Claims

1. Decoder for decoding an encoded audio signal, the decoder comprising:

an adaptive spectrum-time converter for converting successive blocks of spectral values into successive blocks of time values; and

an overlap-add-processor for overlapping and adding successive blocks of time values to obtain decoded audio values,

wherein the adaptive spectrum-time converter is configured to receive a control information and to switch, in response to the control information, between transform kernels of a first group of transform kernels comprising one or more transform kernels having different symmetries at sides of a kernel, and a second group of transform kernels comprising one or more transform kernels having the same symmetries at sides of a transform kernel,

wherein the transform kernel of the first group and the second group is based on the following equation:

$$x_{i,n} = C \sum_{k=0}^{M-1} spec[i][k] \;\; \mathrm{cs}\left(\frac{2\pi}{N}(n+n_0)(k+k_0)\right)$$

wherein the at least one transform kernel of the first group is based on the parameters:

cs( ) = cos( ) and $k_0 = 0.5$ or

cs( ) = sin( ) and $k_0 = 0.5$, or

wherein the at least one transform kernel of the second group is based on the parameters:

cs( ) = cos( ) and $k_0 = 0$; or

cs( ) = sin( ) and $k_0 = 1$,

wherein $x_{i,n}$ is a time domain output, C is a constant parameter, N is a time-window length, spec are spectral values having M values for a block, M is equal to N/2, i is a time block index, k is a spectral index indicating a spectral values, n is a time index indicating a time value in a block i, and n_o is a constant parameter being an integer number or zero, and

wherein the adaptive spectrum-time converter is configured to apply the transform kernel based on the following table:

current frame $i \rightarrow$ last frame $i-1 \downarrow$	right-side symmetry even ($symm_i = 0$)	right-side symmetry odd ($symm_i = 1$)
right-side symmetry odd ($symm_{i-1} = 1$)	cs(…) = cos(...) $k_0 = 0.0$	cs(…) = sin(...) $k_0 = 0.5$
right-side symmetry even ($symm_{i-1} = 0$)	cs(…) = cos(…) $k_0 = 0.5$	cs(…) = sin(…) $k_0 = 1.0$

wherein $symm_i$ is the control information for the current frame at index i, and wherein $symm_{i-1}$ is the control information for the previous frame at index i–1.

2. Decoder of claim 1,

wherein the first group of transform kernels has one or more transform kernels having the odd symmetry at the left side and the even symmetry at the right side of the kernel or vice versa, or wherein the second group of transform kernels has one or more transform kernels having the even symmetry at both sides or the odd symmetry at both sides of the kernel.

3. Decoder of claim 1 or 2,

wherein the first group of transform kernels comprises an inverse MDCT-IV transform kernel or an inverse MDST-IV transform kernel, or wherein the second group of transform kernels comprises an inverse MDCT-II transform kernel or an inverse MDST-II transform kernel,

wherein the MDCT-IV shows an odd symmetry at its left and an even symmetry at its right side, and a synthesized signal is inverted at its left side during signal fold-out of this transform,

wherein the MDST-IV shows an even symmetry at its left and an odd symmetry at its right side, and a synthesized signal is inverted at its right side during signal fold-out of this transform,

wherein the MDCT-II shows an even symmetry at its left and an even symmetry at its right side, and a synthesized signal is not inverted at any side during signal fold-out of this transform, or

wherein the MDST-II exhibits an odd symmetry at its left and an odd symmetry at its right side, and a synthesized signal is inverted at both sides during signal fold-out of this transform.

4. Decoder of one of the preceding claims, wherein the control information comprises a current bit indicating a current symmetry for the current frame, and

wherein the adaptive spectrum-time converter is configured to not switch from the first group to the second group, when the current bit indicates the same symmetry as was used in the preceding frame, and

wherein the adaptive spectrum-time converter is configured to switch from the first group to the second group, when the current bit indicates a different symmetry as was used in the preceding frame.

5. Decoder of one of the preceding claims,

wherein the adaptive spectrum-time converter is configured to switch the second group into the first group, when a current bit indicating a current symmetry for the current frame indicates the same symmetry as was used in the preceding frame, and

wherein the adaptive spectrum-time converter is configured to not switch from the second group into the first group, when the current bit indicates a current symmetry for the current frame having a different symmetry as was used in the preceding frame.

