Claims

1. Decoder for reconstructing a sample array from an entropy encoded data stream, configured to

entropy decode a plurality of entropy slices within the entropy encoder data stream so as to reconstruct different portions of the sample array associated with the entropy slices, respectively, with

performing, for each entropy slice, the entropy decoding along a respective entropy coding path using respective probability estimations,

adapting the respective probability estimations along the respective entropy coding path using a previously decoded part of the respective entropy slice,

starting the entropy decoding the plurality of entropy slices sequentially using an entropy slice order, and

performing, in entropy decoding a predetermined entropy slice, entropy decoding a current part of the predetermined entropy slice based on the respective probability estimations of the predetermined entropy slice as adapted using the previously decoded part of the predetermined entropy slice, and probability estimations as used in the entropy decoding of a spatially neighboring, in entropy slice order preceding entropy slice at a neighboring part of the spatially neighboring entropy slice,

wherein the entropy slices are subdivided into chunks and the decoder is configured to

check whether a current chunk corresponds to a first sub-portion of the portion of the predetermined entropy slice along the entropy coding path, and

if so, entropy decode the current chunk under adapting the respective probability estimations and take a state of the respective probability estimations as manifesting themselves at an end of entropy decoding the current chunk, into account when entropy decoding another chunk which corresponds to a second sub-portion of the portion of the predetermined entropy slice along the entropy coding path, and

if not, entropy decode the current chunk using probability estimations which depend on probability estimations manifesting themselves at an end of entropy decoding a chunk

which corresponds to a sub-portion of the portion of the predetermined entropy slice preceding the sub-portion corresponding to the current chunk, along the entropy coding path.

2. Decoder according to claim 1, wherein the different portions are rows of blocks of the sample array.

3. Decoder according to claim 1 or 2, wherein the entropy slice order is chosen such that, along the entropy slice order, the different portions follow each other in a direction angled relative to the entropy coding paths of the entropy slices, which, in turn, extend substantially in parallel to each other.

4. Decoder according to any of claims 1 to 3, wherein each entropy slice has entropy encoded therein data for a corresponding portion of the sample array, the different portions forming rows of blocks of the sample array with the blocks being regularly arranged in rows and columns so that the portions corresponding to the entropy slices consist of the same number of blocks and the entropy coding path points in parallel along the rows of the blocks, wherein the decoder is configured to perform, for each entropy slice, an initialization, for a respective entropy slice, of the probability estimations before decoding the first block of the portion corresponding to the respective entropy slice along the respective encoding path with probability estimations manifesting themselves after having entropy decoded the second block of the portion corresponding to the in entropy slice order preceding entropy slice along the respective encoding path.

5. Decoder according to claim 4, wherein the decoder is configured to store the probability estimations manifesting themselves after having entropy decoded the second block of the portion corresponding to the in entropy slice order preceding entropy slice along the respective encoding path, and using the stored probability estimations for the initialization before decoding the first block of the portion corresponding to the respective entropy slice along the respective encoding path.

6. Decoder for reconstructing a sample array from an entropy encoded data stream, configured to

entropy decode a plurality of entropy slices within the entropy encoder data stream so as to reconstruct different portions of the sample array associated with the entropy slices, respectively, with

performing, for each entropy slice, the entropy decoding along a respective entropy coding path using respective probability estimations,

adapting the respective probability estimations along the respective entropy coding path using a previously decoded part of the respective entropy slice,

starting the entropy decoding the plurality of entropy slices sequentially using an entropy slice order, and

performing, in entropy decoding a predetermined entropy slice, entropy decoding a current part of the predetermined entropy slice based on the respective probability estimations of the predetermined entropy slice as adapted using the previously decoded part of the predetermined entropy slice, and probability estimations as used in the entropy decoding of a spatially neighboring, in entropy slice order preceding entropy slice at a neighboring part of the spatially neighboring entropy slice,

wherein each entropy slice has entropy encoded therein data for a corresponding portion of the sample array, the different portions forming rows of blocks of the sample array with the blocks being regularly arranged in rows and columns so that the portions corresponding to the entropy slices consist of the same number of blocks and the entropy coding path pointing in parallel along the rows of the blocks, wherein the decoder is configured to perform, for each entropy slice, the entropy decoding along the respective entropy coding path and the adaptation of the respective probability estimations along the respective entropy coding path such that, after the current part of the predetermined entropy slice has been entropy decoded based on the respective probability estimations of the predetermined entropy slice, the respective probability estimations of the predetermined entropy slice are adapted depending on the current part of the predetermined entropy slice, and the probability estimations as manifesting themselves in the entropy decoding of the neighboring part of the spatially neighboring entropy slice.

