DESCRIPTION

ENCODING DEVICE, DECODING DEVICE, ENCODING METHOD, AND DECODING METHOD

Field

[0001] An embodiment of the present invention relates to an encoding method and a decoding method.

Background

[0002] In recent years, a method of encoding an image with markedly improved coding efficiency is recommended as ITU-T REC. H.264 and ISO/IEC 14496-10 (hereinafter, referred to as "H.264") in cooperation of ITU-T (International Telecommunication Union Telecommunication Standardization Sector) and ISO (International Organization for Standardization)/ IEC (International Electrotechnical Commission).

[0003] In H.264, an inter-prediction coding system is disclosed in which redundancy in the time direction is eliminated to achieve high coding efficiency by making a motion compensation prediction of fractional precision using a coded image as a reference image.

[0004] In addition, a system is proposed in which a moving image including a fading or dissolving effect is encoded with efficiency higher than that of an inter-prediction coding system according to ISO/IEC MPEG (Moving Picture Experts Group)-1, 2, 4. In this system, a motion compensation prediction of fractional precision is made for an input moving image having luminance and two color differences as frames for predicting a change in the brightness in the time direction. Then, by using an index representing a combination of a reference image, a weighting factor for each luminance and two color differences, and an offset for each luminance and two color differences, a predicted image is multiplied by the weighting factor, and the offset is added thereto.

Citation List

Patent Literature

[0005] Patent Literature 1: Japanese Laid-open Patent Publication No. 2004-7377

Summary

Technical Problem

[0006] However, in the technology of the related art as described above, in a bidirectional prediction slice in which bi-directional predictions can be selected, when weighted motion compensation is performed using two indices having the same reference image but having different reference image numbers different from each other, there are cases where an index having the same value is encoded twice, and accordingly, there are cases where the coding efficiency decreases. An object of the present invention is to provide an encoding method and a decoding method capable of improving the coding efficiency.

Solution to Problem

[0007] An encoding device~~method~~ according to an embodiment includes an index setting unit~~generating step~~ and an encoding unit~~step~~. The index setting unit~~generating step~~ generates a common index in which reference indices~~numbers~~ of one or more reference images included in a first index and ~~numbers of one or more reference images included in~~ a second index are sorted in a combination so as not to include a same reference image in accordance with a predetermined scanning order. The first index ~~is set to~~ representing a combination of~~including~~ the one or more reference images referred to by a first reference image. The second index ~~is set to~~ representing a combination of~~including~~ the one or more reference images referred to by a second reference image. ~~The numbers of the reference images included in the first index and the second index are scanned in a predetermined order.~~ The encoding unit~~step~~ encodes the common index.

CLAIMS

1. An encoding device~~method~~ comprising ~~the steps of~~:

an index setting unit configured to generate~~ing~~ a common index in which reference indices~~numbers~~ of one or more reference images included in a first index and ~~numbers of one or more reference images included in~~ a second index are sorted in a combination so as not to include a same reference image in accordance with a predetermined scanning order, the first index ~~being set to~~ representing a combination of~~including~~ the one or more reference images referred to by a first reference image, the second index ~~being set to~~ representing a combination of~~including~~ the one or more reference images referred to by a second reference image~~, the numbers of the reference images included in the first index and the second index being scanned in a predetermined order~~; and

an encoding unit configured to encode the common index.

2. The device~~encoding method~~ according to claim 1, wherein

~~each of~~ the first index and the second index include~~s~~ one or more weighting factors,

the device~~encoding method~~ further comprising~~es the steps of:~~

a predicted image generating unit configured to generate a predicted image of a target block by multiplying motion compensated predicted values by weighting factors of the first reference image and the second reference image, the motion compensated predicted values being obtained based on ~~the first reference image and the second reference image referred to by the target block out of a plurality of blocks into which an input image is divided and based on~~ motion vectors ~~corresponding respectively to the first reference image and the second reference image~~; and

a quantization unit configured to generate~~ing~~ a quantization transformation coefficient of the target block based on the input image and the predicted image, and

the ~~step of~~ encoding unit~~the common index includes~~ further encodes~~ing~~ the quantization transformation coefficient and the motion vectors.

