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Video coding method and apparatus using any types of block partitioning

Abstract

The present invention relates to a block partitioning structure in video coding technology, and a video encoding and decoding method and apparatus using the same, wherein the video encoding and decoding method includes the steps of: acquiring quad-partitioning information of a block; acquiring bi-partitioning information of the block when the acquired quad-partitioning information of the block does not indicate four partitions; acquiring partitioning direction information for bi-partitioning of the block when the acquired bi-partitioning information of the block indicates two partitions; acquiring information on whether to perform any other type of partitioning, when the acquired bi-partitioning information of the block does not indicate two partitions; and acquiring additional information required for the any other type of partitioning, when the acquired information on whether to perform any other type of partitioning indicates that the any other type of partitioning is performed.

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Background/Summary

RELATED APPLICATIONS (1) This is a continuation of U.S. application Ser. No. 18/063,404, filed Dec. 8, 2022, which is a continuation of U.S. application Ser. No. 17/363,777, filed Jun. 30, 2021, now U.S. Pat. No. 11,563,941, which is a continuation of U.S. patent application Ser. No. 16/395,109 filed Apr. 25, 2019, now U.S. Pat. No. 11,070,800, which is a continuation application of the International Patent Application Serial No. PCT/KR2016/012111, filed Oct. 27, 2016, which claims priority to the Korean Patent Application Serial No. 10-2016-0139982, filed Oct. 26, 2016, the entire disclosures of which are incorporated herein by reference for all purposes.

TECHNICAL FIELD
(1) The present invention relates to an image processing scheme and, more particularly, to a method and apparatus for describing a block partitioning structure and performing partitioning on the block partitioning structure in a video compression scheme.
BACKGROUND
(2) The demand for multimedia data is increasing due to diversification and miniaturization of multimedia devices, and thus there has been a need for a high efficiency video compression

technology for next generation video services. Based on such a need, the MPEG and VCEG jointly established the Joint Collaborative Team on Video Coding (JCT-VC) for the video compression standardization of H.264/AVC, and established in January 2013 the standardization for HEVC, which is the latest international video compression standard.

(3) In video compression technology, a block partitioning structure refers to a unit in which encoding and decoding are performed, and a unit to which main encoding and decoding technologies such as prediction and transform are applied. As the video compression technology develops, the magnitude of blocks for performing encoding and decoding is gradually increasing, and in terms of block partitioning forms, more various partitioning types are supported. In addition, video compression is performed using units subdivided according to roles of blocks as well as units for performing encoding and decoding. In the HEVC standard, video coding and decoding are performed using unit blocks subdivided according to a block partitioning structure of a quad-tree type and roles of prediction and transform. In addition, various forms of block partitioning structures such as a Quad-Tree plus Binary-Tree (QTBT) which is a form of a combination of a quad-tree and a binary-tree, a block partitioning structure of any form, and the like have been proposed for improving video encoding efficiency.

SUMMARY

(4) It is an object of the present invention to provide a method and an apparatus capable of improving encoding efficiency compared to the existing video compression schemes by which various block partitioning structures are used in combination.

(5) However, the technical problem to be solved by this embodiment is not limited to the above-described technical problems, and other technical problems may exist.

(6) In order to achieve the object, a video encoding and decoding method and apparatus according to an embodiment of the present invention includes acquiring quad-partitioning information of a block; acquiring bi-partitioning information of the block, when the acquired quad-partitioning information of the block does not indicate four partitions; acquiring partitioning direction information for bi-partitioning of the block, when the acquired bi-partitioning information of the block indicates two partitions; acquiring information on whether to perform arbitrary partitioning, when the acquired bi-partitioning information of the block does not indicate two partitions; and acquiring additional information required for the arbitrary partitioning, when the acquired information on whether to perform the arbitrary partitioning indicates that the arbitrary partitioning is performed.

(7) In order to achieve the object, a video encoding and decoding method and apparatus according to an embodiment of the present invention includes acquiring quad-partitioning information of a block; acquiring bi-partitioning and tri-partitioning information of the block, when the acquired quad-partitioning information of the block does not indicate four partitions; acquiring partitioning direction information for bi-partitioning and tri-partitioning of the block, when the acquired bi-partitioning and tri-partitioning information of the block indicates two partitions and three partitions; acquiring information for selecting one of the bi-partitioning and the tri-partitioning, when the acquired bi-partitioning and tri-partitioning information of the block indicates two partitions and three partitions; acquiring information on whether to perform arbitrary partitioning, when the acquired bi-partitioning information of the block does not indicate two partitions; and acquiring additional information required for the arbitrary partitioning, when the acquired information on whether to perform the arbitrary partitioning indicates that the arbitrary partitioning is performed.

