and ternary tree) and partition flags (for example split flag) are determined and signalled for a block. The overhead of the signalling increases when partition depth increases. Then, the increased overhead reduces the video compression efficiency.
[0005]

In view of this, an encoder according to an aspect of the present disclosure provides an encoder, and the like, capable of improving compression efficiency in encoding of block partitioning information.

SOLUTION TO PROBLEM
[0006]

According to first aspect of the present disclosure , there is provided an encoder that encodes a picture and includes: a processor; and memory, wherein the processor includes: a block partition determiner that partitions the picture into a plurality of blocks, using a set of block partition modes obtained by combining one or more block partition modes each of which defines a partition type, the picture being read from the memory; and an encoding unit that encodes the plurality of blocks, the set of block partition modes includes a first partition mode that defines a partition direction and a total number of partitions for partitioning a first block, and a second block partition mode that defines a partition direction and a total number of partitions for partitioning a second block which is one of blocks obtained after the first block is partitioned, and when the total number of partitions of the first block partition mode is three, the second block is a center block among the blocks obtained after the first block is partitioned, and the partition direction of the second block partition mode is same as the partition direction of the first block partition mode, the second block partition mode includes only a block partition mode indicating that the total number of partitions is three, a parameter for identifying the second block partition mode includes a first flag indicating whether a block is to be partitioned horizontally or vertically, and does not include a second flag indicating a total number of partitions into which the block is to be partitioned.
[0007]

According to a second aspect of the present disclosure , there is provided a decoder that decodes an encoded signal and includes: a processor; and memory, wherein the processor includes: a block partition determiner that partitions the encoded signal into a plurality of blocks, using a set of block partition modes obtained by combining one or more block partition modes each of which defines a partition type, the encoded signal being read from the memory; and a decoding unit that decodes the plurality of blocks, the set of block partition modes includes a first partition mode that defines a partition direction and a total number of partitions for partitioning a first block, and a second block partition mode that defines a partition direction and a total number of partitions for partitioning a second block which is one of blocks obtained after the first block is partitioned, and when the total number of partitions of the first block partition mode is three, the second block is a center block among the blocks obtained after the first block is partitioned, and the partition direction of the second block partition mode is same as the partition direction of the first block partition mode, the second block partition mode includes only a block partition mode indicating that the total number of partitions is three, and a parameter for identifying the second block partition mode includes a first flag indicating whether a block is to be partitioned horizontally or vertically, and does not include a second flag indicating a total

number of partitions into which the block is to be partitioned.

[0007a]

According to a third aspect of the present disclosure, there is provided an encoding method, including: partitioning a picture into a plurality of blocks, using a set of block partition modes obtained by combining one or more block partition modes each of which defines a partition type, the picture being read from a memory; and encoding the plurality of blocks, wherein the set of block partition modes includes a first partition mode that defines a partition direction and a total number of partitions for partitioning a first block, and a second block partition mode that defines a partition direction and a total number of partitions for partitioning a second block which is one of blocks obtained after the first block is partitioned, in the partitioning, when the total number of partitions of the first block partition mode is three, the second block is a center block among the blocks obtained after the first block is partitioned, and the partition direction of the second block partition mode is same as the partition direction of the first block partition mode, the second block partition mode includes only a block partition mode indicating that the total number of partitions is three, and a parameter for identifying the second block partition mode includes a first flag indicating whether a block is to be partitioned horizontally or vertically, and does not include a second flag indicating a total number of partitions into which the block is to be partitioned.

[0007b]

According to a fourth aspect of the present disclosure, there is provided a decoding method, including: partitioning an encoded signal into a plurality of blocks, using a set of block partition modes obtained by combining one or more block partition modes each of which defines a partition type, the encoded signal being read from a memory; and decoding the plurality of blocks, wherein the set of block partition modes includes a first partition mode that defines a partition direction and a total number of partitions for partitioning a first block, and a second block partition mode that defines a partition direction and a total number of partitions for partitioning a second block which is one of blocks obtained after the first block is partitioned, in the partitioning, when the total number of partitions of the first block partition mode is three, the second block is a center block among the blocks obtained after the first block is partitioned, and the partition direction of the second block partition mode is same as the partition direction of the first block partition mode, the second block partition mode includes only a block partition mode indicating that the total number of partitions is three, and a parameter for identifying the second block partition mode includes a first flag indicating whether a block is to be partitioned horizontally or vertically, and does not include a second flag indicating a total number of partitions into which the block is to be partitioned.