6. Decoder of one of the preceding claims,

wherein the adaptive spectrum-time converter is configured to read, from the encoded audio signal, the control information for the previous frame and the control information for the current frame following the previous frame from the encoded audio signal in a control data section for the current frame, or

wherein the adaptive spectrum-time converter is configured to read the control information from the control data section for the current frame and to retrieve the control information for the previous frame from a control data section of the previous frame or from a decoder setting applied to the previous frame.

7. Decoder of one of the preceding claims, further comprising a multichannel processor for receiving blocks of spectral values representing a first and a second multichannel and for processing, in accordance with a joint multichannel processing technique, the received blocks to obtain processed blocks of spectral values for the first multichannel and the second multichannel, and wherein the adaptive spectrum-time processor is configured to process the processed blocks for the first multichannel using control information for the first multichannel and the processed blocks for the second multichannel using control information for the second multichannel.

8. Decoder of claim 7, wherein the multichannel processor is configured to apply complex prediction using a complex prediction control information associated with the blocks of spectral values representing the first and the second multichannel.

9. Decoder of one of claims 7 or 8, wherein the multichannel processor is configured to process, in accordance with the joint multichannel processing technique, the received blocks, wherein the received blocks comprise an encoded residual signal of a representation of the first multichannel and a representation of the second multichannel and wherein the multichannel processor is configured to calculate the first multichannel signal and the second multichannel signal using the residual signal and a further encoded signal, or

wherein multichannel processing means a joint stereo processing or a joint processing of more than two channels, and wherein a multichannel signal has two channels or more than two channels.

10. Encoder for encoding an audio signal, the encoder comprising:

adaptive time-spectrum converter for converting overlapping blocks of time values into successive blocks of spectral values; and

a controller for controlling the time-spectrum converter to switch between transform kernels of a first group of transform kernels and transform kernels of a second group of transform kernels,

wherein the adaptive time-spectrum converter is configured to receive a control information and to switch, in response to the control information, between transform kernels of a first group of transform kernels comprising one or more transform kernels having different symmetries at sides of a kernel, and a second group of transform kernels comprising one or more transform kernels having the same symmetries at sides of a transform kernel,

wherein the first group of transform kernels comprises an MDCT-IV transform kernel or an MDST-IV transform kernel, or wherein the second group of transform kernels comprises an MDCT-II transform kernel or an MDST-II transform kernel, and

wherein the controller is configured so that the MDCT-IV transform kernel is followed by the MDST-II transform kernel, or wherein the MDST-IV transform kernel is followed by the MDCT-II transform kernel, or wherein the MDCT-II transform kernel is followed by the MDCT-IV transform kernel, or wherein the MDST-II transform kernel is followed by the MDST-IV transform kernel**.**

11. Encoder of claim 10, further comprising an output interface for generating an encoded audio signal having, for a current frame, a control information indicating a symmetry of the transform kernel used for generating the current frame.

12. Encoder of claim 10 or 11, wherein the output interface is configured to include into a control data section of the current frame a symmetry information for the current frame and for the previous frame, when the current frame is an independent frame, or to include in the control data section of the current frame, only symmetry information for the current frame and no symmetry information for the previous frame, when the current frame is a dependent frame.

13. Encoder of one of claims 10 to 12, wherein the first group of transform kernels has one or more transform kernels having an odd symmetry at a left side and an even symmetry at the right side or vice versa, or wherein the second group of transform kernels has one or more transform kernels having an even symmetry at both sides or an odd symmetry at both sides, or

wherein the MDCT-IV shows an odd symmetry at its left and an even symmetry at its right side, and a synthesized signal is inverted at its left side during signal fold-out of this transform,

wherein the MDST-IV shows an even symmetry at its left and an odd symmetry at its right side, and a synthesized signal is inverted at its right side during signal fold-out of this transform,

wherein the MDCT-II shows an even symmetry at its left and an even symmetry at its right side, and a synthesized signal is not inverted at any side during signal fold-out of this transform, or

wherein the MDST-II exhibits an odd symmetry at its left and an odd symmetry at its right side, and a synthesized signal is inverted at both sides during signal fold-out of this transform.

14. Encoder of one of claims 10 to 15,

wherein the controller is configured to analyze the overlapping blocks of time values having a first channel and a second channel to determine the transform kernel for a frame of the first channel and a corresponding frame of the second channel.

