Appeal decision

Appeal No. 2015-21648

France
Appellant THOMSON LICENSING

Tokyo, Japan
Patent Attorney INABA, Yoshiyuki

Tokyo, Japan
Patent Attorney ONUKI, Toshifumi

Tokyo, Japan
Patent Attorney EGUCHI, Akihiko

Tokyo, Japan
Patent Attorney NAITO, Kazuhiko

Tokyo, Japan
Patent Attorney ABE, Toyotaka

The case of appeal against the examiner's decision of refusal of Japanese Patent Application No. 2011-547886, entitled "Methods and apparatus for transform selection in video encoding and decoding" [International publication on Aug. 5, 2010: WO 2010/087809, and National publication of the translated version on Jul. 19, 2012: National Publication of International Patent Application No. 2012-516627] has resulted in the following appeal decision:

Conclusion

The appeal of the case was groundless.

Reason

No. 1 History of the procedures

The present application was filed on Oct. 21, 2009 (Priority Claim received by the foreign receiving office under the Paris Convention on Jan. 27, 2009, the United States, and on Feb. 17, 2009, the United States) as an international application date, and the outline of the procedures is as indicated below.

Amendment	: Oct. 16, 2012
Notice of reasons for refusal	: Dec. 10, 2013 (drafting date)
Amendment	: Jun. 18, 2014
Notice of reasons for refusal (final)	: Dec. 18, 2014 (drafting date)
Amendment	: Jun. 24, 2015
Decision to dismiss the amendment	: Jul. 28, 2015
Decision of refusal	: Jul. 28, 2015 (drafting date)
Appeal against an examiner's decision of refusal	: Dec. 4, 2015
Amendment	: Dec. 4, 2015
Reconsideration by examiners before appeal proceedings report	: Feb. 9, 2016
Written statement	: Apr. 25, 2016

No. 2 The Invention

The inventions according to claims of the present application are specified by the matters that have been described in claims 1 to 10 of the scope of claims of the written amendment dated Dec. 4, 2015, and the invention described in its claim 7 (hereinafter, referred to as the "Invention") is as follows.

Meanwhile, a reference character of each constitution of the Invention was assigned in the body in favor of explanation, and, hereinafter, reference is made to such reference characters, in the manner of constitution (A), constitution (B), and the like.

(The Invention)

(A) An apparatus, comprising

(B) a video encoder for encoding of at least a block in a picture in a video sequence, by selecting a transform to apply to a residue of the block between adjacent pictures in the video sequence from a set of two or more different transforms determined for each block in advance, wherein

(C) using data reconstituted from one or more previous pictures in the video sequence, determination of the set of two or more different transforms is carried out.

No. 3 Judgment by the body

1. The described matters of Cited Document

In Japanese Unexamined Patent Application Publication No. 2002-314428 that is Cited Document 1 cited in the reasons for refusal stated in the examiner's decision, there are described the following matters relating to "Signal encoding method and apparatus, and decoding method and apparatus" (the title of the invention), together with drawings.

The underlines were added by the body for the purpose of emphasis.

(1) "[0001]

[Field of the Invention] The present invention generally relates to a method of and an apparatus for encoding and decoding a series of signals such as an image signal, and more particularly, to a method of and an apparatus for encoding and decoding a series of signals using a transformation basis such as DCT."

(2) "[0054] The second embodiment of the present invention will be described below.

[0055] The image encoding apparatus according to this embodiment is constructed as showed in FIG. 11, for example, and the image decoding apparatus according to this embodiment is constructed as showed in FIG. 12, for example. This embodiment reduces the redundancy remaining in the time directions by the motion compensation

inter-frame prediction, and modifies the DCT bases so that the base corresponding to the principal component can capture the waveform pattern of the predicted image of a macro block obtained by the motion compensation prediction to compress the information by encoding using the modified bases. Several sets of transformation bases that fit local characteristics of corresponding image are prepared, and a set of transformation bases that fits the pattern of the predicted image is selected. Since the same set of transformation bases is provided to both the image encoding apparatus and the image decoding apparatus, it is not necessary to transmit information other than ID information indicating the switching of bases. The image decoding apparatus is required only to selects a set of bases based on the ID information and does not need to calculate bases.

