

[NPL 2]

JCT-VC "WD4: Working Draft 4 of High-Efficiency Video Coding", JCTVC-F803, July 2011.

5 [Summary of Invention]

[Technical Problem]

[0009]

10 However, there is a demand for the conventional technique to achieve more efficient arithmetic coding and arithmetic decoding of the last position information.

[0010]

~~Embodiments of~~In view of this, the present invention provides an image coding method which allows efficient arithmetic coding and arithmetic decoding of the last position information.

15

[Solution to Problem]

[0011]

20 ~~An image coding method according to an~~ first aspect of the present invention, there is provided an image coding method for coding last position information indicating a horizontal position and a vertical position of a last non-zero coefficient in a predetermined order in a current block to be coded, the image coding method including: binarizing a first component and a second component to generate a first binary signal and a second binary signal, respectively,
25 the first component being one of a horizontal component and a vertical component which are included in the last position information, and the second component being the other of the horizontal component and the vertical component; coding a first partial signal and a second partial signal by first arithmetic coding,
30 and coding a third partial signal and a fourth partial signal by second arithmetic coding different from the first arithmetic coding, the first partial signal being a part of the first binary signal, the second partial signal being a part of the second binary signal, the third partial signal being another part of the first binary signal, and the fourth partial signal being another part of the second binary signal; and placing the
35 coded first partial signal, the

coded second partial signal, the coded third partial signal, and the coded fourth partial signal in a bit stream, wherein in the placing, (i) the coded second partial signal is placed next to the coded first partial signal, or (ii) the coded fourth partial signal is placed next to the coded third partial signal.

According to a second aspect, there is provided an image coding apparatus which codes last position information indicating a horizontal position and a vertical position of a last non-zero coefficient in a predetermined order in a current block to be coded, the image coding apparatus comprising: a binarizing unit configured to binarize a first component and a second component to generate a first binary signal and a second binary signal, respectively, the first component being one of a horizontal component and a vertical component which are included in the last position information, and the second component being the other of the horizontal component and the vertical component; an arithmetic coding unit configured to code a first partial signal and a second partial signal by first arithmetic coding, and code a third partial signal and a fourth partial signal by second arithmetic coding different from the first arithmetic coding, the first partial signal being a part of the first binary signal, the second partial signal being a part of the second binary signal, the third partial signal being another part of the first binary signal, and the fourth partial signal being another part of the second binary signal; and a placing unit configured to place the coded first partial signal, the coded second partial signal, the coded third partial signal, and the coded fourth partial signal in a bit stream, wherein the placing unit is configured to (i) place the coded second partial signal next to the coded first partial signal, or (ii) place the coded fourth partial signal next to the coded third partial signal.

According to a third aspect, there is provided an image decoding method for decoding last position information indicating a horizontal position and a vertical position of a last non-zero coefficient in a predetermined order in a current block to be decoded, the image decoding method comprising: decoding, by first arithmetic decoding, a coded first partial signal and a coded second partial

signal which are included in a bit stream, and decoding, by second arithmetic decoding different from the first arithmetic decoding, a coded third partial signal and a coded fourth partial signal which are included in the bit stream; and reconstructing a first component by debinarizing a first binary signal which includes the decoded first partial signal and the decoded third partial signal, and reconstructing a second component by debinarizing a second binary signal which includes the decoded second partial signal and the decoded fourth partial signal, the first component being one of a horizontal component and a vertical component which are included in the last position information, and the second component being the other of the horizontal component and the vertical component, wherein in the bit stream, (i) the coded second partial signal is placed next to the coded first partial signal, or (ii) the coded fourth partial signal is placed next to the coded third partial signal.

According to a fourth aspect, there is provided an image decoding apparatus which decodes last position information indicating a horizontal position and a vertical position of a last non-zero coefficient in a predetermined order in a current block to be decoded, the image decoding apparatus comprising: an arithmetic decoding unit configured to decode, by first arithmetic decoding, a coded first partial signal and a coded second partial signal which are included in a bit stream, and decode, by second arithmetic decoding different from the first arithmetic decoding, a coded third partial signal and a coded fourth partial signal which are included in the bit stream; and a reconstructing unit configured to reconstruct a first component by debinarizing a first binary signal which includes the decoded first partial signal and the decoded third partial signal, and reconstruct a second component by debinarizing a second binary signal which includes the decoded second partial signal and the decoded fourth partial signal, the first component being one of a horizontal component and a vertical component which are included in the last position information, and the second component being the other of the horizontal component and the vertical component, wherein in the bit stream, (i) the coded second partial signal is

placed next to the coded first partial signal, or (ii) the coded fourth partial signal is placed next to the coded third partial signal.

According to a fifth aspect, there is provided an image coding and decoding apparatus comprising: the above image coding apparatus; and the above image decoding apparatus.

[0012]

It is to be noted that this general aspect may be implemented using a system, an apparatus, an integrated circuit, a computer program, or a computer-readable recording medium such as a CD-ROM, or any combination of systems, apparatuses, integrated circuits, computer programs, or computer-readable recording media.

[Advantageous Effects of Invention]

[0013]

With the image coding method according to an aspect of the present invention, it is possible to arithmetically code and arithmetically decode the last position information efficiently.

[Brief Description of Drawings]

[0014]

[FIG. 1]

FIG. 1 is a block diagram showing an example of a configuration of an image decoding apparatus according to the underlying knowledge.

[FIG. 2]

FIG. 2 is a flowchart showing an example of an image decoding method according to the underlying knowledge.

[FIG. 3A]

FIG. 3A is a diagram showing an example of binary signals of last position information when the block size is 4x4.

[FIG. 3B]

FIG. 3B is a diagram showing an example of binary signals of last position information when the block size is 8x8.

[FIG. 3C]

FIG. 3C is a diagram showing an example of binary signals of