Literature 1 and Non-patent Literature 2).

[0004] The data compression processes in the H.264/AVC Standard is roughly divided into prediction, transform, quantization, and entropy coding. The entropy coding is intended to reduce redundant information in information to be used for the prediction and quantized information. Representatives of entropy coding include variable-length coding, adaptive coding, and fixed-length coding. Representatives of variable-length coding include Huffman coding, run-length coding, and arithmetic coding. Among these, the arithmetic coding is known as a scheme which is intended to determine output codes using contexts for identifying symbol occurrence probabilities and which provides a high coding efficiency by switching contexts according to the features of image data, compared to Huffman coding which uses a fixed coding table.

[Citation List]

[Non Patent Literature]

[0005]

[NPL 1]

"MPEG-4 Part 10 Advanced Video Coding", ISO/IEC 14496 - 10,

[NPL 2]

"Overview of the H. 264/AVC Video Coding Standard", Thomas Wiegand et al, IEEE TRANSACTIONS ON CIRCUITS AND SYSTEMS FOR VIDEO TECHNOLOGY, JULY 2003, PP. ~~1—19~~ 560-576

[Summary of Invention]

[Technical Problem]

[0006] However, the conventional arithmetic coding has a problem of not providing a sufficient coding efficiency.

[0007] The present invention has been made to solve the aforementioned problem, with an aim to provide an image coding method, an image coding apparatus, an image decoding method, an image decoding apparatus, and an image coding and decoding apparatus which make it possible to increase coding efficiency.

[Solution to Problem]

[CLAIMS]

[Claim 1]

An image coding method of compression-coding image data including a plurality of processing units having mutually different sizes, said image coding method comprising:

obtaining current signals to be coded of each of the processing units of the image data;

generating a binary signal by performing binarization on each of the current signals to be coded;

selecting a context for each of the current signals to be coded from among a plurality of contexts;

performing arithmetic coding of the binary signal by using coded probability information associated with the context selected in said selecting; and

updating the coded probability information associated with the context selected in said selecting, based on the binary signal generated in said generating,

wherein, in said selecting, the context for the current signal to be coded is selected for a signal which is included in one of a plurality of processing units and has a size different from a size of the processing unit including the current signal to be coded.

[Claim 2]

The image coding method according to Claim 1,

wherein in said selecting, the context which is set as a shared context in advance is selected in the case where the size of the processing unit including the current signal to be coded obtained in said obtaining is larger than a predetermined size.

[Claim 3]

The image coding method according to one of Claim 1 and Claim 2, further comprising

performing frequency transform on the image data to generate transform coefficients of frequency components and to generate the

current signals to be coded which respectively indicate the transform coefficients of the frequency components,

wherein in said selecting, the context which is set for a processing unit which is included in the processing units is selected in the case where the frequency component corresponding to the current signal to be coded is lower than a predetermined frequency.

[Claim 4]

The image coding method according to any one of Claim 1 to Claim 3, further comprising

performing frequency transform on the image data to generate transform coefficients of frequency components and to generate the current signals to be coded which respectively indicate the transform coefficients of the frequency components,

wherein in said selecting, the context which is set as a shared context in advance for processing units which are included in the processing units and have high frequencies which are higher than a predetermined frequency is selected in the case where the frequency component corresponding to the current signal to be coded is higher than the predetermined frequency.

[Claim 5]

The image coding method according to any one of Claim 1 to Claim 4, further comprising

segmenting the image data into a plurality of sub blocks each having the same sub processing unit size,

wherein in said generating, the binary signal is generated by performing binarization on the current signals to be coded of each of the sub blocks, and

in said selecting, the context which is set for the sub processing unit size in advance is selected.

[Claim 6]

An image decoding method of reconstructing a coded image data including a plurality of processing units having mutually

different sizes by decoding the coded image data, said image decoding method comprising:

obtaining current signals to be decoded of each of the processing units of the coded image data;

selecting a context of each of the current signals to be decoded from among a plurality of contexts;

generating a binary signal by performing arithmetic decoding of the current signal to be decoded by using decoded probability information associated with the context selected in said selecting;

reconstructing the coded image data by performing multi-value conversion on the binary signal; and

updating the decoded probability information associated with the context selected in said selecting, based on the binary signal,

wherein, in said selecting, the context for the current signal to be decoded is selected, as a shared context, for a signal which is included in a plurality of processing units and has a size different from a size of the processing unit including the current image to be decoded.

[Claim 7]

The image decoding method according to Claim 6,

wherein in said selecting, the context which is set as a shared context in advance is selected in the case where the processing unit size including the current signals to be coded obtained in said obtaining is larger than a predetermined size.

[Claim 8]

The image decoding method according to one of Claim 6 and 7,

wherein in said selecting, the context which is set as a dedicated context in advance for a processing unit included in the processing units is selected when the frequency component corresponding to the current signal to be decoded is lower than a predetermined frequency in the case where the current signal to be decoded is a signal indicating one of transform coefficients of frequency components generated through frequency transform in the

generation of the coded image data.

[Claim 9]

The image decoding method according to any one of Claim 6 to 8,

wherein in said selecting, the context which is set as a shared context in advance for processing units which are included in the processing units and have high frequencies which are higher than the predetermined frequency is selected when the frequency component corresponding to the current signal to be decoded is higher than the predetermined frequency in the case where the current signal to be decoded is a signal indicating one of transform coefficients of frequency components generated through frequency transform in the generation of the coded image data.

