

consideration of a view-direction correlation, a reference image disposed in the view direction can be inserted at a preferable position in the temporal list.

CITATION LIST

NON-PATENT DOCUMENT

[0007]

Non-Patent Document 1: Gerhard Tech, Krzysztof Wegner, Ying Chen, Miska Hannuksela, "MV-HEVC Draft Text2", JCT3V-B1004, 2012,11,07

Non-Patent Document 2: Li Zhang, Ying Chen, Jewon Kang, "AHG5: MV-Hevc software for HTM", JCT3V-B0046, 2012,10,07

SUMMARY OF THE INVENTION

PROBLEMS TO BE SOLVED BY THE INVENTION

[0008]

However, in the technology disclosed in Non-Patent Document 2, also when it is not necessary to change the insertion position of the reference image disposed in the view direction in the temporal list, the slice header needs to be transmitted, and there is concern that the coding efficiency may decrease.

[0009]

Embodiments of the present invention improve the coding efficiency in hierarchical coding or multi-viewpoint coding.

SOLUTIONS TO PROBLEMS

[0010]

According to an aspect of the present invention, there is provided an image processing device including: a decoding unit that generates an image by decoding a bit stream; a reference

list setting unit that sets a reference list being referred to when the image generated by the decoding unit is predicted by inserting a reference image that can be referred to in a layer direction between a plurality of reference images that can be referred to in a time direction; and a prediction unit that predicts the image generated by the decoding unit by referring to the reference list set by the reference list setting unit, wherein the reference list setting unit sets the reference list by inserting the reference image that can be referred to in the layer direction between a reference image located before the image in time and a reference image located after the image in time among the plurality of reference images that can be referred to in the time direction.

[0011]

~~The above-described reference list setting unit may set the reference list by inserting the reference image that can be referred to in the layer direction between a reference image located before the image in time and a reference image located after the image in time among the plurality of reference images that can be referred to in the time direction.~~

[0012]

The above-described reference list setting unit may set the reference list by arranging images in a direction L0 in order of reference images located before the image in time, the reference image that can be referred to in the layer direction, and reference images located after the image in time.

[0013]

The above-described reference list setting unit may set the reference list by arranging images in a direction L1 in order of reference images located after the image in time, the

reference image that can be referred to in the layer direction, and reference images located before the image in time.

[0014]

The above-described reference list setting unit may set the reference list by alternately arranging the reference image that can be referred to in the time direction and the reference image that can be referred to in the layer direction.

[0015]

The above-described reference list setting unit may set the reference list by alternately arranging an element of a list of the reference images that can be referred to in the time direction set in order of the reference images located before the image in time and the reference images located after the image in time and an element of a list of the reference images that can be referred to in the layer direction, which is configured by the reference images that can be referred to in the layer direction, in a direction L0.

[0016]

The above-described reference list setting unit may set the reference list by alternately arranging an element of a list of the reference images that can be referred to in the time direction set in order of the reference images located after the image in time and the reference images located before the image in time and an element of a list of the reference images that can be referred to in the layer direction, which is configured by the reference images that can be referred to in the layer direction, in a direction L1.

[0017]

The above-described reference list setting unit may set the reference list by inserting the reference images that can be referred to in the layer direction in a direction L1 with

order of the reference image that can be referred to in the layer direction being opposite to that of the case of a direction L0.

[0018]

The above-described reference list setting unit may include: a temporal list setting unit that sets a temporal list that is a temporary list used for setting the reference list by inserting the reference image that can be referred to in the layer direction between the plurality of reference images that can be referred to in the time direction; and a reference image list setting unit that sets the reference list based on the temporal list set by the temporal list setting unit.

[0019]

According to another aspect of the present invention, there is provided an image processing method implemented in an image processing device. ~~The image processing method includes,~~ the image processing method including: generating an image by decoding a bit stream; setting a reference list being referred to when the generated image is predicted by inserting a reference image that can be referred to in a layer direction between a plurality of reference images that can be referred to in a time direction; and predicting the generated image by referring to the set reference list, wherein the step of setting the reference list sets the reference list by inserting the reference image that can be referred to in the layer direction between a reference image located before the image in time and a reference image located after the image in time among the plurality of reference images that can be referred to in the time direction.