(8) According to the present invention, it is possible to provide video coding method and apparatus capable of efficiently performing block partitioning and improving the encoding efficiency through the block partitioning, by using various block structures in combination.

(9) According to an embodiment of the present invention, it is possible to improve the encoding performance by using various block partitioning types in combination.

Description

BRIEF DESCRIPTION OF DRAWINGS

(1) FIG. **1** is a block diagram illustrating a configuration of a video encoding apparatus according to an embodiment of the present invention.

(2) FIG. **2** is a block diagram illustrating a configuration of a video decoding apparatus according to an embodiment of the present invention.

(3) FIG. **3** is a conceptual diagram illustrating a block partitioning structure in which bi-partitioning and quad-partitioning are combined according to an embodiment of the present invention.

(4) FIG. **4** is a conceptual diagram illustrating a block partitioning structure in which bi-partitioning, tri-partitioning, and quad-partitioning are combined according to an embodiment of the present invention.

(5) FIG. **5** is a conceptual diagram illustrating arbitrary block partitioning according to an embodiment of the present invention.

(6) FIG. **6** is a conceptual diagram illustrating a block partitioning structure in which various block partitioning types and arbitrary block partitioning are combined according to an embodiment of the present invention.

(7) FIG. **7** is a table illustrating a syntax using arbitrary block partitioning in a block structure of a form in which bi-partitioning and quad-partitioning are combined according to an embodiment of the present invention.

(8) FIG. **8** is a table illustrating a syntax using arbitrary block partitioning in a block structure of a form in which bi-partitioning, tri-partitioning, and quad-partitioning are combined according to an embodiment of the present invention.

(9) FIG. **9** is a flowchart illustrating the use of arbitrary block partitioning in a block structure of a form in which bi-partitioning and quad-partitioning are combined according to an embodiment of the present invention.

(10) FIG. **10** is a flowchart illustrating the use of arbitrary block partitioning in a block structure of a form in which bi-partitioning, tri-partitioning, and quad-partitioning are combined according to an embodiment of the present invention.

DETAILED DESCRIPTION

(11) Hereinafter, embodiments of the present invention will be described in detail with reference to the drawings attached thereto, so that those skilled in the art can easily carry out the present invention. The present invention may, however, be embodied in many different forms and should not be construed as limited to the embodiments set forth herein. In order to clearly illustrate the present invention, parts not related to the description are omitted, and similar parts are denoted by like reference characters throughout the specification.

(12) Throughout this specification, when a part is referred to as being ‘connected’ to another part, it includes not only a case where they are directly connected but also a case where the part is electrically connected with another part in between.

(13) In addition, when a part is referred to as ‘comprising’ an element throughout the specification, it is understood that the element may include other elements as well, without departing from the other elements unless specifically stated otherwise.

(14) The term ‘a step of doing something’ or ‘a step of something’ used throughout this specification does not mean a step for something.

(15) Also, the terms first, second, etc. may be used to describe various components, but the components should not be limited by the terms. The terms are used only for the purpose of distinguishing one component from another.

(16) In addition, the components shown in the embodiments of the present invention are shown independently to represent different characteristic functions, but that does not mean that each

component consists of separate hardware or one software constituent unit. That is, each component is described by arranging each component for convenience of explanation, and at least two components of components may be combined to form one component or one component may be partitioned into a plurality of components to perform functions. The integrated embodiments and the separate embodiments of each of these components are also included in the scope of the present invention without departing from the essence of the present invention.

(17) Hereinafter, in various embodiments of the present invention disclosed herein, an encoding block or an encoding unit may be generically referred to as including a single block or unit in which encoding and decoding are performed in video coding. The encoding block or the encoding unit is not limited to one single block, but may be collectively referred to as including the block that is partitioned with a plurality of depths.

(18) Hereinafter, video coding method and apparatus using arbitrary block partitioning according to an embodiment of the present invention will be described in detail with reference to FIG. **9**.

(19) FIG. **9** is a flowchart illustrating the use of arbitrary block partitioning in a block structure of a form in which bi-partitioning and quad-partitioning are combined according to an embodiment of the present invention.

(20) In a video coding method and apparatus using arbitrary block partitioning according to an embodiment, a block partitioning unit for acquiring information on block partitioning and performing partitioning includes a quad-partitioning information parsing unit **920**, a sub-block partitioning calling unit **930**, a bi-partitioning information parsing unit **940**, a partitioning direction parsing unit **950**, an information parsing unit **960** for arbitrary partitioning, and an additional information parsing unit **970** for arbitrary partitioning.

(21) The quad-partitioning information parsing unit **920** acquires block quad-partitioning information by parsing block partitioning information on whether to perform quad-partitioning for a block from a bitstream.

(22) When the block quad-partitioning information acquired by the quad-partitioning information parsing unit **920** indicates four partitions, the sub-block partitioning calling unit **930** serves to call sub-block partitioning in order to perform partitioning on four sub-blocks.