[Claim 10]

The image decoding method according to any one of Claim 6 to 9,

wherein in the case where the coded image data is a coded image generated by segmenting the image data into a plurality of sub blocks each having the same sub processing unit size and performing binarization and arithmetic coding of each of the sub blocks,

in said selecting, the context which is set as a context for each of the sub blocks having the sub processing unit size is selected.

[Claim 11]

An image coding apparatus which compression-codes image data including a plurality of processing units having mutually different sizes, said image coding apparatus comprising:

a storage unit configured to store a plurality of contexts;

a binarization unit configured to obtain current signals to be coded included in the plurality of processing units of the image data and generate a binary signal by performing binarization on each of the current signals to be coded;

a context selection control unit configured to select a context

for each of the current signals to be coded from among a plurality of contexts;

a context control unit configured to execute a coded probability information identification process for identifying coded probability information associated with the context selected by said context selection control unit and an update process for updating, based on the binary signal, the coded probability information associated with the context selected by said context selection control unit; and

an arithmetic coding unit configured to perform arithmetic coding of the binary signal by using the coded probability information identified by said context control unit,

wherein said context selection control unit is configured to select, as a shared context, the context for the current signal to be coded for a signal which is included in one of a plurality of processing units and has a size different from a size of the processing unit including the current signal to be coded.

[Claim 12]

An image decoding apparatus which reconstructs coded image data including a plurality of processing units having mutually different sizes by decoding the coded image, said image decoding apparatus comprising:

a storage unit configured to store a plurality of contexts;

a context selection control unit configured to select, from among a plurality of contexts, a context for each of current signals to be decoded included in the plurality of processing units of the coded image data;

a context control unit configured to execute a decoded probability information identification process for identifying decoded probability information associated with the context selected by said context selection control unit;

an arithmetic decoding unit configured to obtain the current signals to be decoded and perform arithmetic decoding of the current signals to be decoded by said context control unit by using the

decoded probability information; and

a multi-value conversion unit configured to reconstruct the image data by performing multi-value conversion on the binary signal,

wherein said context control unit is configured to execute an update process for updating the decoded probability information identified by said context control unit based on the binary signal, and

said context selection control unit is configured to select, as a shared context, the context for the current signal to be decoded for a signal which is included in one of a plurality of processing units and has a size different from a size of the processing unit including the current signal to be decoded.

[Claim 13]

The image coding and decoding apparatus comprising:

the image coding apparatus according to Claim 11; and

the image decoding apparatus according to Claim 12.

Claims

1. An image decoding method of reconstructing a coded image including a plurality of processing units having mutually different sizes by decoding the coded image, said image decoding method comprising:

obtaining current signals to be decoded of each of the processing units of the coded image;

selecting a context of each of the current signals to be decoded from among a plurality of contexts;

generating a binary signal by performing arithmetic decoding of the current signal to be decoded by using decoded probability information associated with the context selected in said selecting;

reconstructing the coded image by performing multi-value conversion on the binary signal; and

updating the decoded probability information associated with the context selected in said selecting, based on the binary signal,

wherein a first shared context is set in advance,

wherein, in said selecting, the first shared context is selected as the context for the current signal to be decoded in the case where a size of the processing unit which includes the current signal to be decoded is a block size of 16 x 16, and in the case where the size of the processing unit which includes the current signal to be decoded is a block size of 32 x 32, and

wherein, in said selecting, a dedicated context is selected as the context for the current signal to be decoded in the case where the size of the processing unit which includes the current signal to be decoded is smaller than the block size of 16 x 16.

2. The image decoding method according to claim 1,

wherein in said selecting, a dedicated context is selected as the context for the current signal to be decoded in the case where the frequency component corresponding to the current signal to be decoded is lower than a predetermined frequency.

3. The image decoding method according to claim 1,

wherein a second shared context is set in advance, and

wherein in said selecting, the second shared context is selected as the context for the current signal to be decoded in the case where the frequency component corresponding to the current signal to be decoded is higher than a predetermined frequency.

4. The image decoding method according to claim 1,

wherein in the case where the coded image is a coded image generated by segmenting the image into a plurality of sub blocks each having the same sub processing unit size, and performing binarization and arithmetic coding of each of the sub blocks, and in said selecting, the context which is set as a context for each of the sub blocks having the sub processing unit size is selected.

5. An image decoding apparatus which reconstructs a coded image including a plurality of processing units having mutually different sizes by decoding the coded image, said image decoding apparatus comprising:

a storage unit configured to store a plurality of contexts;

a context selection control unit configured to select, from among a plurality of contexts, a context for each of current signals to be decoded included in the plurality of processing units of the coded image;

a context control unit configured to execute a decoded probability information identification process for identifying decoded probability information associated with the context selected by said context selection control unit;

an arithmetic decoding unit configured to obtain the current signals to be decoded and perform arithmetic decoding of the current signals to be decoded by said context control unit by using the decoded probability information; and

a multi-value conversion unit configured to reconstruct the image data by performing multi-value conversion on the binary signal,

wherein said context control unit is configured to execute an update process for updating the decoded probability information identified by said

context control unit based on the binary signal,

wherein a shared context is set in advance,

wherein said context selection control unit is configured to select the shared context as the context for the current signal to be decoded in the case where a size of the processing unit which includes the current signal to be decoded is a block size of 16 x 16, and in the case where the size of the processing unit which includes the current signal to be decoded is a block size of 32 x 32, and

wherein said context selection control unit is configured to select a dedicated context as the context for the current signal to be decoded in the case where the size of the processing unit which includes the current signal to be decoded is smaller than the block size of 16 x 16.