[0020]

~~According to another aspect of the present invention,~~
~~there is provided~~ Disclosed herein is an image processing device including: a reference list setting unit that sets a reference list being referred to when an image is predicted by inserting a reference image that can be referred to in a layer direction between a plurality of reference images that can be referred to in a time direction; a prediction unit that predicts the image by referring to the reference list set by the reference list setting unit; and an encoding unit that generates a bit stream by performing coding using the image predicted by the prediction unit.

[0021]

The above-described reference list setting unit may set the reference list by inserting the reference image that can be referred to in the layer direction between a reference image located before the image in time and a reference image located after the image in time among the plurality of reference images that can be referred to in the time direction.

[0022]

The above-described reference list setting unit may set the reference list by arranging images in a direction L0 in order of reference images located before the image in time, the reference image that can be referred to in the layer direction, and reference images located after the image in time.

[0023]

The above-described reference list setting unit may set the reference list by arranging images in a direction L1 in order of reference images located after the image in time, the reference image that can be referred to in the layer direction,

and reference images located before the image in time.

[0024]

The above-described reference list setting unit may set the reference list by alternately arranging the reference image that can be referred to in the time direction and the reference image that can be referred to in the layer direction.

[0025]

The above-described reference list setting unit may set the reference list by alternately arranging an element of a list of the reference images that can be referred to in the time direction set in order of the reference images located before the image in time and the reference images located after the image in time and an element of a list of the reference images that can be referred to in the layer direction, which is configured by the reference images that can be referred to in the layer direction, in a direction L0.

[0026]

The above-described reference list setting unit may set the reference list by alternately arranging an element of a list of the reference images that can be referred to in the time direction set in order of the reference images located after the image in time and the reference images located before the image in time and an element of a list of the reference images that can be referred to in the layer direction, which is configured by the reference images that can be referred to in the layer direction, in a direction L1.

[0027]

The above-described reference list setting unit may set the reference list by inserting the reference images that can be referred to in the layer direction in a direction L1 with order of the reference image that can be referred to in the

layer direction being opposite to that of the case of a direction L0.

[0028]

The above-described reference list setting unit may include: a temporal list setting unit that sets a temporal list that is a temporary list used for setting the reference list by inserting the reference image that can be referred to in the layer direction between the plurality of reference images that can be referred to in the time direction; and a reference image list setting unit that sets the reference list based on the temporal list set by the temporal list setting unit.

[0029]

~~According to another aspect of the present invention,~~
~~there is provided~~ Disclosed herein is an image processing method implemented in an image processing device. The image processing method includes: setting a reference list being referred to when an image is predicted by inserting a reference image that can be referred to in a layer direction between a plurality of reference images that can be referred to in a time direction; predicting the image by referring to the set reference list; and generating a bit stream by performing coding using the predicted image.

[0030]

According to embodiments of the present invention, an image is generated by decoding a bit stream, and a reference list being referred to when the image generated is predicted is set by inserting a reference image that can be referred to in a layer direction between a plurality of reference images that can be referred to in a time direction. Then, the generated image is predicted by referring to the set reference

list.

[0031]

According to embodiments of the present invention, a reference list being referred to when an image is predicted is set by inserting a reference image that can be referred to in a layer direction between a plurality of reference images that can be referred to in a time direction. Then, the image is predicted by referring to the set reference list, and a bit stream is generated by performing coding using the predicted image.

[0032]

Here, the above-described image processing device may be an independent device or an internal block that configures one image encoding device or image decoding device.

EFFECTS OF THE INVENTION

[0033]

According to embodiments of the present invention, an image can be decoded. Particularly, the coding efficiency can be improved.

[0034]

According to embodiments of the present invention, an image can be coded. Particularly, the coding efficiency can be improved.