(23) When the block quad-partitioning information acquired by the quad-partitioning information parsing unit **920** does not indicate four partitions, the bi-partitioning information parsing unit **940** acquires block bi-partitioning information by parsing block partitioning information on whether to perform bi-partitioning for the block from the bitstream.

(24) When the block bi-partitioning information acquired by the bi-partitioning information parsing unit **940** indicates two partitions, the partitioning direction parsing unit **950** acquires information on a direction of block bi-partitioning, that is, a direction indicating one of a vertical direction and a horizontal direction.

(25) When the block bi-partitioning information acquired by the bi-partitioning information parsing unit **940** does not indicate two partitions, the information parsing unit **960** for arbitrary partitioning determines whether arbitrary partitioning is performed on the current coding block.

(26) When the arbitrary partitioning information acquired by the information parsing unit **960** for arbitrary partitioning performs arbitrary partitioning on the current coding block, the additional information parsing unit **970** for arbitrary partitioning acquires additional information on arbitrary partitioning. The additional information for arbitrary partitioning may include angle and distance information used for arbitrary partitioning.

(27) Hereinafter, embodiments of the present invention will be described in detail with reference to the drawings attached thereto, so that those skilled in the art can easily carry out the present invention. The present invention may, however, be embodied in many different forms and should not be construed as limited to the embodiments set forth herein. In order to clearly illustrate the present invention, parts not related to the description are omitted, and similar parts are denoted by like reference characters throughout the specification.

(28) Throughout this specification, when a part is referred to as being ‘connected’ to another part, it includes not only a case where they are directly connected but also a case where the part is electrically connected with another part in between.
(29) In addition, when a part is referred to as ‘comprising’ an element throughout the specification, it is understood that the element may include other elements as well, without departing from the other elements unless specifically stated otherwise.
(30) The term ‘a step of doing something’ or ‘a step of something’ used throughout this specification does not mean a step for something.
(31) Also, the terms first, second, etc. may be used to describe various components, but the components should not be limited by the terms. The terms are used only for the purpose of distinguishing one component from another.
(32) In addition, the components shown in the embodiments of the present invention are shown independently to represent different characteristic functions, but that does not mean that each component consists of separate hardware or one software constituent unit. That is, each component is described by arranging each component for convenience of explanation, and at least two components of components may be combined to form one component or one component may be partitioned into a plurality of components to perform functions. The integrated embodiments and the separate embodiments of each of these components are also included in the scope of the present invention without departing from the essence of the present invention.
(33) Hereinafter, in various embodiments of the present invention disclosed herein, an encoding block or an encoding unit may be generically referred to as including a single block or unit in which encoding and decoding are performed in video coding. The encoding block or the encoding unit is not limited to one single block, but may be collectively referred to as including that the block is partitioned with a plurality of depths.
(34) Hereinafter, video coding method and apparatus using arbitrary block partitioning according to an embodiment of the present invention will be described in detail with reference to FIG. **9**.
(35) FIG. **1** is a block diagram illustrating a configuration of video encoding method and apparatus according to an embodiment of the present invention.
(36) Video encoding method and apparatus according to an embodiment of the present invention may include an inter prediction unit **120**, an intra prediction unit **125**, a subtraction unit **130**, a transform unit **140**, a quantization unit **150**, an entropy encoding unit **160**, inverse transform unit **145**, an inverse quantization unit **155**, an adding unit **135**, an in-loop filter unit **180**, and a reconstructed picture buffer **190**.
(37) The inter prediction unit **120** performs motion prediction by using an input image **110** and a reconstructed image stored in the reconstructed picture buffer **190**, thereby generating a prediction signal.
(38) The intra prediction unit **125** performs spatial prediction by using pixel values of pre-reconstructed neighboring blocks that are adjacent to the current block to be encoded, thereby generating a prediction signal.
(39) The subtraction unit **130** uses the input image and the prediction signal generated through the inter prediction unit **120** or the intra prediction unit **125** to generate a residual signal.
(40) The transform unit **140** and the quantization unit **150** perform transform and quantization on the residual signal generated through the subtraction unit **130** to generate a quantized coefficient.
(41) The entropy encoding unit **160** performs entropy encoding on encoding information such as syntax elements and quantized coefficients defined in the video encoder, thereby outputting the bitstream.
(42) The inverse transform unit **145** and the inverse quantization unit **155** receive the quantized coefficients; and perform inverse quantization and inverse transform in order, thereby generating a reconstructed residual signal.
(43) The adding unit **135** generates a reconstructed signal by using the prediction signal generated