(Omitted)

[0057] In FIG. 11, an input image signal 201 is a signal of a framed image in a time series of framed images (the framed image to be encoded corresponds to the current frame of FIG. 3). The current frame is encoded in the following procedure by a macro block. The current macro block is transferred to the motion detection unit 202 for detecting the motion vector 205. The motion compensation unit 207 retrieves a predicted image 206 of each macro block by looking up partially decoded images 217 in the frame memory 203 using the motion vector 205.

[0058] The predicted remainder signal 208 is obtained as the difference between the current macro block and the predicted image 206 and converted into the orthogonal transformation coefficient data 210 by the adaptive transformation unit 209. The transformation bases 219 used by the adaptive transformation unit 209 is selected by the transformation base operation unit 218 depending on the used pattern of the predicted image 206. The selected transformation bases 219 are transferred to the adaptive transformation unit 209 and used for the orthogonal transformation. The ID information 250 of a transformation base 219 for each orthogonal transformation processing is multiplexed on the compressed stream 214 and transferred to the image decoding apparatus. The operation of the transformation base operation unit 218 will be described later.

(Omitted)

[0061] The transformation base operation unit 218 divides the input predicted image 206 into regions (N x N pixel blocks, where N = 4, 8, and so forth) to which the orthogonal transformation is applied, obtain the transformation bases 219 for each region, and output the transformation bases 219 to the adaptive transformation unit 109. As showed in FIG. 10, average brightness distributions x_H and x_V in the horizontal and vertical directions are obtained for each region of the predicted image 206 to which the orthogonal transformation is applied. Waveform patterns that reflect the principal components of each region in the horizontal and vertical directions are obtained (see FIG. 10). "K" kinds of normalized orthogonal bases A_i(i = 0, 1, ..., K-1), the principal axis of which reflects the pattern of typical average brightness distribution vector x_H and x_V are prepared for the transformation base operation unit 218, and one of the bases Aicorresponding to x_H and x_V is selected. Examples of the bases (N=4) prepared as Aiare showed in FIGS. 13B through 19B. "

(3) "[0083] Additionally, the fourth embodiment of the present invention will be described below.

[0084] The image encoding apparatus according to this embodiment is constructed as showed in FIG. 24, for example, and the image decoding apparatus according to this embodiment is constructed as showed in FIG. 25, for example.

[0085] This embodiment encodes an image using a base set A_i(i = 0, 1, ..., K-1) by adaptively selecting a transformation base in the same manner in which the second embodiment described above operates, and additionally updates the transformation base A_i dynamically. Accordingly, when the image encoding apparatus encounters an image pattern with which the image encoding apparatus cannot fully comply using the fixed transformation set, the image encoding apparatus can further improve the efficiency of encoding.

[0086] In the image encoding apparatus showed in FIG. 24, the input image signal 401 represents a signal of each frame image in a time series of frame images (the frame image to be encoded corresponds to the current frame of FIG. 3). The current frame is

encoded by a macro block in the following procedure. The current macro block is transferred to the motion detection unit 402, and the motion detection unit 402 detects the motion vector 405. The motion compensation unit 407 retrieves the predicted image 406 of each macro block from the.frame memory 403 by reference to partially decoded image 417 using the motion vector 405.

[0087] The predicted remainder signal 408 is obtained as the difference between the current macro block and the predicted image 406, and converted into the orthogonal transformation coefficient data 410 by the adaptive transformation unit 409. The transformation base 419 that is used by the adaptive transformation unit 409 is adaptively selected by the transformation base operation unit 418 depending on the pattern of the predicted image 406. The selected transformation base 419 is transferred to the adaptive transformation unit 409 and used for the orthogonal transformation. In addition, the ID information 450 of the transformation base 419 by an orthogonal transformation operation is multiplexed on the compressed stream 414 and transmitted to the image decoding apparatus.

[0088] Further, when the transformation base operation unit 418 generates another transformation base that is no included in the base set A_i at the point of time, the transformation base is multiplexed on the compressed stream 414 through the variable length encoding unit 413 and transmitted with the ID information 450. In this case, the ID information 450 that is transmitted means the ID information of a base that is replaced by the transformation base that is transmitted at the same time. The operation of the transformation base operation unit 418 will be described later.

