CLAIMS

1. A device comprising:

an audio decoder configured to:

decode a bit stream to generate a time-domain mid channel;

generate a windowed time-domain mid channel by:

application of at least two first asymmetric windows to a first frame of the time-domain mid channel; and

application of at least two second asymmetric windows to a second frame of the time-domain mid channel;

transform the windowed time-domain mid channel to a transform domain to generate sets of transform-domain mid channel data including first transform-domain mid channel data corresponding to a first mid channel window of the first frame and second transform-domain mid channel data corresponding to a second mid channel window of the first frame; and

perform an up-mix operation using the sets of transform-domain mid channel data, stereo parameters from the bit stream, and an interpolated stereo parameter determined using an unevenly weighted interpolation between a first stereo parameter value associated with the first frame and a second stereo parameter value associated with the second frame, wherein the second frame is adjacent to the first frame.

2. The device of claim 1, wherein the decoder is further configured to:

determine a first interpolated stereo parameter value for the first mid channel window based on a sum of a first product and a second product, the first product based on a first interpolation weight and the first stereo parameter value, the second product based on a second interpolation weight and the second stereo parameter value, wherein the first interpolation weight is not equal to the second interpolation weight; and

apply the first interpolated stereo parameter value to the first mid channel window during the up-mix operation.

3. The device of claim 2, wherein the first interpolation weight is equal to one, and wherein the second interpolation weight is equal to zero; or

wherein the first interpolation weight is equal to zero, and wherein the second interpolation weight is equal to one; or

wherein at least a portion of the first mid channel window extends to the second frame.

4. The device of claim 2, wherein the decoder is further configured to:

determine a second interpolated stereo parameter value for the second mid channel window based on a sum of a third product and a fourth product, the third product based on a third interpolation weight and the first stereo parameter value, and the fourth product based on a fourth interpolation weight and the second stereo parameter value, the third interpolation weight greater than or equal to the first interpolation weight, and the fourth interpolation weight less than the second interpolation weight; and

apply the second interpolated stereo parameter value to the second mid channel window during the up-mix operation, and preferably

wherein the second mid channel window does not overlap the second frame; or.

wherein the third interpolation weight is equal to one, and wherein the fourth interpolation weight is equal to zero; or

wherein the first interpolation weight, the second interpolation weight, the third interpolation weight, and the fourth interpolation weight are distinct from corresponding interpolation weights for windows used, by an encoder, to generate the bit stream.

5. The device of claim 1, wherein the unevenly weighted interpolation corresponds to an overlap-dependent interpolation having interpolation weights selected based on an amount of overlap associated with asymmetric windows applied to frames of the time-domain mid channel; or

wherein each interpolation weight associated with the unevenly weighted interpolation is selected to reduce an absolute value of a slope, the slope indicating an amount of stereo parameter variation relative to an amount of asymmetric window overlap of the time-domain mid channel.

6. The device of claim 1, wherein a set of interpolation weights are selected to match an absolute value of a slope across different overlapping portions of the first asymmetric windows and the second asymmetric windows, the slope indicating an amount of stereo parameter variation relative to an amount of asymmetric window overlap of the time-domain mid channel; and preferably

wherein the set of interpolation weights are selected based on a coder type and based on signal characteristics of the first frame of the time-domain mid channel and the second frame of the time-domain mid channel.

7. The device of claim 1, wherein the decoder is further configured to select a set of interpolation weights, wherein based on the set of interpolation weights, a difference between an absolute value of a slope across different overlapping portions of the at least two first asymmetric windows and the at least two second asymmetric windows is less than a difference if each interpolation weight is equal to 0.5, the slope indicating an amount of stereo parameter variation relative to an amount of asymmetric window overlap of the time-domain mid channel; or

wherein the stereo parameters include at least one of interchannel intensity difference (IID) parameters, interchannel time difference (ITD) parameters, interchannel phase difference (IPD) parameters, interchannel correlation (ICC) parameters, non-causal shift parameters, spectral tilt parameters, inter-channel voicing parameters, inter-channel pitch parameters, or inter-channel gain parameters; or

wherein the decoder is further configured to perform a Discrete Fourier Transform (DFT) operation to transform the windowed time-domain mid channel to the transform domain.

8. The device of claim 1, wherein the decoder is further configured to:

generate left channel data and right channel data based on the up-mix operation;

perform a first inverse transform operation on the left channel data to generate a left time-domain channel;

perform a second inverse transform operation on the right channel data to generate a right time-domain channel; and

generate an output based on the left time-domain channel and the right time-domain channel; and preferably

wherein the first inverse transform operation includes a first Inverse Discrete Fourier Transform (IDFT) operation, and wherein the second inverse transform operation includes a second IDFT operation.

