DESCRIPTION

IMAGE PROCESSING DEVICE AND IMAGE PROCESSING METHOD

TECHNICAL FIELD

[0001]

The present disclosure relates to an image processing device and an image processing method. Specifically, the present disclosure relates to an image processing device and an image processing method capable of improving encoding efficiency.

BACKGROUND ART

[0002]

In recent years, devices, which handle image information as digital data, which, in such a case, aim to transmit and store information with a high efficiency, and which conform to a scheme such as MPEG (Moving Picture Experts Group), for compressing image information using orthogonal transformation, such as discrete cosine transformation, and using motion compensation by utilizing redundancy that is unique to the image information have become widespread in both information distribution in broadcasting stations and information reception in ordinary homes.

[0003]

In particular, MPEG2 (International Organization for Standardization and International Electrotechnical Commission (ISO/IEC) 13818-2) is defined as a general-purpose image encoding scheme and is presently widely used in a wide range of applications for professional use and consumer use as standards for both interlaced-scanning images and sequential scanning images and standard and high-definition images. By

employing the MPEG2 compression scheme, for example, a coding rate (bit rate) of 4 to 8 Mbps is allocated for an interlaced-scanning image of a standard resolution with 720 × 480 pixels, and a coding rate (bit rate) of 18 to 22 Mbps is allocated for an interlaced-scanning image of a high resolution with 1920 × 1088 pixels. As a result, a high compression ratio and a good image quality can be realized.

[0004]

The MPEG2 has been mainly intended for high-image-quality encoding appropriate for broadcasting, but was not compatible with an encoding scheme for realizing a lower coding rate (bit rate) (a higher compression ratio) than that of MPEG1. With the popularity of mobile terminals, the demand for such an encoding scheme is expected to increase in the future. To respond this, standardization of MPEG4 encoding schemes have been confirmed. With regard to an image encoding scheme, the specification thereof was confirmed as the international standard ISO/IEC 14496-2 in December in 1998.

[0005]

In addition, in recent years, originally for the purpose of video coding for television conferencing, standardization of specifications of a standard called H.26L (ITU-T (International Telecommunication Union Telecommunication Standardization Sector) Q6/16 VCEG (Video Coding Expert Group)) has progressed. H.26L is known to achieve higher encoding efficiency although it requires a greater amount of computations for encoding and decoding than conventional encoding schemes such as MPEG2 and MPEG4. Moreover, currently, as part of the activity of MPEG4, standardization for incorporating functions, which are not supported by H.26L, into the H.26L is performed as Joint Model of Enhanced-

Compression Video Coding to realize high encoding efficiency.

[0006]

The schedule of standardization showed that, it became an international standard under the name of H.264 and MPEG-4 Part 10 (Advanced Video Coding, hereinafter referred to as AVC) in March, 2003.

[0007]

However, setting the size of a macroblock to 16 × 16 pixels is not optimal for a large image frame named UHD (Ultra High Definition; 4000 × 2000 pixels) that will become an object of the next generation encoding scheme.

[0008]

Thus, the standardization of an encoding system called HEVC (High Efficiency Video Coding) has been currently developed by JCTVC (Joint Collaboration Team-Video Coding), which is a joint standardization organization of ITU-T and ISO/IEC, for the purpose of further improving the encoding efficiency compared to AVC (for example, see Non-Patent Document 1).

[0009]

In the HEVC encoding scheme, a coding unit (CU) is defined as the same processing unit as the macroblock in the AVC scheme. The size of CU is not fixed to 16 × 16 pixels unlike the macroblock of the AVC scheme but is designated in image compression information in respective sequences.

[0010]

However, in order to improve encoding of motion vectors using median prediction defined in the AVC scheme, a method that allows "temporal predictor" and "spatio-temporal predictor" as well as "spatial predictor" to be used as candidates for predictive motion vectors has been taken into

consideration (for example, see Non-Patent Document 2).