(Omitted)

[0091] The transformation base operation unit 418 divides the input predicted image 406 into regions (N x N pixel blocks, where N = 4, 8, and so forth) to which the orthogonal transformation is applied, obtains a transformation base 419 by a region, and outputs the obtained transformation base to the adaptive transformation unit 409. The transformation base operation unit 418 first obtains average brightness distribution x_H and x_V in the horizontal and vertical directions for each region of the predicted image 406 to which the orthogonal transformation is applied. A waveform pattern that reflects

the principal components of the horizontal and vertical directions of each region is obtained (see FIG. 10). "K" kinds of normalized orthogonal bases A_i(i = 0, 1, ..., K-1) of which principal axis reflects the pattern of the typical average brightness distribution vectors x_H and x_V are prepared in the transformation base operation unit 418, and one of the bases Aicorresponding to x_H and x_V is selected. An example of base A_i(N = 4) is showed in FIGS. 13 through 19. Since each example is described in detail in connection with the second embodiment, their description is omitted here."

2. The invention described in Cited Document 1

The invention described in Cited Document 1 is as follows.

(1) Image encoding apparatus

According to statements of the above 1. (1) of Cited Document 1, there is described in Cited Document 1 an invention regarding an apparatus for encoding a series of signals such as an image signal; that is, an invention about an image encoding apparatus.

(2) The second embodiment

According to the statements of the above-mentioned 1. (2) of Cited Document 1, there is described in Cited Document 1 an apparatus, as an image encoding apparatus according to the second embodiment, that is an apparatus to encode an input image signal that is a time series of framed images in a macro block, and that is an apparatus to obtain a prediction residue signal as a difference between the current macro block and a predicted image, and to convert into the orthogonal transform coefficient data by an adaptive transformation unit. Then, a transform bases used by the adaptive transformation unit is selected, by the transformation base operation unit from a base set composed of several kinds of transformation bases prepared in consideration of a regional property of an image in advance depending on the used pattern of the predicted image.

(3) The fourth embodiment

According to the statements of the above-mentioned 1. (3) of Cited Document 1, there is described in Cited Document 1, as an image encoding apparatus according to the fourth embodiment, an apparatus that encode using a base set by adaptively selecting a transformation base in the same manner in which the second embodiment, and additionaly updates the transformation base of the base set dynamically when the image encoding apparatus encounters an image pattern with which the image encoding apparatus cannot fully comply using the fixed transformation set in the transformation base operation unit.

That is, an image encoding appaatus according to the fourth embodiment includes an adaptive transformation unit to perform encoding in a macro block of an input image signal that is a time series of frame images by transformation base, in a transformation base operation unit, a predictied remainder signal that is a difference between the current macro block and a predicted image to orthogonal transformation coefficient data using a transformation base selected from a base set composed of several kinds of transformation bases prepared in consideration of a regional property of an image in advance depending on the pattern of the prediction image to be used.

Then, it is provided with a structure to update the transformation bases of the set dynamically in the transformation base peration unit, when another transformation base not included in the base set at that time point is generated based on the prediction image.

(4) Summary

As stated above, when an image encoding apparatus according to the fourth embodiment is recognized as a cited invention, it is recognized that there is described in Cited Document 1 the following invention (hereinafter, referred to as "Cited invention").

(Cited invention)

(c) An image encoding apparatus, comprising

(a) an adaptive transformation unit to perform encoding in a macro block of an input image signal that is a time series of frame images by transformation base, in a

transformation base operation unit, a predictied remainder signal that is a difference between the current macro block and a predicted image to orthogonal transformation coefficient data using a transformation base selected from a base set composed of several kinds of transformation bases prepared in consideration of a regional property of an image in advance depending on the pattern of the prediction image to be used, wherein

(b) the transformation bases of the base set are updated dynamically in the transformation base operation unit, when another transformation base not included in the base set at that time point is generated based on the prediction image.

3. Comparison

The Invention and Cited invention will be compared.

(1) Comparison between constitution (A) of the Invention and constitution (c) of Cited invention

As stated in constitution (a), since "image encoding apparatus" of Cited invention is one that performs encoding of an input image signal that is a time series of frame images, it is a apparatus to perform encoding of a dynamic picture image, and thus corresponds to "apparatus" including a video encoder of the Invention.

(2) Comparison between constitution (B) of the Invention and constitution (a) of Cited invention

"Encoding of a macro block of an input image signal that is a time series of frame images" of Cited invention corresponds to "encoding of at least a block in a picture in a video sequence" of the Invention.

