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 conventional technology as described above, since the index is coded with being maintained as direct values, the coding efficiency is reduced. An object to be solved by 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~~step~~, an index reconfiguring unit~~prediction step~~, and an entropy encoding unit~~step~~. The index setting unit~~step~~ sets an index that represents information of a reference image and a weighting factor. The index reconfiguring unit~~prediction step~~ predicts ~~so that~~ a reference value of the weighting factor, wherein the reference value indicates a factor to be set if~~when~~ a difference of pixel value ~~change~~ between ~~at least one~~ reference image and a target image to be encoded is less than or equal to a specific ~~reference or less is derived as a predicted~~ value. The entropy encoding unit~~step~~ encodes a difference value between the weighting factor and the reference~~predicted~~ value.

Brief Description of Drawings

[0008] FIG. 1 is a block diagram that illustrates an example of an encoding device according to a first embodiment.

FIG. 2 is an explanatory diagram that illustrates an example of a predicted coding sequence for a pixel block according to the first embodiment.

FIG. 3A is a diagram that illustrates an example of the block size of a coding tree block according to the first embodiment.

CLAIMS

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

an index setting unit configured to set an index that represents information of a reference image and a weighting factor;

an index reconfiguring unit configured to predict~~ing so that~~ a reference value of the weighting factor, wherein the reference value indicates a factor to be set if~~when~~ a difference of pixel value ~~change~~ between a~~t least one~~ reference image and a target image to be encoded is less than or equal to a specific ~~reference or less is derived as a predicted~~ value; and

an entropy encoding unit configured to encode a difference value between the weighting factor and the reference~~predicted~~ value.

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

the index represents a combination including the weighting factor and fixed point precision of the weighting factor, and

the index reconfiguring unit~~step of predicting includes~~ derive~~sing, as the predicted value,~~ the reference value of the weighting factor ~~when there is no pixel value~~

~~change from the target image~~ based on the fixed point precision.

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

~~the index includes the reference image,~~

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

a predicted image ~~-~~generating unit configured to generate a predicted image of a target block by multiplying a ~~motion compensated~~ predicted value by the weighting factor, the ~~motion compensated~~ predicted value being compensated~~obtained based on a reference image referred to by the target block out of a plurality of blocks into which an input image is divided and~~ based on a motion vector; 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~~, wherein~~and~~

the entropy~~step of~~ encoding unit~~the difference value includes~~ further encodes~~ing~~ the quantization transformation coefficient and the motion vector.

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

the index further includes an offset, and

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

~~generating the motion compensated predicted image~~ by ~~making a motion compensated prediction based on the 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 vector;~~

~~multiplying a the generated motion compensated~~ predicted value~~image~~ by the weighting factor~~;~~ and

~~multiplying the generated motion compensated predicted image by the weighting factor; and~~

adding the offset, the predicted value being compensated based on the motion vector~~to a resultant value~~.

5. The device~~encoding method~~ according to claim 1~~4~~, wherein

the index includes a weighting factor of luminance, first fixed point precision of the weighting factor of the luminance, a weighting factor of a color difference, and second fixed point precision of the weighting factor of the color difference,

the index reconfiguring unit~~step of predicting includes~~ derive~~sing, as the predicted value,~~ a first difference value between the first fixed point precision and the second fixed point precision, and

the entropy~~step of~~ encoding unit~~the difference value includes~~ encode~~sing~~ a second difference value between one of the first fixed point precision and the second fixed point precision and the first difference~~predicted~~ value.

6. The device~~encoding method~~ according to claim 1~~4~~, wherein

the index includes a weighting factor of a color difference and an offset of the color difference,

the index reconfiguring unit ~~step of predicting includes~~

~~——————~~multiplies~~ying~~ a median value of a maximal brightness value of the color difference by the weighting factor of the color difference,~~;~~ and

~~——————~~derive~~sing, as the predicted value,~~ a value acquired by subtraction of the median value of the color difference, and

the entropy~~step of~~ encoding unit~~the difference value includes~~ encode~~sing~~ a difference value between the offset of the color difference and the derived~~predicted~~ value.

~~7. The encoding method according to claim 6, wherein~~

~~the step of predicting includes deriving, as predicted values, a reference weighting factor and a reference offset that are set in accordance with a time distance ratio between the target block and the reference image, a weighting factor of the color difference that represents a time distance other than the reference weighting factor and the reference offset, and the difference value, for the weighting factor of the color difference and the offset of the color difference, and~~

~~the step of encoding the difference value includes encoding difference values between the weighting factor of the color difference and the offset of the color difference and the predicted values.~~

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

~~the step of deriving the reference value includes correcting a weighting factor that is implicitly derived using a time distance ratio between the target block and the reference image so as to have same precision as fixed point precision of the weighting factor of the color difference; and~~

~~deriving, as the predicted value, a difference value between the corrected weighting factor and the weighting factor of the color difference, and~~

~~the step of encoding the difference value includes encoding a difference value between the corrected weighting factor and the predicted value.~~

7~~9~~. A decoding device~~method~~ comprising ~~the steps of~~:

an index reconfiguring unit configured to predict~~ing so that~~ a reference value of a weighting factor, wherein the reference value indicates a factor to be set if~~when~~ a difference of pixel value ~~change~~ between a~~t least one~~ reference image and a target image to be encoded is less than or equal to a specific ~~reference or less is derived as a predicted~~ value;

an entropy decoding unit configured to decode the weighting factor by adding a difference value acquired by decoding encoded data and the reference~~predicted~~ value; and

an index setting unit configured to set an index that represents information of the reference image and the decoded weighting factor.