through the inter prediction unit **120** or the intra prediction unit **125** and the reconstructed residual signal.
(44) The reconstructed signal is transmitted to the in-loop filter unit **180**. The reconstructed picture to which the filtering is applied is stored in the reconstructed picture buffer **190**, and may be used as a reference picture in the inter prediction unit **120**.
(45) FIG. **2** is a block diagram showing a configuration of video decoding apparatus and method according to an embodiment of the present invention.
(46) The video decoding apparatus and method according to an embodiment includes an entropy decoding unit **210**, an inverse quantization unit **220**, an inverse transform unit **230**, an intra prediction unit **240**, an inter prediction unit **250**, adding unit **260**, an in-loop filter unit **270**, and a reconstructed picture buffer **280**.
(47) The entropy decoding unit **210** decodes the input bitstream **200** and outputs decoding information such as syntax elements and quantized coefficients.
(48) The inverse quantization unit **220** and the inverse transform unit **230** receive the quantized coefficients and perform inverse quantization and inverse transform in order, thereby outputting a residual signal.
(49) The intra prediction unit **240** performs spatial prediction by using pixel values of the pre-reconstructed neighboring blocks adjacent to the current block to be decoded, thereby generating a prediction signal.
(50) The inter prediction unit **250** performs motion compensation using motion vector extracted from the bitstream and a reconstructed picture stored in the reconstructed picture buffer **280**, thereby generating a prediction signal.
(51) The prediction signals output from the intra prediction unit **240** and the inter prediction unit **250** are summed with the residual signal through the adding unit **260**, and accordingly the reconstructed signal generated on a per-block basis includes the reconstructed image.
(52) The reconstructed image is transferred to the in-loop filter unit **270**. The reconstructed picture to which the filtering is applied is stored in the reconstructed picture buffer **280** and may be used as a reference picture in the inter prediction unit **250**.
(53) FIG. **3** is a conceptual diagram illustrating a block partitioning structure in which bi-partitioning and quad-partitioning are combined according to an embodiment of the present invention.
(54) A video coding method and apparatus utilizing a combination of diverse block partitioning types according to an embodiment of the present invention includes a type of block partitioning including a non-partitioned block **310**, a horizontally partitioned block **320**, a vertically partitioned block **330**, and a quad-partitioned block **340**, and a block structure **350** of a type in which the diverse block partitionings are combined.
(55) According to an embodiment of the present invention, the non-partitioned block **310** includes a type in which one coding block is not partitioned, and the horizontally partitioned block **320** includes a type in which one coding block is horizontally partitioned. In addition, according to an embodiment of the present invention, the vertically partitioned block **330** includes a type in which one coding block is vertically partitioned, and the quad-partitioned block **340** includes a type in which one coding block is vertically and horizontally partitioned. The one coding block includes both a square block and a non-square block.
(56) According to an embodiment of the present invention, the block structure **350** of a type in which the diverse block partitionings are combined includes a block structure of a type in which blocks **310**, **320**, **330**, and **340** of diverse block partitioning types are combined. In the block partitioning structure according to the embodiment, the most upper block **350** may be quad-partitioned into four partitioned blocks, i. e., a first partitioned block **351**, a second partitioned block **352**, a third partitioned block **353**, and a fourth partitioned block **354**. The first partitioned block **351** according to an embodiment is a block represented by the block partitioning type of the

block **310** of a non-partitioned type, and the second partitioned block **352** is a block represented by block partitioning type of the block **340** of a quad-partitioned type. The one coding block may be partitioned into one or more blocks, and the partitioned blocks may be repeatedly partitioned. The second partitioned block **352** is quad-partitioned to form four sub-partitioned blocks, and each sub-partitioned block indicates a block represented by block partitioning type of the non-partitioned block **310**. The third partitioned block **353** is a block represented by the block partitioning type of the horizontally partitioned block **320**, and the lower end rectangular block **356** of the sub-partitioned blocks is a block represented by block partitioning type of the vertically partitioned block **330**. The fourth partitioned block **354** is a block represented by block partitioning type of the quad-partitioned block **340**, and a first sub-partitioned block and a third sub-partitioned block of the fourth partitioned block are blocks represented by block partitioning type of the vertically partitioned block **330**. Herein, the third sub-partitioned block represents an embodiment in which additional vertical partitioning is performed.

(57) FIG. **4** is a conceptual diagram illustrating a block partitioning structure in which bi-partitioning, tri-partitioning, and quad-partitioning are combined according to an embodiment of the present invention.

(58) A video coding method and apparatus using a block partitioning structure in which bi-partitioning, tri-partitioning, and quad-partitioning are combined according to an embodiment of the present invention includes block partitioning types of a non-partitioned block **410**, a horizontally bi-partitioned block **420**, a horizontally tri-partitioned block **430**, a vertically bi-partitioned block **440**, vertically tri-partitioned block **450**, and a horizontally and vertically quad-partitioned block **460**, and a block structure **470** of a type in which the bi-partitioning, the tri-partitioning, and the quad-partitioning are combined.