BRIEF DESCRIPTION OF DRAWINGS

[0035]

CLAIMS

1. An image processing device comprising:

a decoding unit that generates an image by decoding a bit stream;

a reference list setting unit that sets a reference list being referred to when the image generated by the decoding unit is predicted by inserting a reference image that can be referred to in a layer direction between a plurality of reference images that can be referred to in a time direction; and

a prediction unit that predicts the image generated by the decoding unit by referring to the reference list set by the reference list setting unit,

wherein the reference list setting unit sets the reference list by inserting the reference image that can be referred to in the layer direction between a reference image located before the image in time and a reference image located after the image in time among the plurality of reference images that can be referred to in the time direction.

~~2. The image processing device according to claim 1, wherein the reference list setting unit sets the reference list by inserting the reference image that can be referred to in the layer direction between a reference image located before the image in time and a reference image located after the image in time among the plurality of reference images that can be referred to in the time direction.~~

32. The image processing device according to claim 21, wherein the reference list setting unit sets the reference list by arranging images in a direction L0 in order of

reference images located before the image in time, the reference image that can be referred to in the layer direction, and reference images located after the image in time.

43. The image processing device according to claim 21, wherein the reference list setting unit sets the reference list by arranging images in a direction L1 in order of reference images located after the image in time, the reference image that can be referred to in the layer direction, and reference images located before the image in time.

54. The image processing device according to claim 1, wherein the reference list setting unit sets the reference list by alternately arranging the reference image that can be referred to in the time direction and the reference image that can be referred to in the layer direction.

65. The image processing device according to claim 54, wherein the reference list setting unit sets the reference list by alternately arranging an element of a list of the reference images that can be referred to in the time direction set in order of the reference images located before the image in time and the reference images located after the image in time and an element of a list of the reference images that can be referred to in the layer direction, which is configured by the reference images that can be referred to in the layer direction, in a direction L0.

76. The image processing device according to claim 54, wherein the reference list setting unit sets the reference list by alternately arranging an element of a list of the reference images that can be referred to in the time direction

set in order of the reference images located after the image in time and the reference images located before the image in time and an element of a list of the reference images that can be referred to in the layer direction, which is configured by the reference images that can be referred to in the layer direction, in a direction L1.

87. The image processing device according to claim 1, wherein the reference list setting unit sets the reference list by inserting the reference images that can be referred to in the layer direction in a direction L1 with order of the reference image that can be referred to in the layer direction being opposite to that of the case of a direction L0.

98. The image processing device according to claim 1, wherein the reference list setting unit includes:

- a temporal list setting unit that sets a temporal list that is a temporary list used for setting the reference list by inserting the reference image that can be referred to in the layer direction between the plurality of reference images that can be referred to in the time direction; and

- a reference image list setting unit that sets the reference list based on the temporal list set by the temporal list setting unit.

109. An image processing method implemented in an image processing device, the image processing method comprising:

- generating an image by decoding a bit stream;

- setting a reference list being referred to when the generated image is predicted by inserting a reference image that can be referred to in a layer direction between a plurality of reference images that can be referred to in a

time direction; and

predicting the generated image by referring to the set reference list,

wherein the step of setting the reference list sets the reference list by inserting the reference image that can be referred to in the layer direction between a reference image located before the image in time and a reference image located after the image in time among the plurality of reference images that can be referred to in the time direction.

10. The image processing method according to claim 9, wherein the step of setting the reference list sets the reference list by arranging images in a direction L0 in order of reference images located before the image in time, the reference image that can be referred to in the layer direction, and reference images located after the image in time.

11. The image processing method according to claim 9, wherein the step of setting the reference list sets the reference list by arranging images in a direction L1 in order of reference images located after the image in time, the reference image that can be referred to in the layer direction, and reference images located before the image in time.

12. The image processing method according to claim 9, wherein the step of setting the reference list sets the reference list by alternately arranging the reference image that can be referred to in the time direction and the reference image that can be referred to in the layer direction.

13. The image processing method according to claim 12, wherein the step of setting the reference list sets the

reference list by alternately arranging an element of a list of the reference images that can be referred to in the time direction set in order of the reference images located before the image in time and the reference images located after the image in time and an element of a list of the reference images that can be referred to in the layer direction, which is configured by the reference images that can be referred to in the layer direction, in a direction L0.