[0011]

Moreover, a method called motion partition merging in which merge_flag and merge_left_flag are transmitted is proposed as one of encoding schemes for motion information (for example, see Non-Patent Document 3).

CITATION LIST

NON-PATENT DOCUMENT

[0012]

Non-Patent Document 1: Thomas Wiegand, Woo-Jin Han, Benjamin Bross, Jens-Rainer Ohm, Gary J. Sullivan, "Working Draft 1 of High-Efficiency Video Coding", JCTVC-C403, Joint Collaborative Team on Video Coding (JCT-VC) of ITU-T SG16 WP3 and ISO/IEC JTC1/SC29/WG11 3rd Meeting: Guangzhou, CN, 7-15 October, 2010

Non-Patent Document 2: Joel Jung, Guillaume Laroche, "Competition-Based Scheme for Motion Vector Selection and Coding," VCEG-AC06, ITU-Telecommunications Standardization Sector STUDY GROUP 16 Question 6, Video Coding Experts Group (VCEG) 29th Meeting: Klagenfurt, Austria, 17-18 July, 2006

Non-Patent Document 3: Martin Winken, Sebastian Bosse, Benjamin Bross, Philipp Helle, Tobias Hinz, Heiner Kirchhoffer, Haricharan Lakshman, Detlev Marpe, Simon Oudin, Matthias Preiss, Heiko Schwarz, Mischa Siekmann, Karsten Suehring, and Thomas Wiegand, "Description of video coding technology proposed by Fraunhofer HHI," JCTVC-A116, April, 2010

SUMMARY OF THE INVENTION

PROBLEMS TO BE SOLVED BY THE INVENTION

[0013]

However, these techniques illustrate processes in the same view only and cannot perform inter-view vector prediction in the case of multi-view encoding. Thus, encoding efficiency may decrease.

[0014]

Embodiments of the present invention aim to suppress a decrease in the encoding efficiency.

SOLUTIONS TO PROBLEMS

[0014a]

According to a first aspect of the present invention, there is provided an image processing device including: a predictive motion vector generating unit that sets a co-located block to be not available when a type of a reference picture of a current block is different from a type of the reference picture of a co-located block included in a co-located picture when encoding a current motion vector of the current block used in prediction using correlation in a temporal direction and generates a predictive motion vector of the current motion vector using a reference motion vector referred when generating a predictive motion vector; and a difference motion vector generating unit that generates a difference motion vector between the current motion vector and the predictive motion vector generated by the predictive motion vector generating unit.

[0014b]

According to a second aspect of the present invention, there is provided an image processing method of an image processing device, for allowing the image processing device to execute the steps of: setting a co-located block to be not available when a type of a reference picture of a current

block is different from a type of the reference picture of a co-located block included in a co-located picture when encoding a current motion vector of the current block used in prediction using correlation in a temporal direction, and generating a predictive motion vector of the current motion vector using a reference motion vector referred when generating a predictive motion vector; and generating a difference motion vector between the current motion vector and the generated predictive motion vector.

[0015]

Disclosed herein is an image processing device including: a predictive vector generating unit that generates a predictive vector of a current parallax vector of a current block used in prediction using correlation in a parallax direction using a reference parallax vector referred when generating a predictive motion vector, when encoding the current parallax vector; and a difference vector generating unit that generates a difference vector between the current parallax vector and the predictive vector generated by the predictive vector generating unit.

[0016]

The predictive vector generating unit may generate a predictive vector of the current parallax vector using a parallax vector of a co-located block included in a co-located picture of a time different from a current picture of the same view as a current view.

[0017]

The predictive vector generating unit may set the co-located block to be available when a property of a vector of the current block is identical to a property of a vector of the co-located block.

[0018]

The property of the vector is a type of a vector, and the predictive vector generating unit may set the co-located block to be available when the property of the vector of the current block is a parallax vector and the property of the vector of the co-located block is a parallax vector.