(59) According to an embodiment of the present invention, the non-partitioned block **410** includes a type in which one coding block is not partitioned, and the horizontally bi-partitioned block **420** includes a first partitioned block **421** and a second partitioned block **422** acquired by equally partitioning one coding block in a horizontal direction. In addition, according to an embodiment of the present invention, the vertically bi-partitioned block **440** includes a first partitioned block **441** and a second partitioned block **442** acquired by equally partitioning one coding block in a vertical direction.

(60) According to an embodiment of the present invention, the horizontally tri-partitioned block **430** includes a first partitioned block **431** and a third partitioned block **433** having a ¼ vertical size with respect to the vertical size of the entire block **430**, and a second partitioned block **432** having a ½ vertical size with respect to the vertical size of the entire block **430**. In addition, according to an embodiment of the present invention, the vertically tri-partitioned block **450** may include a first partitioned block **451** and a third partitioned block **453** having a ¼ horizontal size with respect to the horizontal size of the entire block **450**, and a second partitioned block **452** having a ½ horizontal size with respect to the horizontal size of the entire block **450**.

(61) According to an embodiment of the present invention, the horizontally and vertically quad-partitioned block **460** may include a first partitioned block **461**, a second partitioned block **462**, a third partitioned block **463**, and a fourth partitioned block **464** in which the horizontal size and the vertical size of the entire block **460** is equally partitioned.

(62) According to one embodiment of the present invention, a block structure **470** of a type in which the bi-partitioning, the tri-partitioning, and the quad-partitioning are combined includes a block structure in which block partitioning types such as the bi-partitioned blocks **420** and **440**, the tri-partitioned block **430** and **450**, and the quad-partitioned block **460** are combined. In the block structure **470** of a type in which the bi-partitioning, the tri-partitioning, and the quad-partitioning are combined, the most upper block **470** is quad-partitioned into a first partitioned block **471**, a second partitioned block **472**, a third partitioned block **473**, and a fourth partitioned block **474**. The first partitioned block **471** according to an embodiment is a block represented by the block

partitioning type of the non-partitioned block **410**, the second partitioned block **472** is a block represented by the block partitioning type of the quad-partitioned block **460**, the third partitioned block **473** is a block represented by a block partitioning type of the horizontally bi-partitioned block **420**, and a fourth partitioned block **474** is a block represented by a block partitioning type of the vertically tri-partitioned block **450**. The one coding block may be partitioned into one or more blocks, and the sub-partitioned blocks may be repeatedly partitioned. The second partitioned block **472** may be quad-partitioned to form four sub-partitioned blocks, and each sub-partitioned block indicates a block represented by block partitioning type of the non-partitioned block **410**.

(63) FIG. **5** is a conceptual diagram illustrating arbitrary block partitioning according to an embodiment of the present invention.

(64) In the video coding method and apparatus using arbitrary block partitioning according to an embodiment of the present invention, the arbitrary block partitioning includes partitioning one non-partitioned coding block **510** into a first partitioned block **511** and a second partitioned block **512** on the basis of a line segment **560** orthogonal to the line segment **550** having a predetermined angle **530** and a predetermined distance **540** with respect to a block center **520**.

(65) The block center **520** according to an embodiment of the present invention indicates a single virtual point having a y-coordinate of a ½ position of a vertical size and an x-coordinate of a ½ position of a horizontal size for the one non-partitioned coding block **510**. According to an embodiment of the present invention, the predetermined angle **530** indicates art angle that rotates counterclockwise to the line segment **550** about a virtual horizontal axis based on the block center **520**, and the predetermined distance **540** indicates a distance between the line segment **560** partitioning the block and the block center **520**.

(66) The line segment **560** partitioning the block according to an embodiment is a line segment partitioning the one non-partitioned coding block **510**, and the video coding method and apparatus using arbitrary block partitioning is provided such that one coding block **510** is partitioned into two blocks performing independent prediction, i.e., a first partitioned block **511** and a second partitioned block **512** on the basis of the line segment **560** partitioning the block. The first partitioned block **511** and the second partitioned block **512**, which are two blocks partitioned by arbitrary block partitioning, perform encoding and decoding on pixels included in each block using different prediction information.

(67) FIG. **6** is a conceptual diagram illustrating a block partitioning structure in which various block partitioning types and arbitrary block partitioning are combined according to an embodiment of the present invention.

(68) The video coding method and apparatus using arbitrary block partitioning according to an embodiment of the present invention may partition each of coding blocks **610**, **620**, **630**, **640**, **650**, and **660** into one or more sub-coding blocks by performing bi-partitioning, tri-partitioning, and quad-partitioning, and the one or more partitioned coding blocks may be partitioned by arbitrary block partitioning.