7. Decoder according to any of claim 6, wherein the decoder is configured such that the adaptation of the respective probability estimations of the predetermined entropy slice, after the current part of the predetermined entropy slice has been entropy decoded based on the respective probability estimations of the predetermined entropy slice, is performed by a first adaptation depending on the current part of the predetermined entropy slice and an averaging of a result of the first adaptation with the probability estimations as used in the entropy decoding of the neighboring part of the spatially neighboring entropy slice.

8. Decoder according to any of claims 4 to 7, wherein the decoder is configured to steer the entropy decoding of immediately consecutive entropy slices in entropy slice order so that a distance of currently decoded blocks of portions corresponding to immediately consecutive entropy slices measured in blocks along the encoding paths is prevented from becoming lower than two blocks.

9. Decoder according to any of claims 4 to 7, wherein the decoder is configured to steer the entropy decoding of immediately consecutive entropy slices in entropy slice order so that a distance of currently decoded blocks of portions corresponding to immediately consecutive entropy slices measured in blocks along the encoding paths remains two blocks.

10. Decoder according to any of claims 1 to 9, wherein the entropy slices are sub-divided into chunks, and the decoder comprises a de-interleaver to de-interleave the chunks and is configured to start the entropy decoding the entropy slices in parallel along the entropy decoding paths even before a reception of any of the entropy slices as a whole .

11. Decoder according to any of claims 1 to 10, wherein the sample array is a current sample array of a sequence of sample arrays and the decoding is configured to , in entropy decoding a predetermined entropy slice, entropy decode the current part of the predetermined entropy slice based on the respective probability estimations of the predetermined entropy slice as adapted using the previously decoded part of the predetermined entropy slice, probability estimations as used in the entropy decoding of a spatially neighboring, in entropy slice order preceding entropy slice at a neighboring part of the spatially neighboring entropy slice, and probability estimations used in decoding a previously decoded frame of the entropy encoded data stream relating to another sample array than the current sample array.

12. Encoder for encoding a sample array into an entropy encoded data stream, configured to

entropy encode a plurality of entropy slices into the entropy encoder data stream each entropy slice being associated with a different portion of the sample array, respectively, with

performing, for each entropy slice, the entropy encoding along a respective entropy coding path using respective probability estimations,

adapting the respective probability estimations along the respective entropy coding path using a previously decoded part of the respective entropy slice,

starting the entropy encoding the plurality of entropy slices sequentially using an entropy slice order, and

performing, in entropy encoding a predetermined entropy slice, entropy encoding a current part of the predetermined entropy slice based on the respective probability estimations of the predetermined entropy slice as adapted using the previously encoded part of the predetermined entropy slice, and probability estimations as used in the entropy encoding of a spatially neighboring, in entropy slice order preceding entropy slice at a neighboring part of the spatially neighboring entropy slice,

wherein the entropy slices are subdivided into chunks and the encoder is configured to

check whether a current chunk corresponds to a first sub-portion of the portion of the predetermined entropy slice along the entropy coding path, and

if so, entropy encode the current chunk under adapting the respective probability estimations and take a state of the respective probability estimations as manifesting themselves at an end of entropy encoding the current chunk, into account when entropy encoding another chunk which corresponds to a second sub-portion of the portion of the predetermined entropy slice along the entropy coding path, and

if not, entropy encode the current chunk using probability estimations which depend on probability estimations manifesting themselves at an end of entropy encoding a chunk which corresponds to a sub-portion of the portion of the predetermined entropy slice preceding the sub-portion corresponding to the current chunk, along the entropy coding path.

13. Method for reconstructing a sample array from an entropy encoded data stream, comprising

entropy decoding a plurality of entropy slices within the entropy encoder data stream so as to reconstruct different portions of the sample array associated with the entropy slices, respectively, with

performing, for each entropy slice, the entropy decoding along a respective entropy coding path using respective probability estimations,

adapting the respective probability estimations along the respective entropy coding path using a previously decoded part of the respective entropy slice,

starting the entropy decoding the plurality of entropy slices sequentially using an entropy slice order, and

performing, in entropy decoding a predetermined entropy slice, entropy decoding a current part of the predetermined entropy slice based on the respective probability estimations of the predetermined entropy slice as adapted using the previously decoded part of the predetermined entropy slice, and probability estimations as used in the entropy decoding of a spatially neighboring, in entropy slice order preceding entropy slice at a neighboring part of the spatially neighboring entropy slice,