[0007c]

According to a fifth aspect of the present disclosure, there is provided a picture compression program, including: partitioning a picture into a plurality of blocks, using a set of block partition modes obtained by combining one or more block partition modes each of which defines a partition type, the picture being read from a memory; and decoding the plurality of blocks, wherein the set of block partition modes includes a first partition mode that defines a partition direction and a total number of partitions for partitioning a first block, and a second block partition mode that defines a partition direction and a total number of partitions for partitioning a second block which is one of blocks obtained after the first block

is partitioned, in the partitioning, when the total number of partitions of the first block partition mode is three, the second block is a center block among the blocks obtained after the first block is partitioned, and the partition direction of the second block partition mode is same as the partition direction of the first block partition mode, the second block partition mode includes only a block partition mode indicating that the total number of partitions is three, and a parameter for identifying the second block partition mode includes a first flag indicating whether a block is to be partitioned horizontally or vertically, and does not include a second flag indicating a total number of partitions into which the block is to be partitioned.

[0008]

It should be noted that general and specific aspects described above may be implemented using a system, a method, an integrated circuit, a computer program, or a computer-readable recording medium such as a CD-ROM, or any arbitrary combination of systems, methods, integrated circuits, computer programs, or computer-readable recording media.

ADVANTAGEOUS EFFECT OF INVENTION

[0009]

Embodiments of the present disclosure enable improvement of compression efficiency in encoding of block partitioning information.

BRIEF DESCRIPTION OF DRAWINGS

[0010]

FIG. 1 is a block diagram illustrating a functional configuration of the encoder according to Embodiment 1.

FIG. 2 illustrates one example of block splitting according to Embodiment 1.

FIG. 3 is a chart indicating transform basis functions for each transform type.

FIG. 4A illustrates one example of a filter shape used in ALF.

FIG. 4B illustrates another example of a filter shape used in ALF.

FIG. 4C illustrates another example of a filter shape used in ALF.

FIG. 5A illustrates 67 intra prediction modes used in intra prediction.

FIG. 5B is a flow chart for illustrating an outline of a prediction image correction process performed via OBMC processing.

FIG. 5C is a conceptual diagram for illustrating an outline of a prediction image correction process performed via OBMC processing.

FIG. 5D illustrates one example of FRUC.

FIG. 6 is for illustrating pattern matching (bilateral matching) between two blocks along a motion trajectory.

FIG. 7 is for illustrating pattern matching (template matching) between a template in the current picture and a block in a reference picture.

FIG. 8 is for illustrating a model assuming uniform linear motion.

FIG. 9A is for illustrating deriving a motion vector of each sub-block based on motion vectors of neighboring blocks.

FIG. 9B is for illustrating an outline of a process for deriving a motion vector via merge mode.

CLAIMS

1. An encoder that encodes a picture, the encoder comprising:

a processor; and

memory, wherein

the processor includes:

a block partition determiner that partitions the picture into a plurality of blocks, using a set of block partition modes obtained by combining one or more block partition modes each of which defines a partition type, the picture being read from the memory; and

an encoding unit that encodes the plurality of blocks,

the set of block partition modes includes a first partition mode that defines a partition direction and a total number of partitions for partitioning a first block, and a second block partition mode that defines a partition direction and a total number of partitions for partitioning a second block which is one of blocks obtained after the first block is partitioned,

when the total number of partitions of the first block partition mode is three, the second block is a center block among the blocks obtained after the first block is partitioned, and the partition direction of the second block partition mode is same as the partition direction of the first block partition mode, the second block partition mode includes only a block partition mode indicating that the total number of partitions is three, and

a parameter for identifying the second block partition mode includes a first flag indicating whether a block is to be partitioned horizontally or vertically, and does not include a second flag indicating a total number of partitions into which the block is to be partitioned.