(69) One coding block **610** according to an embodiment of the present invention is a block which is not partitioned using bi-partitioning, tri-partitioning, and quad-partitioning, and the block may be partitioned by arbitrary block partitioning. As an example of FIG. **6**, a coding block **620** may be horizontally partitioned into a first partitioned block **621** and a second partitioned block **622**, in which the first partitioned block **621** shown in FIG. **6** represents a block that is partitioned by arbitrary block partitioning, and the second partitioned block **622** represents a block that is not partitioned by arbitrary block partitioning. As shown in FIG. **6**, when one coding block is partitioned into one or more sub-coding blocks, the sub-coding blocks may include blocks that are partitioned by arbitrary block partitioning and blocks that are non-partitioned by arbitrary block partitioning.

(70) FIG. **7** is a table illustrating a syntax using arbitrary block partitioning in a block structure of a form in which bi-partitioning and quad-partitioning are combined according to an embodiment of

the present invention.
(71) The syntax information used in the video coding method and apparatus using arbitrary block partitioning according to an embodiment of the present invention includes partitioning information **710** on whether to perform block quad-partitioning, partitioning information **720** on whether to perform block bi-partitioning for the non-quad-partitioned block, direction information **730** on a direction of block bi-partitioning, information **740** on whether to perform arbitrary block partitioning, information **750** on an angle of arbitrary block partitioning, and information **760** on a distance of arbitrary block partitioning. When one block is not quad-partitioned according to the partitioning information **710** on whether to perform quad-partitioning, it is determined whether bi-partitioning is performed for the block through the information **720** on whether to perform bi-partitioning. When one coding block is bi-partitioned according to the information **720** on whether to perform block bi-partitioning, the direction information **730** on the direction of block bi-partitioning is acquired. When the block is not bi-partitioned, information on arbitrary block partitioning is acquired. When the block is not bi-partitioned, the acquired information of arbitrary block partitioning includes the information **740** on whether to perform arbitrary block partitioning, and when the information **740** on whether to perform arbitrary block partitioning indicates partitioning, the information **750** on the angle of additional block partitioning and the information **760** on the distance thereof are additionally acquired.
(72) In the video coding method and apparatus according to an embodiment of the present invention, when the block partitioning information is used in combination, the syntax shown in FIG. **7** includes confirming whether to perform arbitrary block partitioning and then performing block partitioning using arbitrary block partitioning, only when bi-partitioning and quad-partitioning are no longer performed in the process of performing bi-partitioning and quad-partitioning on one coding block.
(73) FIG. **8** is a table illustrating a syntax using arbitrary block partitioning in a block structure of a form in which bi-partitioning, tri-partitioning, and quad-partitioning are combined according to an embodiment of the present invention.
(74) The syntax information used in the video coding method and apparatus using arbitrary block partitioning according to an embodiment of the present invention includes partitioning information **810** on whether to perform block quad-partitioning, partitioning information **820** on whether to perform block bi-partitioning and block tri-partitioning additionally for the non-quad-partitioned block, direction information **830** on a direction of block bi-partitioning and block tri-partitioning, partitioning information **840** on a partitioning type of block bi-partitioning and block tri-partitioning, information **850** on whether to perform arbitrary block partitioning, information **860** on an angle of arbitrary block partitioning, and information **870** on a distance of arbitrary block partitioning. When one block is not quad-partitioned according to the information **810** on whether to perform quad-partitioning, it is determined whether bi-partitioning and tri-partitioning is performed for the block through the information **820** on whether to perform bi-partitioning and tri-partitioning for the block. When one coding block is bi-partitioned and tri-partitioned according to the information **820** on whether to perform bi-partitioning and tri-partitioning, the direction information **830** on the direction of bi-partitioning and tri-partitioning and the partitioning information **840** indicating one of bi-partitioning and tri-partitioning are acquired. When the block is not bi-partitioned and tri-partitioned, information on arbitrary block partitioning is acquired. When the block is not bi-partitioned and tri-partitioned, the acquired information of arbitrary block partitioning includes the information **850** on whether to perform arbitrary block partitioning, and when the information **850** indicates partitioning, the information **860** on the angle for additional block partitioning and the information **870** on the distance thereof are additionally acquired.
(75) In the video coding method and apparatus according to an embodiment of the present invention, when the block partitioning information is used in combination, the syntax shown in FIG. **8** includes confirming whether to perform arbitrary block partitioning and then performing