8~~10~~. The device~~decoding method~~ according to claim 7~~9~~, wherein

the index reconfiguring unit~~step of predicting includes~~ derive~~sing, as the predicted value,~~ the reference value of the weighting factor ~~when there is no pixel value change from the target image~~ based on fixed point precision of the weighting factor, and

the index represents a combination including the weighting factor and the fixed point precision of the weighting factor.

9~~11~~. The device~~decoding method~~ according to claim 7~~10~~, wherein

~~the index includes the reference image,~~

the entropy~~step of~~ decoding unit further~~the weighting factor includes~~ decode~~sing~~ a~~the~~ quantization transformation coefficient and a~~the~~ motion vector by decoding the encoded data,

the device~~decoding method~~ further comprisinge~~s the steps of:~~

a predicted image generating unit configured to generate a predicted image of a target block by multiplying a ~~motion compensated~~ predicted value by the weighting factor, the ~~motion compensated~~ predicted value being compensated~~obtained based on a reference image referred to by the target block out of a plurality of blocks into which~~

~~a decoded image based on the quantization transformation coefficient is divided and~~ based on the motion vector; and

an addition unit configured to generate~~ing~~ an output image based on a~~the~~ decoded image and the predicted image.

10~~12~~. The device~~decoding method~~ according to claim 9~~11~~, wherein

the index further includes an offset, and

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

~~generating a motion compensated predicted image~~ by ~~making a motion compensated prediction based on the 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 vector;~~

~~multiplying a the generated motion compensated~~ predicted value~~image~~ by the weighting factor~~;~~ and

~~adding the offset, the predicted to a resultant~~ value being compensated based on the motion vector.

11~~13~~. The device~~decoding method~~ according to claim 7~~12~~, wherein

the index reconfiguring unit~~step of predicting includes~~ derive~~sing, as the predicted value,~~ a first difference value between first fixed point precision of the weighting factor of luminance and second fixed point precision of the weighting factor of a color difference, and

the entropy~~step of~~ decoding unit~~the weighting factor includes~~

add~~sing~~ a second difference value of one of the first fixed point precision and the second fixed point precision acquired by decoding the encoded data and the first difference~~predicted~~ value~~,~~ ~~,~~ and

decode~~sing~~ one of the first fixed point precision and the second fixed point precision, and

the index includes the weighting factor of the luminance, the first fixed point precision, the weighting factor of the color difference, and the second fixed point precision.

12~~14~~. The device~~decoding method~~ according to claim 7~~12~~, wherein

the index reconfiguring unit~~step of deriving the reference value includes~~

multiplies~~ying~~ a median value of a maximal brightness value of the color difference by the weighting factor of the color difference, ~~,~~ and

derives~~ing, as the predicted value,~~ a value acquired by subtraction of the median value of the color difference,

the entropy~~step of~~ decoding unit~~the weighting factor includes~~

adds~~ing~~ a difference value of the offset of the color difference acquired by decoding the encoded data and the ~~predicted~~ value, ~~,~~ and

decodes~~ing~~ the offset of the color difference, and

the index includes the weighting factor of the color difference and the offset of the color difference.

13. An encoding method comprising:

setting an index that represents information of a reference image and a weighting factor;

predicting a reference value of the weighting factor, wherein the reference value indicates a factor to be set if a difference of pixel value between a reference image and a target image to be encoded is less than or equal to a specific value; and

encoding a difference value between the weighting factor and the reference value.

14. A decoding method comprising:

predicting a reference value of a weighting factor, wherein the reference value indicates a factor to be set if a difference of pixel value between a reference image and a target image to be encoded is less than or equal to a specific value;

decoding the weighting factor by adding a difference value acquired by decoding encoded data and the reference value; and

setting an index that represents information of the reference image and the decoded weighting factor.

~~15. The decoding method according to claim 14, wherein the step of predicting includes deriving, as predicted values, a reference weighting factor and a reference offset that are set in accordance with a time distance ratio between the target block and the reference image, a weighting factor of the color difference that represents a time distance other than the reference weighting factor and the reference offset, and the difference value, for the weighting factor of the color difference and the offset of the color difference, and~~

~~the step of decoding the weighting factor includes adding a difference value between the weighting factor of the color difference and the offset of the color difference acquired by decoding the encoded data and the predicted value; and~~

~~decoding the weighting factor of the color difference and the offset of the color difference.~~

~~16. The decoding method according to claim 15, wherein~~

~~the step of deriving the reference value includes correcting a weighting factor that is implicitly derived using a time distance ratio between the target block and the reference image so as to have same precision as fixed point precision of the weighting factor of the color difference; and~~

~~deriving, as a predicted value, a difference value between the corrected weighting factor and the weighting factor of the color difference, and~~

~~the step of decoding the weighting factor includes adding a difference value of the corrected weighting factor acquired by decoding the encoded data and the predicted value; and~~

~~decoding the corrected weighting factor.~~