3. The device~~encoding method~~ according to claim 2, wherein

~~each of~~ the first index and the second index includes one or more offsets, and

the ~~step of generating the~~ predicted image ~~includes, to~~ generating unit generates~~the predicted image of the target block,~~

~~making a~~ motion compensated predicted values~~ion~~ based on ~~the first reference image and the second reference image referred to by the target block out of the plurality of blocks into which the input image is divided and based on~~ the motion vectors ~~corresponding respectively to the first reference image and the second reference image~~,

multiplies~~ying~~ the motion compensated predicted values~~images~~ by the weighting factors of the first reference image and the second reference image, and

adds~~ing~~ offsets corresponding to~~of~~ the first reference image and the second reference image to generate the predicted image of the target block~~resultant values~~.

4. The device~~encoding method~~ according to claim 2~~3~~, wherein the ~~step of~~ encoding unit~~the common index includes~~ encodes~~ing~~ high-level information and low-level information as mutually-different units, the high-level information ~~being made up of information~~ including the common index in units of one or more pictures, the low-level information including~~being made up of~~ the quantization transformation coefficient and the motion vectors and~~to~~ referring to an identification number of the high-level information.

5. The device~~encoding method~~ according to claim 4, wherein the common index includes information of a maximum number of allowed reference images and the number of reference images maintained by a unit structure higher than the picture.

6. The device~~encoding method~~ according to claim 1, wherein

the predicted image~~step of~~ generating unit~~the common index includes~~ replaces~~ing~~ a reference image that is the same as the reference image included in the first index out of the one or more reference images included in the second index with reference information for referring to the reference image included in the first index, and

the ~~step of~~ encoding unit~~the common index includes~~ encodes~~ing~~ the first index and the second index after being replaced with the reference information.

~~7. An encoding method comprising the steps of:~~

~~generating an index in which a reference image that is the same as the reference image included in a first index out of one or more reference images included in a second index is replaced with reference information for referring to the reference image included in the first index, the~~

~~first index being set to represent a combination including the one or more reference images referred to by a first reference image, the second index being set to represent a combination including the one or more reference images referred to by a second reference image; and~~

~~encoding the first index and the second index after being replaced with the reference information.~~

~~8. The encoding method according to claim 7, wherein~~

~~each of the first index and the second index includes one or more weighting factors,~~

~~the encoding method further comprises the steps of:~~

~~generating a predicted image of a target block by multiplying motion compensated predicted values by weighting factors of the first reference image and the second reference image, the motion compensated predicted values being obtained based on the first reference image and the second reference image referred to by the target block out of a plurality of blocks into which an input image is divided and based on motion vectors corresponding respectively to the first reference image and the second reference image; and~~

~~generating a quantization transformation coefficient of the target block based on the input image and the predicted image, and~~

~~the step of encoding the common index includes further encoding the quantization transformation coefficient and the motion vectors.~~

~~9. The encoding method according to claim 8, wherein~~

~~each of the first index and the second index includes one or more offsets, and~~

~~the step of generating the predicted image includes, to generate the predicted image of the target block,~~

~~making a motion compensated prediction based on the first reference image and the second reference image referred to by the target block out of the plurality of blocks into which the input image is divided and based on the motion vectors corresponding respectively to the first reference image and the second reference image,~~

~~multiplying the motion compensated predicted images by the weighting factors of the first reference image and the second reference image, and~~

~~adding offsets of the first reference image and the second reference image to resultant values.~~

7~~10~~. A decoding device~~method~~ comprising ~~the steps of~~:

an decoding unit configured to decode~~ing~~ encoded data and generate~~ing~~ a common index in which reference indices~~numbers~~ of one or more reference images included in a first index and ~~numbers of one or more reference images included in~~ a second index are sorted in a combination so as not to include a same reference image in accordance with a predetermined scanning order~~, the numbers of the reference images included in the first index and the second index being scanned in a predetermined order~~; and

an index setting unit configured to generate~~ing~~ the first index and the second index from the generated common index.

8~~11~~. The device~~decoding method~~ according to claim 7~~10~~, wherein

~~each of~~ the first index and the second index include~~s~~ one or more weighting factors, and

the ~~step of~~ decoding unit~~the encoded data includes~~ generates~~ing~~ a quantization transformation coefficient and motion vectors by decoding the encoded data,

the device~~decoding method~~ further comprising~~es the steps of:~~

a predicted image generating unit configured to generate~~ing~~ a predicted image of a target block by multiplying motion compensated predicted values by weighting factors of a first reference image and a second reference image, the motion compensated predicted values being obtained based on ~~the first reference image and the second reference image referred to by the target block out of a plurality of blocks into which the decoded image based on the quantization transformation coefficient is divided and based on~~ motion vectors ~~corresponding respectively to the first reference image and the second reference image~~; and

an addition unit configured to generate~~ing~~ an output image using the decoded image and the predicted image.