block partitioning using arbitrary block partitioning, only when bi-partitioning, tri-partitioning, and quad-partitioning are no longer performed in the process of performing bi-partitioning, tri-partitioning, and quad-partitioning for one coding block.
(76) FIG. **10** is a flowchart illustrating the use of arbitrary block partitioning in a block structure of a form in which bi-partitioning, tri-partitioning, and quad-partitioning are combined according to an embodiment of the present invention.
(77) In the video coding method and apparatus using arbitrary block partitioning according to an embodiment of the present invention, a block partitioning unit for acquiring information on block partitioning and performing partitioning includes a quad-partitioning information parsing unit **1020**, a sub-block partitioning calling unit **1030**, a bi-, tri-partitioning information parsing unit **1040**, a partitioning direction parsing unit **1051**, partitioning number parsing unit **1052**, an information parsing unit **1060** for arbitrary partitioning, and an additional information parsing unit **1070** for arbitrary partitioning.
(78) The quad-partitioning information parsing unit **1020** acquires block quad-partitioning information by parsing block partitioning information on whether to perform quad-partitioning for the block from a bitstream.
(79) When the block quad-partitioning information acquired by the quad-partitioning information parsing unit **1020** indicates four partitions, the sub-block partitioning calling unit **1030** serves to call sub-block partitioning in order to perform sub-block partitioning for four sub-blocks.
(80) When the block quad-partitioning information acquired by the quad-partitioning information parsing unit **1020** does not indicate four partitions, the bi-, tri-partitioning information parsing unit **1040** acquires block bi-partitioning and tri-partitioning information by parsing block partitioning information on whether to perform bi-partitioning and tri-partitioning for the block from a bitstream.
(81) When the block bi-partitioning and tri-partitioning information acquired by the bi-, tri-partitioning information parsing unit **1040** indicates two partitions and three partitions, the partitioning direction parsing unit **1051** acquires the direction information indicating a direction of block bi-partitioning and tri-partitioning, that is, one of a vertical direction and a horizontal direction.
(82) When the block bi-partitioning and tri-partitioning information acquired by the bi-, tri-partitioning information parsing unit **1040** indicates two partitions and three partitions, the partitioning number parsing unit **1052** acquires the block number information indicating the partitioning number of block bi-partitioning and tri-partitioning, that is, one of bi-partitioning and tri-partitioning is acquired.
(83) When the block bi-partitioning and tri-partitioning information acquired by the bi-, tri-partitioning information parsing unit **1040** does not indicate two partitions and tri-partitioning, the information parsing unit **1060** for arbitrary partitioning determines whether arbitrary partitioning is performed in the current coding block.
(84) When arbitrary partitioning information acquired by the information parsing unit **1060** for arbitrary partitioning performs arbitrary partitioning for the current coding block, the additional information parsing unit **1070** for arbitrary partitioning acquires additional information on arbitrary partitioning. The additional information for arbitrary partitioning may include angle and distance information used for arbitrary partitioning.
(85) The present invention can be used for manufacturing such as broadcasting equipment manufacturing, terminal manufacturing, and the like, and industries related to source technology.

Claims

1. A video decoding method, comprising: acquiring quad-partitioning information of a block; acquiring non-quad-partitioning information of the block in case the acquired quad-partitioning

information of the block does not indicate that the block is divided into four partitions; dividing, based on the non-quad-partitioning information or the quad-partitioning information, the block into a plurality of partitions; generating a prediction partition of a current partition among the plurality of partitions by performing prediction for the current partition; generating a residual partition of the current partition by performing inverse quantization and inverse transform for the current partition; and reconstructing the current partition based on the prediction partition and the residual partition, wherein the non-quad-partitioning information includes partitioning direction information indicating whether a partitioning direction of the non-quad-partitioning for the block is a vertical direction or a horizontal direction and partitioning number information indicating whether the non-quad-partitioning for the block is a bi-partitioning or a tri-partitioning, wherein the bi-partitioning is a partitioning type of dividing the block into two partitions of a same size and partitioning depth and the tri-partitioning is a partitioning type of dividing the block into three partitions of a same partitioning depth, wherein a center partition of the three partitions has a size equal to a sum of a size of the other two of the three partitions, and the other two of the three partitions have a same size, wherein the partitioning number information is acquired after acquiring the partitioning direction information, and wherein the partitioning direction information and the partitioning number information are both 1 bit flags, respectively.

2. The method of claim 1, further comprising: determining, based on information on whether to perform a geometric partitioning, whether to perform the geometric partitioning for a partition, wherein the partition is one of the plurality of partitions divided by the bi-partitioning or the tri-partitioning from the block, and wherein the geometric partitioning is performed only when the bi-partitioning and the tri-partitioning is no longer performed for the partition; and in response to the determination to perform the geometric partitioning, dividing, based on the geometric partitioning, the partition into two sub-partitions, wherein the geometric partitioning is a partitioning type of dividing the partition by using a particular line specified based on geometric partitioning information.

3. The method of claim 2, wherein the geometric partitioning information includes partitioning angle information and partitioning distance information for the particular line.