[0019]

The predictive motion vector generating unit may determine the property of the vector of the current block and the property of the vector of the co-located block using POC (Picture Order Count) that indicates an output order of pictures.

[0020]

The predictive motion vector generating unit may determine the property of the vector of the current block and the property of the vector of the co-located block using the POC of the current picture, the POC of a current reference picture referred from the current picture, the POC of the co-located picture, and the POC of a co-located reference picture referred from the co-located picture.

[0021]

The predictive motion vector generating unit may determine that the property of the vector of the current block and the property of the vector of the co-located block are parallax vectors when the POC of the current picture is identical to the POC of the current reference picture referred from the current picture and the POC of the co-located picture is identical to the POC of the co-located reference picture referred from the co-located picture.

[0022]

The predictive vector generating unit may set the co-

located block to be not available when the property of the vector of the current block is different from the property of the vector of the co-located block.

[0023]

The property of the vector is a type of a reference picture, and the predictive vector generating unit may set the co-located block to be not available when the type of the reference picture of the current block is different from the type of the reference picture of the co-located block.

[0024]

The property of the vector is a type of a reference picture, and the predictive vector generating unit may skip a process of searching a reference index when the type of the reference picture of the current block is a long reference type and the type of the reference picture of the co-located block is a long reference type.

[0025]

The predictive vector generating unit may generate a predictive vector of the current parallax vector using a parallax vector of a reference block included in a picture of the same time as a current picture of a view different from the current view.

[0026]

The predictive vector generating unit may scale the reference parallax vector based on a positional relationship between a current picture and a reference picture referred when generating a predictive motion vector to generate a predictive vector of the current parallax vector.

[0027]

The predictive vector generating unit may generate a predictive vector of the current motion vector using a

reference motion vector referred when generating a predictive motion vector, when encoding the current motion vector of the current block used in prediction using correlation in a temporal direction, and the difference vector generating unit may generate a difference vector between the current motion vector and the predictive vector generated by the predictive vector generating unit.

[0028]

The predictive vector generating unit may generate the predictive vector of the current motion vector using a motion vector of the reference block included in a picture of the same time as the current picture of a view different from the current view.

[0029]

The predictive vector generating unit may generate a predictive vector of the current motion vector using a motion vector of a reference block included in a picture of a time different from the current picture of the same view as the current view.

[0030]

The predictive vector generating unit may scale the reference motion vector based on a positional relationship between the current picture and a reference picture referred when generating a predictive motion vector to generate a predictive vector of the current motion vector.

[0031]

The predictive vector generating unit may generate the predictive vector using a vector of a block located at the same position as the current block in a state where a position of a pixel of a picture of the same time as the current picture of a view different from the current view is shifted.

[0032]

The predictive vector generating unit may set a shift amount of the image according to a parallax vector of a neighboring region of the current block.

[0033]

The predictive vector generating unit may use a parallax vector in an X-direction, of the neighboring block in which the value of a parallax vector in a Y-direction is not zero as the shift amount.

[0034]

The predictive vector generating unit may use a value calculated from parallax vectors in an X-direction, of a plurality of the neighboring blocks in which the value of a parallax vector in a Y-direction is not zero as the shift amount.

[0035]

The predictive vector generating unit may use an average value or a median value of the parallax vectors in the X-direction, of the plurality of the neighboring blocks in which the value of the parallax vector in the Y-direction is not zero as the shift amount of the image.

[0036]

The predictive vector generating unit may set the shift amount of the image according to a global parallax vector.

[0037]

Disclosed herein is an image processing device, for allowing the image processing device to execute: generating a predictive vector of a current parallax vector of a current block used in prediction using correlation in a parallax direction using a reference parallax vector referred when generating a predictive motion vector, when encoding the

current parallax vector; and generating a difference vector between the current parallax vector and the generated predictive vector.