wherein the entropy slices are subdivided into chunks and the method further comprises

checking whether a current chunk corresponds to a first sub-portion of the portion of the predetermined entropy slice along the entropy coding path, and

if so, entropy decoding the current chunk under adapting the respective probability estimations and take a state of the respective probability estimations as manifesting themselves at an end of entropy decoding the current chunk, into account when entropy decoding another chunk which corresponds to a second sub-portion of the portion of the predetermined entropy slice along the entropy coding path, and

if not, entropy decoding the current chunk using probability estimations which depend on probability estimations manifesting themselves at an end of entropy decoding a chunk which corresponds to a sub-portion of the portion of the predetermined entropy slice preceding the sub-portion corresponding to the current chunk, along the entropy coding path.

14. Method for encoding a sample array into an entropy encoded data stream, comprising

entropy encoding a plurality of entropy slices into the entropy encoder data stream each entropy slice being associated with a different portion of the sample array, respectively, with

performing, for each entropy slice, the entropy encoding along a respective entropy coding path using respective probability estimations,

adapting the respective probability estimations along the respective entropy coding path using a previously decoded part of the respective entropy slice,

starting the entropy encoding the plurality of entropy slices sequentially using an entropy slice order, and

performing, in entropy encoding a predetermined entropy slice, entropy encoding a current part of the predetermined entropy slice based on the respective probability estimations of the predetermined entropy slice as adapted using the previously encoded part of the predetermined entropy slice, and probability estimations as used in the entropy encoding of a spatially neighboring, in entropy slice order preceding entropy slice at a neighboring part of the spatially neighboring entropy slice,

wherein the entropy slices are subdivided into chunks and the method further comprises

checking whether a current chunk corresponds to a first sub-portion of the portion of the predetermined entropy slice along the entropy coding path, and

if so, entropy encoding the current chunk under adapting the respective probability estimations and take a state of the respective probability estimations as manifesting themselves at an end of entropy encoding the current chunk, into account when entropy encoding another chunk which corresponds to a second sub-portion of the portion of the predetermined entropy slice along the entropy coding path, and

if not, entropy encoding the current chunk using probability estimations which depend on probability estimations manifesting themselves at an end of entropy encoding a chunk which corresponds to a sub-portion of the portion of the predetermined entropy slice preceding the sub-portion corresponding to the current chunk, along the entropy coding path.

15. Computer program having a program code configured to perform, when running on a computer, a method according to any of claims 13 to 14

Claims

1. A decoder for reconstructing a sample array from an entropy encoded data stream, configured to:

entropy decode a plurality of entropy slices within the entropy encoder data stream so as to reconstruct different portions of the sample array associated with the entropy slices, respectively, with

performing, for each entropy slice, the entropy decoding along a respective entropy coding path using respective probability estimations,

adapting the respective probability estimations along the respective entropy coding path using a previously decoded part of the respective entropy slice,

starting the entropy decoding the plurality of entropy slices sequentially using an entropy slice order, and

performing, in entropy decoding a predetermined entropy slice, entropy decoding a current part of the predetermined entropy slice based on the respective probability estimations of the predetermined entropy slice as adapted using the previously decoded part of the predetermined entropy slice, and probability estimations as used in the entropy decoding of a spatially neighboring, in entropy slice order preceding entropy slice at a neighboring part of the spatially neighboring entropy slice,

wherein the entropy slices are subdivided into chunks and the decoder is configured to:

check whether a current chunk corresponds to a first sub-portion of the portion of the predetermined entropy slice along the entropy coding path, and

if so, entropy decode the current chunk under adapting the respective probability estimations and take a state of the respective probability estimations as manifesting themselves at an end of entropy decoding the current chunk, into account when entropy decoding another chunk which corresponds to a second sub-portion of the portion of the predetermined entropy slice along the entropy coding path, and

if not, entropy decode the current chunk using probability estimations which depend on probability estimations manifesting themselves at an end of entropy decoding a chunk which corresponds to a sub-portion of the portion of the predetermined entropy slice preceding the sub-portion corresponding to the current chunk, along the entropy coding path.

2. A decoder according to claim 1, wherein the different portions are rows of blocks of the sample array.

3. A decoder according to either claim 1 or 2, wherein the entropy slice order is chosen such that, along the entropy slice order, the different portions follow each other in a direction angled relative to the entropy coding paths of the entropy slices,

which, in turn, extend substantially in parallel to each other.