15. Encoder of one of the claims 10 to 14, wherein the time-spectrum converter is configured to process a first channel and a second channel of a multichannel signal and wherein the encoder further comprises a multichannel processor for processing the successive blocks of spectral values of the first channel and the second channel using a joint multichannel processing technique to obtain processed blocks of spectral values, and an encoding processor for processing the processed blocks of spectral values to obtain encoded channels.

16. Encoder of one of the claims 10 to 15, wherein the first processed blocks of spectral values represent a first encoded representation of the joint multichannel processing technique and the second processed blocks of spectral values represent a second encoded representation of the joint multichannel processing technique, wherein the encoding processor is configured to process the first processed blocks using quantization and entropy encoding to form a first encoded representation, wherein the encoding processor is configured to process the second processed blocks using quantization and entropy encoding to form a second encoded representation, and wherein the encoding processor is configured to form a bitstream of the encoded audio signal using the first encoded representation and the second encoded representation, or

wherein multichannel processing means a joint stereo processing or a joint processing of more than two channels, and wherein a multichannel signal has two channels or more than two channels.

17. Method of decoding an encoded audio signal, the method comprising:

converting successive blocks of spectral values into successive blocks of time values; and

overlapping and adding successive blocks of time values to obtain decoded audio values,

receiving a control information and switching, in response to the control information and in the converting, between transform kernels of a first group of transform kernels comprising one or more transform kernels having different symmetries at

sides of a kernel, and a second group of transform kernels comprising one or more transform kernels having the same symmetries at sides of a transform kernel,

wherein the transform kernel of the first group and the second group is based on the following equation:

$$x_{i,n} = C \sum_{k=0}^{M-1} spec[i][k] \;\; \mathrm{cs}\left(\frac{2\pi}{N}(n+n_0)(k+k_0)\right)$$

wherein the at least one transform kernel of the first group is based on the parameters:

cs( ) = cos( ) and k_0 = 0.5 or

cs( ) = sin( ) and k_0 = 0.5, or

wherein the at least one transform kernel of the second group is based on the parameters:

cs( ) = cos( ) and k_0 = 0; or

cs( ) = sin( ) and k_0 = 1,

wherein $x_{i,n}$ is a time domain output, C is a constant parameter, N is a time-window length, spec are spectral values having M values for a block, M is equal to N/2, i is a time block index, k is a spectral index indicating a spectral values, n is a time index indicating a time value in a block i, and n_o is a constant parameter being an integer number or zero, and

wherein the converting comprises applying the transform kernel based on the following table:

current frame $i \rightarrow$ last frame $i-1 \downarrow$	right-side symmetry even ($symm_i = 0$)	right-side symmetry odd ($symm_i = 1$)
right-side symmetry odd ($symm_{i-1} = 1$)	cs(…) = cos(...) k_0 = 0.0	cs(…) = sin(...) k_0 = 0.5
right-side symmetry even ($symm_{i-1} = 0$)	cs(…) = cos(…) k_0 = 0.5	cs(…) = sin(…)

		$k_0 = 1.0$

wherein $symm_i$ is the control information for the current frame at index i, and wherein $symm_{i-1}$ is the control information for the previous frame at index i–1.

18. Method of encoding an audio signal, the method comprising:

converting overlapping blocks of time values into successive blocks of spectral values; and

controlling the time-spectrum converting to switch between transform kernels of a first group of transform kernels and transform kernels of a second group of transform kernels,

receiving a control information and switching, in response to the control information and in the converting, between transform kernels of a first group of transform kernels comprising one or more transform kernels having different symmetries at sides of a kernel, and a second group of transform kernels comprising one or more transform kernels having the same symmetries at sides of a transform kernel,

wherein the first group of transform kernels comprises an MDCT-IV transform kernel or an MDST-IV transform kernel, or wherein the second group of transform kernels comprises an MDCT-II transform kernel or an MDST-II transform kernel, and

wherein the controlling is configured so that the MDCT-IV transform kernel is followed by the MDST-II transform kernel, or wherein the MDST-IV transform kernel is followed by the MDCT-II transform kernel, or wherein the MDCT-II transform kernel is followed by the MDCT-IV transform kernel, or wherein the MDST-II transform kernel is followed by the MDST-IV transform kernel**.**

19. Computer program for performing, when running on a computer or a processor, the methods of claim 17 or 18.