[0038]

Disclosed herein is an image processing device including: a predictive vector generating unit that generates a predictive vector of a current parallax vector of a current block used in prediction using correlation in a parallax direction using a reference parallax vector referred when generating a predictive motion vector, when decoding the current parallax vector; and an arithmetic unit that performs an operation of adding the predictive vector generated by the predictive vector generating unit to a difference vector between the current parallax vector and the predictive vector to reconstruct the current parallax vector.

[0039]

Disclosed herein is an image processing method of an image processing device, for allowing the image processing device to execute: generating a predictive vector of a current parallax vector of a current block used in prediction using correlation in a parallax direction using a reference parallax vector referred when generating a predictive motion vector, when decoding the current parallax vector; and performing an operation of adding the generated predictive vector to a difference vector between the current parallax vector and the predictive vector to reconstruct the current parallax vector.

[0040]

Disclosed herein is an image processing device including: a predictive vector generating unit that sets a co-located block to be not available when a type of a reference picture of a current block is different from a type of the reference

picture of a co-located block included in a co-located picture of a different time from a current picture when encoding a current motion vector of the current block used in prediction using correlation in a temporal direction and generates a predictive vector of the current motion vector using a reference motion vector referred when generating a predictive motion vector; and a difference vector generating unit that generates a difference vector between the current motion vector and the predictive vector generated by the predictive vector generating unit.

[0041]

Disclosed herein is an image processing device, for allowing the image processing device to execute: setting a co-located block to be not available when a type of a reference picture of a current block is different from a type of the reference picture of a co-located block included in a co-located picture of a different time from a current picture when encoding a current motion vector of the current block used in prediction using correlation in a temporal direction, and generating a predictive vector of the current motion vector using a reference motion vector referred when generating a predictive motion vector; and generating a difference vector between the current motion vector and the generated predictive vector.

[0042]

In one embodiment, a predictive vector of a current parallax vector of a current block used in prediction using correlation in a parallax direction is generated using a reference parallax vector referred when generating a predictive motion vector, when encoding the current parallax vector; and a difference vector between the current parallax

vector and the generated predictive vector is generated.

[0043]

According to another embodiment, a predictive vector of a current parallax vector of a current block used in prediction using correlation in a parallax direction is generated using a reference parallax vector referred when generating a predictive motion vector, when decoding the current parallax vector; and an operation of adding the generated predictive vector to a difference vector between the current parallax vector and the predictive vector to reconstruct the current parallax vector is performed.

[0044]

According to a still another embodiment, a co-located block is set to be not available when a type of a reference picture of a current block is different from a type of the reference picture of a co-located block included in a co-located picture of a different time from a current picture when encoding a current motion vector of the current block used in prediction using correlation in a temporal direction; a predictive vector of the current motion vector is generated using a reference motion vector referred when generating a predictive motion vector; and a difference vector between the current motion vector and the generated predictive vector is generated.

EFFECTS OF THE INVENTION

[0045]

According to embodiments of the present invention, it is possible to process images. In particular, it is possible to suppress a decrease in encoding efficiency.

BRIEF DESCRIPTION OF THE DRAWINGS

[0046]

Fig. 1 is a diagram for describing an example of the types of prediction units.

Fig. 2 is a diagram for describing an example of neighboring regions used for reference image index determination in a merge mode temporal correlation region.

Fig. 3 is a diagram for describing an example of reference image index determination conditions in a merge mode temporal correlation region.

Fig. 4 is a diagram for describing an example of a temporal correlation region determination method.

Fig. 5 is a diagram for describing an example of a method of determining an image that includes a temporal correlation region.

Fig. 6 is a diagram for describing an example of positional relationship between a current region and a temporal correlation region.

Fig. 7 is a diagram illustrating an example of scaling of a motion vector of a temporal correlation region.

Fig. 8 is a diagram illustrating an example of a reference relationship of a 3-view image.

Fig. 9 is a diagram for describing an example of allocation of a reference image when predicting a parallax vector with respect to a current region.

Fig. 10 is a diagram for describing an example of allocation of a reference image when predicting a motion