2. A decoder that decodes an encoded signal, the decoder comprising:

a processor; and

memory, wherein

the processor includes:

a block partition determiner that partitions the encoded signal into a plurality of blocks, using a set of block partition modes obtained by combining one or more block partition modes each of which defines a partition type, the encoded signal being read from the memory; and

a decoding unit that decodes the plurality of blocks,

the set of block partition modes includes a first partition mode that defines a partition direction and a total number of partitions for partitioning a first block, and a second block partition mode that defines a partition direction and a total number of partitions for partitioning a second block which is one of blocks obtained after the first block is partitioned,

when the total number of partitions of the first block partition mode is three, the second block is a center block among the blocks obtained after the first block is partitioned, and the partition direction of the second block partition mode is same as the partition direction of the first block partition mode, the second block partition mode includes only a block partition mode indicating that the total number of partitions is three, and

a parameter for identifying the second block partition mode includes a first flag indicating whether a block is to be partitioned horizontally or vertically, and does not include a second flag indicating a total number of partitions into which the block is to be partitioned.

3. An encoding method, comprising:

partitioning a picture into a plurality of blocks, using a set of block partition modes obtained by combining one or more block partition modes each

of which defines a partition type, the picture being read from a memory; and

encoding the plurality of blocks, wherein

the set of block partition modes includes a first partition mode that defines a partition direction and a total number of partitions for partitioning a first block, and a second block partition mode that defines a partition direction and a total number of partitions for partitioning a second block which is one of blocks obtained after the first block is partitioned,

in the partitioning, when the total number of partitions of the first block partition mode is three, the second block is a center block among the blocks obtained after the first block is partitioned, and the partition direction of the second block partition mode is same as the partition direction of the first block partition mode, the second block partition mode includes only a block partition mode indicating that the total number of partitions is three, and

a parameter for identifying the second block partition mode includes a first flag indicating whether a block is to be partitioned horizontally or vertically, and does not include a second flag indicating a total number of partitions into which the block is to be partitioned.

4. A decoding method, comprising:

partitioning an encoded signal into a plurality of blocks, using a set of block partition modes obtained by combining one or more block partition modes each of which defines a partition type, the encoded signal being read from a memory; and

decoding the plurality of blocks, wherein

the set of block partition modes includes a first partition mode that defines a partition direction and a total number of partitions for partitioning a first block, and a second block partition mode that defines a partition direction

and a total number of partitions for partitioning a second block which is one of blocks obtained after the first block is partitioned,

in the partitioning, when the total number of partitions of the first block partition mode is three, the second block is a center block among the blocks obtained after the first block is partitioned, and the partition direction of the second block partition mode is same as the partition direction of the first block partition mode, the second block partition mode includes only a block partition mode indicating that the total number of partitions is three, and

a parameter for identifying the second block partition mode includes a first flag indicating whether a block is to be partitioned horizontally or vertically, and does not include a second flag indicating a total number of partitions into which the block is to be partitioned.

5. A picture compression program, comprising:

partitioning a picture into a plurality of blocks, using a set of block partition modes obtained by combining one or more block partition modes each of which defines a partition type, the picture being read from a memory; and

decoding the plurality of blocks, wherein

the set of block partition modes includes a first partition mode that defines a partition direction and a total number of partitions for partitioning a first block, and a second block partition mode that defines a partition direction and a total number of partitions for partitioning a second block which is one of blocks obtained after the first block is partitioned,

in the partitioning, when the total number of partitions of the first block partition mode is three, the second block is a center block among the blocks obtained after the first block is partitioned, and the partition direction of the second block partition mode is same as the partition direction of the first

block partition mode, the second block partition mode includes only a block partition mode indicating that the total number of partitions is three, and

a parameter for identifying the second block partition mode includes a first flag indicating whether a block is to be partitioned horizontally or vertically, and does not include a second flag indicating a total number of partitions into which the block is to be partitioned.