing a set of component frequency-domain gain vectors, wherein at least one of the component frequency domain gain vectors is a decorrelating component frequency domain gain vector formed by augmenting the component frequency domain gain vector with

additional component frequency-domain gain vectors having modified frequency responses to create a decorrelation effect on the frequency-domain output audio signal; and

summing the component frequency-domain gain vectors to form the composite frequency-domain gain vector.

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10. The audio filterbank of any of the claims 8 or 9, wherein the decorrelating component frequency-domain gain vector is formed by scaling the at least one of the component frequency domain vectors by a component gain value.

10 11. The audio filterbank of any one of the preceding claims 8-10, wherein one or more of the component frequency-domain gain vectors includes a phase response that varies over the sub-band frequency range, thereby providing a group-delay that is approximately constant over the sub-band frequency, and where the group-delay is approximately constant if a fluctuation in the group-delay is small enough to be perceptually insignificant for a listener.

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12. The audio filterbank of any one of the preceding claims 8-11, wherein one or more of the component frequency-domain gain vectors includes a phase response that varies over the sub-band frequency range, thereby providing a group-delay that varies over the sub-band frequency range to provide the decorrelation effect on the frequency-domain output audio signal.

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13. The audio filterbank of any one of the preceding claims 8-12, wherein the decorrelating component frequency domain gain vector is formed by multiplying the component frequency domain gain vector by a decorrelation function.

25 14. A filterbank-based audio system, comprising:

a converter configured to convert a set of time-domain input audio signals into a set of frequency-domain input audio signals; and

a linear mixer configured to convert the set of frequency-domain input signals into a set of frequency-domain output signals, wherein the linear mixer includes weighting
30 coefficients that provide a frequency dependent gain function that includes a direct component that is defined as a frequency dependent gain and one or more decorrelated components that have a frequency-varying group phase response, and wherein the frequency dependent gain is formed from a set of sub-band functions, with each sub-band function being formed from a set

of corresponding component transfer functions including a direct component and one or more decorrelated components.