"A predicted remainder signal that is a difference between the current macro block and a predicted image" of Cited invention corresponds to "a residue of the block between adjacent pictures in the video sequence" of the Invention.

In addition, it can be said that "a base set composed of several kinds of

transformation bases prepared in consideration of a regional property of an image in advance" of Cited invention is "a set of two or more different transforms determined in advance" of the Invention.

Then, to transform, in the transformation base operation unit, a prediction remainder signal to orthogonal transform coefficient data using a transformation base selected from a base set composed of several kinds of transformation bases of Cited invention corresponds to performing encoding "by selecting a transform to apply to a residue of the block between adjacent pictures in the video sequence from a set of two or more different transforms determined for each relevant block in advance" of the Invention, because transformation of a prediction remainder signal is performed for each block.

It can be said that "transformation base operation unit" and "adaptive transformation unit" of Cited invention to perform encoding as above are "video encoder" of the Invention.

Therefore, constitution (a) of Cited invention is identical with the constitution of "a video encoder for encoding of at least a block in a picture in a video sequence, by selecting a transform to apply to a residue of the block between adjacent pictures in the video sequence from a set of two or more different transforms determined for each block in advance" of constitution (B) of the Invention.

(3) Comparison between constitution (C) of the Invention and constitution (b) of Cited invention

Cited invention is an invention in which "the transform bases of the base set are updated dynamically in the transform base calculation unit, when another transformation base not included in the base set at that time point is generated based on the prediction image", "prediction image" is "reconstituted data" in encoding, and "a transformation base of the base set is updated dynamically" corresponds to "determining" "a base set composed of several kinds of transformation bases" of

constitution (a).

Therefore, constitution (b) of Cited invention is identical with constitution (C) of the Invention in a point that it is one in which "using data reconstituted, determination of the set of two or more different transforms is carried out."

However, there are cases where "prediction image" is a previous frame or a following frame in the time series of a frame image, and, therefore, Cited invention is different from the Invention in a point that, related to "reconstituted data," it is not specified as "data reconstituted from one or more previous pictures in the video sequence" unlike the Invention.

4. Corresponding features and different feature

In light of the comparison results of the above-mentioned 3. (1) to (3), the corresponding features and the different feature between the Invention and Cited invention are as follows.

[Corresponding features]

An apparatus, comprising

a video encoder for encoding of at least a block in a picture in a video sequence, by selecting a transform to apply to a residue of the block between adjacent pictures in the video sequence from a set of two or more different transforms determined for each relevant block in advance, wherein

using data reconstituted, determination of the set of two or more different transforms is carried out.

[Different feature]

A point that, relating to "reconstituted data," it is not specified in Cited invention as "data reconstituted from one or more previous pictures in the video sequence" unlike the Invention.

5. Judgment about the different feature

Generally, "prediction image" is reconstituted data from pictures of one or more previous or following subsequent ones in a video sequence, and, in the technical field of moving image encoding, it can be made with ease by a person skilled in the art to only use "one or more previous pictures" that precede temporally.

6. Regarding effects and the like

The constitution of the Invention could have been conceived with ease by a person skilled in the art as mentioned above, and the effect exerted by the Invention is in a range that can be easily predicted by a person skilled in the art from the constitution in question that could have been conceived with ease, and is not remarkable to the extent that exceeds that range.

7. Regarding the written statement

In the written statement, the applicant stated that, regarding claim 7, the applicant was ready for amendment to add the constitution of the underlined portion of "at least one of determination and refinement of the set of two or more different transforms is carried out." However, "the transform bases of the base set are updated dynamically" of Cited invention includes, in addition to determination of the base set, to perform refinement of the base set.

Accordingly, even by the above-mentioned amendment described in the written statement, it is not recognized that the amended invention has an inventive step.

8. Summary

As above, the Invention is an invention that could have been invented with ease by a person skilled in the art based on the invention described in Cited Document 1.

No. 4 Closing

As above, since the invention according to claim 7 of the present application could have been invented with ease by a person skilled in the art based on the invention described in Cited Document 1, the appellant should not be granted a patent for that

under the provisions of Article 29(2) of the Patent Act.

Therefore, the present application should be rejected without examining other claims.

Accordingly, the appeal decision shall be made as described in the conclusion.

June 16, 2017

Chief administrative judge: FUJII, Hiroshi

Administrative judge: SHIMIZU, Masakazu

Administrative judge: SHINOHARA, Koichi