4. A decoder according to any one of claims 1 to 3, wherein each entropy slice has entropy encoded therein data for a corresponding portion of the sample array, the different portions forming rows of blocks of the sample array with the blocks being regularly arranged in rows and columns so that the portions corresponding to the entropy slices consist of the same number of blocks and the entropy coding path points in parallel along the rows of the blocks, wherein the decoder is configured to perform, for each entropy slice, an initialization, for a respective entropy slice, of the probability estimations before decoding the first block of the portion corresponding to the respective entropy slice along the respective encoding path with probability estimations manifesting themselves after having entropy decoded the second block of the portion corresponding to the in entropy slice order preceding entropy slice along the respective encoding path.

5. A decoder according to claim 4, wherein the decoder is configured to store the probability estimations manifesting themselves after having entropy decoded the second block of the portion corresponding to the in entropy slice order preceding entropy slice along the respective encoding path, and using the stored probability estimations for the initialization before decoding the first block of the portion corresponding to the respective entropy slice along the respective encoding path.

6. A decoder according to any one of claims 1 to 3, wherein each entropy slice has entropy encoded therein data for a corresponding portion of the sample array, the different portions forming rows of blocks of the sample array with the blocks being regularly arranged in rows and columns so that the portions corresponding to the entropy slices consist of the same number of blocks and the entropy coding path pointing in parallel along the rows of the blocks, wherein the decoder is configured to perform, for each entropy slice, the entropy decoding along the respective entropy coding path and the adaptation of the respective probability estimations along the respective entropy coding path such that, after the current part of the predetermined entropy slice has been entropy decoded based on the respective probability estimations of the predetermined entropy slice, the respective probability estimations of the predetermined entropy slice are adapted depending on the current part of the predetermined entropy slice, and the probability estimations as manifesting themselves in the entropy decoding of the neighboring part of the spatially neighboring entropy slice.

7. A decoder according to claim 6, wherein the decoder is configured such that the adaptation of the respective probability estimations of the predetermined entropy

slice, after the current part of the predetermined entropy slice has been entropy decoded based on the respective probability estimations of the predetermined entropy slice, is performed by a first adaptation depending on the current part of the predetermined entropy slice and an averaging of a result of the first adaptation with the probability estimations as used in the entropy decoding of the neighboring part of the spatially neighboring entropy slice.

8. A decoder according to any one of claims 4 to 7, wherein the decoder is configured to steer the entropy decoding of immediately consecutive entropy slices in entropy slice order so that a distance of currently decoded blocks of portions corresponding to immediately consecutive entropy slices measured in blocks along the encoding paths is prevented from becoming lower than two blocks.

9. A decoder according to any one of claims 4 to 7, wherein the decoder is configured to steer the entropy decoding of immediately consecutive entropy slices in entropy slice order so that a distance of currently decoded blocks of portions corresponding to immediately consecutive entropy slices measured in blocks along the encoding paths remains two blocks.

10. A decoder according to any one of claims 1 to 9, wherein the entropy slices are sub-divided into chunks, and the decoder comprises a de-interleaver to de-interleave the chunks and is configured to start the entropy decoding the entropy slices in parallel along the entropy decoding paths even before a reception of any of the entropy slices as a whole .

11. A decoder according to any one of claims 1 to 10, wherein the sample array is a current sample array of a sequence of sample arrays and the decoding is configured to, in entropy decoding a predetermined entropy slice, entropy decode the current part of the predetermined entropy slice based on the respective probability estimations of the predetermined entropy slice as adapted using the previously decoded part of the predetermined entropy slice, probability estimations as used in the entropy decoding of a spatially neighboring, in entropy slice order preceding entropy slice at a neighboring part of the spatially neighboring entropy slice, and probability estimations used in decoding a previously decoded frame of the entropy encoded data stream relating to another sample array than the current sample array.