9. The device of claim 1, wherein the decoder is further configured to:

generate a time-domain side channel based on the bit stream;

generate a windowed time-domain side channel by applying two asymmetric windows to each frame of the time-domain side channel; and

transform the windowed time-domain side channel to the transform domain to generate sets of transform-domain side channel data including first transform-domain side channel data corresponding to a first side channel window of the first frame and second transform-domain side channel data corresponding to a second side channel window of the first frame,

wherein the up-mix operation is further based on the sets of transform-domain side channel data; or

wherein the decoder is integrated into a base station; or

wherein the decoder is integrated into a mobile device.

10. A method comprising:

decoding, at an audio decoder, a bit stream to generate a time-domain mid channel;

generating a windowed time-domain mid channel by:

applying at least two first asymmetric windows to a first frame of the time-domain mid channel; and

applying at least two second asymmetric windows to a second frame of the time-domain mid channel;

transforming the windowed time-domain mid channel to a transform domain to generate sets of transform-domain mid channel data including first transform-domain mid channel data corresponding to a first mid channel window of the first frame and second transform-domain mid channel data corresponding to a second mid channel window of the first frame; and

performing an up-mix operation using the sets of transform-domain mid channel data, stereo parameters from the bit stream, and an interpolated stereo parameter determined using an unevenly weighted interpolation between a first stereo parameter value associated with the first frame and a second stereo parameter value associated with the second frame, wherein the second frame is adjacent to the first frame.

11. The method of claim 10, further comprising:

determining a first interpolated stereo parameter value for the first mid channel window based on a sum of a first product and a second product, the first product based on a first interpolation weight and the first stereo parameter value, the second product based on a second interpolation weight and the second stereo parameter value, wherein the first interpolation weight is not equal to the second interpolation weight; and

applying the first interpolated stereo parameter value to the first mid channel window during the up-mix operation.

12. The method of claim 11, wherein the first interpolation weight is equal to one, and wherein the second interpolation weight is equal to zero; or

wherein the first interpolation weight is equal to zero, and wherein the second interpolation weight is equal to one; or

wherein at least a portion of the first mid channel window overlaps a portion of the second frame.

13. The method of claim 11, further comprising:

determining a second interpolated stereo parameter value for the second mid channel window based on a sum of a third product and a fourth product, the third product based on a third interpolation weight and the first stereo parameter value, and the fourth product based on a fourth interpolation weight and the second stereo parameter value, the third interpolation weight greater than or equal to the first interpolation weight, and the fourth interpolation weight less than the second interpolation weight; and

applying the second interpolated stereo parameter value to the second mid channel window during the up-mix operation; and preferably

wherein the second mid channel window does not overlap the second frame; or

wherein the third interpolation weight is equal to one, and wherein the fourth interpolation weight is equal to zero; or

wherein the first interpolation weight, the second interpolation weight, the third interpolation weight, and the fourth interpolation weight are distinct from interpolation weights for corresponding windows used, by an encoder, to generate the bit stream.

14. The method of claim 10, wherein the stereo parameters include at least one of interchannel intensity difference (IID) parameters, interchannel time difference (ITD) parameters, interchannel phase difference (IPD) parameters, interchannel correlation (ICC) parameters, non-causal shift parameters, spectral tilt parameters, inter-channel voicing parameters, inter-channel pitch parameters, or inter-channel gain parameters; or

further comprising performing a Discrete Fourier Transform (DFT) operation to transform the windowed time-domain mid channel to the transform domain.

15. The method of claim 10, further comprising:

generating left channel data and right channel data based on the up-mix operation;

performing a first inverse transform operation on the left channel data to generate a left time-domain channel;

performing a second inverse transform operation on the right channel data to generate a right time-domain channel; and

generating an output based on the left time-domain channel and the right time-domain channel; and preferably

wherein the first inverse transform operation includes a first Inverse Discrete Fourier Transform (IDFT) operation, and wherein the second inverse transform operation includes a second IDFT operation.

16. The method of claim 10, further comprising:

generating a time-domain side channel based on the bit stream;

generating a windowed time-domain side channel by applying two asymmetric windows to each frame of the time-domain side channel; and

transforming the windowed time-domain side channel to the transform domain to generate sets of transform-domain side channel data including first transform-domain side channel data corresponding to a first side channel window of the first frame and second transform-domain side channel data corresponding to a second side channel window of the first frame,

wherein the up-mix operation is further based on the sets of transform-domain side channel data.

17. The method of claim 10, wherein the up-mix operation is performed at a base station; or

wherein the up-mix operation is performed at a mobile device.

18. A non-transitory computer-readable medium comprising instructions that, when executed by a processor, cause the processor to perform the steps of any one of method claims 10 to 17.