4. The method of claim 3, wherein the partitioning angle information is information for indicating an angle of the particular line, and wherein the partitioning distance information is information for indicating a distance from a center of the partition to the particular line.

5. The method of claim 2, wherein at least one of the two sub-partitions is a triangular partition.

6. A video encoding method, comprising: encoding quad-partitioning information of a block; encoding non-quad-partitioning information of the block in case the block is not divided into four partitions; dividing, based on the non-quad-partitioning information or the quad-partitioning information, the block into a plurality of partitions; generating a prediction partition of a current partition among the plurality of partitions by performing prediction for the current partition; generating a residual partition of the current partition by performing inverse quantization and inverse transform for the current partition; and reconstructing the current partition based on the prediction partition and the residual partition, wherein the non-quad-partitioning information includes partitioning direction information indicating whether a partitioning direction of the non-quad-partitioning for the block is a vertical direction or a horizontal direction and partitioning number information indicating whether the non-quad-partitioning for the block is a bi-partitioning or a tri-partitioning, wherein the bi-partitioning is a partitioning type of dividing the block into two partitions of a same size and partitioning depth and the tri-partitioning is a partitioning type of dividing the block into three partitions of a same partitioning depth, wherein a center partition of the three partitions has a size equal to a sum of a size of the other two of the three partitions, and the other two of the three partitions have a same size, wherein the partitioning number information is encoded after encoding the partitioning direction information, and wherein the partitioning direction information and the partitioning number information are both 1 bit flags, respectively.

7. The method of claim 6, further comprising: determining whether to perform a geometric partitioning for a partition, information on whether to perform the geometric partitioning being encoded into a bitstream, wherein the partition is one of the plurality of partitions divided by the bi-partitioning or the tri-partitioning from the block, and wherein the geometric partitioning is performed only when the bi-partitioning and the tri-partitioning is no longer performed for the partition; and in response to the determination to perform the geometric partitioning, dividing, based on the geometric partitioning, the partition into two sub-partitions, wherein the geometric partitioning is a partitioning type of dividing the partition by using a particular line, geometric partitioning information specifying the particular line is encoded into the bitstream.
8. The method of claim 7, wherein the geometric partitioning information includes partitioning angle information and partitioning distance information for the particular line.
9. The method of claim 8, wherein the partitioning angle information is information for indicating an angle of the particular line, and wherein the partitioning distance information is information for indicating a distance from a center of the partition to the particular line.
10. The method of claim 7, wherein at least one of the two sub-partitions is a triangular partition.
11. A method for transmitting a bitstream comprising: encoding quad-partitioning information of a block into the bitstream; encoding non-quad-partitioning information of the block into the bitstream in case the block is not divided into four partitions; dividing, based on the non-quad-partitioning information or the quad-partitioning information, the block into a plurality of partitions; generating a prediction partition of a current partition among the plurality of partitions by performing prediction for the current partition; generating a residual partition of the current partition by performing inverse quantization and inverse transform for the current partition; reconstructing the current partition based on the prediction partition and the residual partition; and transmitting the bitstream, wherein the non-quad-partitioning information includes partitioning direction information indicating whether a partitioning direction of the non-quad-partitioning for the block is a vertical direction or a horizontal direction and partitioning number information indicating whether the non-quad-partitioning for the block is a bi-partitioning or a tri-partitioning, wherein the bi-partitioning is a partitioning type of dividing the block into two partitions of a same size and partitioning depth and the tri-partitioning is a partitioning type of dividing the block into three partitions of a same partitioning depth, wherein a center partition of the three partitions has a size equal to a sum of a size of the other two of the three partitions, and the other two of the three partitions have a same size, wherein the partitioning number information is encoded after encoding the partitioning direction information, and wherein the partitioning direction information and the partitioning number information are both 1 bit flags, respectively.
12. The method of claim 11, wherein the method further comprises: determining whether to perform a geometric partitioning for a partition, information on whether to perform the geometric partitioning being encoded into the bitstream, wherein the partition is one of the plurality of partitions divided by the bi-partitioning or the tri-partitioning from the block, and wherein the geometric partitioning is performed only when the bi-partitioning and the tri-partitioning is no longer performed for the partition; and in response to the determination to perform the geometric partitioning, dividing, based on the geometric partitioning, the partition into two sub-partitions, wherein the geometric partitioning is a partitioning type of dividing the partition by using a particular line, geometric partitioning information specifying the particular line is encoded into the bitstream.
13. The method of claim 12, wherein the geometric partitioning information includes partitioning angle information and partitioning distance information for the particular line.
14. The method of claim 13, wherein the partitioning angle information is information for indicating an angle of the particular line, and wherein the partitioning distance information is information for indicating a distance from a center of the partition to the particular line.
15. The method of claim 12, wherein at least one of the two sub-partitions is a triangular partition.