9~~12~~. The device~~decoding method~~ according to claim 8~~11~~, wherein

~~each of~~ the first index and the second index includes one or more offsets, and

~~the step of generating~~ the predicted image generating unit~~includes, to~~ generates ~~the predicted image of the target block,~~

~~making a~~ motion compensated predicted values~~ion~~ based on ~~the first reference image and the second reference image referred to by the target block out of the plurality of blocks into which the decoded image is divided and based on~~ the motion vectors ~~corresponding respectively to the first reference image and the second reference image~~,

multiplies~~ying~~ the motion compensated predicted values~~images~~ by the weighting factors of the first reference image and the second reference image, and

adds~~ing~~ offsets corresponding to~~of~~ the first reference image and the second reference image, to generate the predicted image of the target block~~resultant values~~.

10~~13~~. The device~~decoding method~~ according to claim 7~~12~~, wherein the ~~step of~~ decoding unit~~the encoded data includes~~ decodes~~ing~~ high-level information and low-level information as mutually-different units, the high-level information ~~being made up of information~~ including the common index in units of one or more pictures, the low-level information including~~being made up of~~ the quantization transformation coefficient and the motion vectors and~~to~~ referring to an identification number of the high-level information.

11~~14~~. The device~~decoding method~~ according to claim 10~~13~~, wherein the common index includes information of a maximum number of allowed reference images and the number of reference images maintained by a unit structure higher than the picture.

12~~15~~. The device~~decoding method~~ according to claim 7~~10~~, wherein

the ~~step of~~ decoding unit~~the encoded data includes~~ decodes~~ing~~ the encoded data and generating the first index that represents a combination including one or more reference images referred to by a first reference image and the second index in which a reference image that is the same as the reference image included in the first index out of the one or more reference images is replaced with reference information for referring to the reference image included in the first index, and

the index setting unit~~step of~~ generates~~ing~~ the first index and the second index and~~includes~~ replaces~~ing~~ the reference information of the second index with the reference image included in the first index.

13. An encoding method comprising:

generating a common index in which reference indices of one or more reference images included in a first index and a second index are sorted in a combination so as not to include a same reference image in accordance with a predetermined scanning order, the first index representing a combination of the one or more reference images referred to by a first reference image, the second index representing a combination of the one or more reference images referred to by a second reference image; and

encoding the common index.

14. A decoding method comprising:

decoding encoded data and generating a common index in which reference indices of one or more reference images included in a first index and a second index are sorted in a combination so as not to include a same reference image in accordance with a predetermined scanning order; and

generating the first index and the second index from the generated common index.

~~16. A decoding method comprising the steps of:~~

~~decoding encoded data and generating a first index representing a combination including one or more reference images referred to by a first reference image and a second index in which a reference image that is the same as the~~

~~reference image included in the first index out of the one or more reference images is replaced with reference information for referring to the reference image included in the first index; and~~

~~generating an index by replacing the reference information of the second index with the reference image included in the first index.~~

~~17. The decoding method according to claim 16, wherein~~

~~each of the first index and the second index includes one or more offsets,~~

~~the step of decoding the encoded data includes generating a quantization transformation coefficient and motion vectors by decoding the encoded data,~~

~~the decoding method further comprises the steps of:~~

~~generating a predicted image of a target block by multiplying motion compensated predicted values by weighting factors of the first reference image and the second reference image, the motion compensated predicted values being obtained based on the first reference image and the second reference image referred to by the target block out of a plurality of blocks into which the decoded image based on the quantization transformation coefficient is divided and based on motion vectors corresponding~~

~~respectively to the first reference image and the second reference image; and~~

~~generating an output image using the decoded image and the predicted image.~~

~~18. The decoding method according to claim 17, wherein~~

~~each of the first index and the second index includes one or more offsets, and~~

~~the step of generating the predicted image includes, to generate the predicted image of the target block,~~

~~making a motion compensated prediction based on the first reference image and the second reference image referred to by the target block out of the plurality of blocks into which the decoded image is divided and based on the motion vectors corresponding respectively to the first reference image and the second reference image,~~

~~multiplying the motion compensated predicted images by the weighting factors of the first reference image and the second reference image, and~~

~~adding offsets of the first reference image and the second reference image to resultant values.~~