14. The image processing method according to claim 12, wherein the step of setting the reference list sets the reference list by alternately arranging an element of a list of the reference images that can be referred to in the time direction set in order of the reference images located after the image in time and the reference images located before the image in time and an element of a list of the reference images that can be referred to in the layer direction, which is configured by the reference images that can be referred to in the layer direction, in a direction L1.

15. The image processing method according to claim 9, wherein the step of setting the reference list sets the reference list by inserting the reference images that can be referred to in the layer direction in a direction L1 with order of the reference image that can be referred to in the layer direction being opposite to that of the case of a direction L0.

16. The image processing method according to claim 9, wherein the step of setting the reference list includes:

setting a temporal list that is a temporary list used for setting the reference list by inserting the reference image that can be referred to in the layer direction between the

plurality of reference images that can be referred to in the time direction; and

setting the reference list based on the temporal list set by the temporal list setting unit.

~~11. An image processing device comprising:~~

~~— a reference list setting unit that sets a reference list being referred to when an image is predicted by inserting a reference image that can be referred to in a layer direction between a plurality of reference images that can be referred to in a time direction;~~

~~— a prediction unit that predicts the image by referring to the reference list set by the reference list setting unit; and~~

~~— an encoding unit that generates a bit stream by performing coding using the image predicted by the prediction unit.~~

~~12. The image processing device according to claim 11, wherein the reference list setting unit sets the reference list by inserting the reference image that can be referred to in the layer direction between a reference image located before the image in time and a reference image located after the image in time among the plurality of reference images that can be referred to in the time direction.~~

~~13. The image processing device according to claim 12, wherein the reference list setting unit sets the reference list by arranging images in a direction L0 in order of reference images located before the image in time, the reference image that can be referred to in the layer direction, and reference images located after the image in time.~~

~~14. The image processing device according to claim 12,~~

~~wherein the reference list setting unit sets the reference list by arranging images in a direction L1 in order of reference images located after the image in time, the reference image that can be referred to in the layer direction, and reference images located before the image in time.~~

~~15. The image processing device according to claim 11, wherein the reference list setting unit sets the reference list by alternately arranging the reference image that can be referred to in the time direction and the reference image that can be referred to in the layer direction.~~

~~16. The image processing device according to claim 15, wherein the reference list setting unit sets the reference list by alternately arranging an element of a list of the reference images that can be referred to in the time direction set in order of the reference images located before the image in time and the reference images located after the image in time and an element of a list of the reference images that can be referred to in the layer direction, which is configured by the reference images that can be referred to in the layer direction, in a direction L0.~~

~~17. The image processing device according to claim 15, wherein the reference list setting unit sets the reference list by alternately arranging an element of a list of the reference images that can be referred to in the time direction set in order of the reference images located after the image in time and the reference images located before the image in time and an element of a list of the reference images that can be referred to in the layer direction, which is configured by the reference images that can be referred to in the layer~~

~~direction, in a direction L1.~~

~~18. The image processing device according to claim 11, wherein the reference list setting unit sets the reference list by inserting the reference images that can be referred to in the layer direction in a direction L1 with order of the reference image that can be referred to in the layer direction being opposite to that of the case of a direction L0.~~

~~19. The image processing device according to claim 11, wherein the reference list setting unit includes:~~

~~—— a temporal list setting unit that sets a temporal list that is a temporary list used for setting the reference list by inserting the reference image that can be referred to in the layer direction between the plurality of reference images that can be referred to in the time direction; and~~

~~—— a reference image list setting unit that sets the reference list based on the temporal list set by the temporal list setting unit.~~

~~20. An image processing method implemented in an image processing device, the image processing method comprising:~~

~~—— setting a reference list being referred to when an image is predicted by inserting a reference image that can be referred to in a layer direction between a plurality of reference images that can be referred to in a time direction;~~

~~—— predicting the image by referring to the set reference list; and~~

~~—— generating a bit stream by performing coding using the predicted image.~~