12. An encoder for encoding a sample array into an entropy encoded data stream, configured to:
entropy encode a plurality of entropy slices into the entropy encoder data stream each entropy slice being associated with a different portion of the sample array,

respectively, with

performing, for each entropy slice, the entropy encoding along a respective entropy coding path using respective probability estimations,

adapting the respective probability estimations along the respective entropy coding path using a previously decoded part of the respective entropy slice,

starting the entropy encoding the plurality of entropy slices sequentially using an entropy slice order, and

performing, in entropy encoding a predetermined entropy slice, entropy encoding a current part of the predetermined entropy slice based on the respective probability estimations of the predetermined entropy slice as adapted using the previously encoded part of the predetermined entropy slice, and probability estimations as used in the entropy encoding of a spatially neighboring, in entropy slice order preceding entropy slice at a neighboring part of the spatially neighboring entropy slice,

wherein the entropy slices are subdivided into chunks and the method further comprises:

checking whether a current chunk corresponds to a first sub-portion of the portion of the predetermined entropy slice along the entropy coding path, and

if so, entropy decoding the current chunk under adapting the respective probability estimations and take a state of the respective probability estimations as manifesting themselves at an end of entropy decoding the current chunk, into account when entropy decoding another chunk which corresponds to a second sub-portion of the portion of the predetermined entropy slice along the entropy coding path, and

if not, entropy decoding the current chunk using probability estimations which depend on probability estimations manifesting themselves at an end of entropy decoding a chunk which corresponds to a sub-portion of the portion of the predetermined entropy slice preceding the sub-portion corresponding to the current chunk, along the entropy coding path.

13. A method for reconstructing a sample array from an entropy encoded data stream, comprising:

entropy decoding a plurality of entropy slices within the entropy encoder data stream so as to reconstruct different portions of the sample array associated with the entropy slices, respectively, with

performing, for each entropy slice, the entropy decoding along a respective entropy coding path using respective probability estimations,

adapting the respective probability estimations along the respective entropy coding path using a previously decoded part of the respective entropy slice,

starting the entropy decoding the plurality of entropy slices sequentially using an entropy slice order, and

performing, in entropy decoding a predetermined entropy slice, entropy decoding a current part of the predetermined entropy slice based on the respective probability estimations of the predetermined entropy slice as adapted using the previously decoded part of the predetermined entropy slice, and probability estimations as used in the entropy decoding of a spatially neighboring, in entropy slice order preceding entropy slice at a neighboring part of the spatially neighboring entropy slice, wherein the entropy slices are subdivided into chunks and the method further comprises:

checking whether a current chunk corresponds to a first sub-portion of the portion of the predetermined entropy slice along the entropy coding path, and

if so, entropy decoding the current chunk under adapting the respective probability estimations and take a state of the respective probability estimations as manifesting themselves at an end of entropy decoding the current chunk, into account when entropy decoding another chunk which corresponds to a second sub-portion of the portion of the predetermined entropy slice along the entropy coding path, and

if not, entropy decoding the current chunk using probability estimations which depend on probability estimations manifesting themselves at an end of entropy decoding a chunk which corresponds to a sub-portion of the portion of the predetermined entropy slice preceding the sub-portion corresponding to the current chunk, along the entropy coding path.

14. A method for encoding a sample array into an entropy encoded data stream, comprising:

entropy encoding a plurality of entropy slices into the entropy encoder data stream each entropy slice being associated with a different portion of the sample array, respectively, with

performing, for each entropy slice, the entropy encoding along a respective entropy coding path using respective probability estimations,

adapting the respective probability estimations along the respective entropy coding path using a previously decoded part of the respective entropy slice,

starting the entropy encoding the plurality of entropy slices sequentially using an entropy slice order, and

performing, in entropy encoding a predetermined entropy slice, entropy encoding a current part of the predetermined entropy slice based on the respective probability estimations of the predetermined entropy slice as adapted using the previously encoded part of the predetermined entropy slice, and probability estimations as used in the entropy encoding of a spatially neighboring, in entropy slice order preceding entropy slice at a neighboring part of the spatially neighboring entropy slice, wherein the entropy slices are subdivided into chunks and the method further

comprises:

checking whether a current chunk corresponds to a first sub-portion of the portion of the predetermined entropy slice along the entropy coding path, and

if so, entropy encoding the current chunk under adapting the respective probability estimations and take a state of the respective probability estimations as manifesting themselves at an end of entropy encoding the current chunk, into account when entropy encoding another chunk which corresponds to a second sub-portion of the portion of the predetermined entropy slice along the entropy coding path, and

if not, entropy encoding the current chunk using probability estimations which depend on probability estimations manifesting themselves at an end of entropy encoding a chunk which corresponds to a sub-portion of the portion of the predetermined entropy slice preceding the sub-portion corresponding to the current chunk, along the entropy coding path.

15. A computer program having a program code configured to perform, when running on a computer, a method according to claim 13 or claim 14.