CLAIMS

[1] A moving image encoding device comprising:

an encoding controlling unit for determining a maximum size of a coding block which is a unit to be processed at a time when a prediction process is carried out, and also determining a hierarchy number upper limit for hierarchical partitioning of the coding block having the maximum size, and for selecting a coding mode corresponding to each of coding blocks into which the coding block having the maximum size is divided hierarchically from one or more available coding modes;

a block dividing unit for dividing an inputted image into coding blocks each having the maximum size determined by said encoding controlling unit, and also dividing each of said coding blocks hierarchically until its hierarchy number reaches the hierarchy number upper limit determined by said encoding controlling unit;

a prediction image generating unit for carrying out a prediction process corresponding to the coding mode selected by said encoding controlling unit on said each of coding blocks into which each of said coding blocks having the maximum size is divided by said block dividing unit to generate a prediction image;

a difference image generating unit for generating a difference image between said each of the coding blocks into which each of said coding blocks having the maximum size is divided by said block dividing unit, and the prediction image generated by said prediction image generating unit;

an image compression unit for compressing the difference image generated by said difference image generating unit, and

outputting compressed data of said difference image; and

a variable length encoding unit for variable-length-encoding the compressed data outputted from said image compression unit and the coding mode selected by said encoding controlling unit to generate a bitstream into which coded data of said compressed data and coded data of said coding mode are multiplexed, wherein

when variable-length-encoding an intra prediction parameter which is used when a prediction image is generated by said prediction image generating unit, in addition to the compressed data and the coding mode, to multiplex coded data of said intra prediction parameter into said bitstream, said variable length encoding unit variable-length-encodes an intra merge flag indicating whether an intra prediction parameter for each of partitions generated through the division by said block dividing unit is identical to that for a partition adjacent to said each of the partitions, and, when said intra prediction parameter for said each of partitions is identical to that for an adjacent partition, variable-length-encodes an intra merge direction for specifying said adjacent partition, otherwise variable-length-encodes the intra prediction parameter for said each of the partitions generated through the division by said block dividing unit.

[2] The moving image encoding device according to claim 1, wherein when the coding mode selected by the encoding controlling unit is an intra prediction mode, the prediction image generating unit carries out an intra-frame prediction process using pixels adjacent to said each of the coding blocks which is generated through the division by the block dividing unit or pixels adjacent to a higher layer coding block to which

said each of the coding blocks belongs to generate a prediction image.

[3] The moving image encoding device according to claim 2, wherein when the coding block which is generated through the division by the block dividing unit is further divided into partitions, the encoding controlling unit selects a coding mode corresponding to the coding block to which each of the partitions belongs or a coding mode corresponding to each of the partitions, and, when the coding mode selected by said encoding controlling unit is an intra prediction mode, the prediction image generating unit carries out an intra-frame prediction process using pixels adjacent to said each of the partitions which is generated through the division by said block dividing unit or pixels adjacent to a higher layer partition to which said each of the partitions belongs to generate a prediction image.

[4] The moving image encoding device according to claim 3, wherein when a higher layer coding block or a higher layer partition exists, an intra coding mode using pixels adjacent to a higher layer coding block or a higher layer partition is prepared in the one or more available coding modes, and, when an intra prediction mode is selected by said encoding controlling unit, the prediction image generating unit carries out an intra-frame prediction process using pixels adjacent to a higher layer coding block or a higher layer partition to which said each of the coding blocks or the partitions, which is generated through the division by the block dividing unit, belongs to generate a prediction image.

[5] A moving image decoding device comprising:

a variable length decoding unit for specifying a maximum

size of a coding block which is a unit to be processed at a time when a prediction process is carried out, and also determining a number of hierarchical layers of coding blocks into which a coding block having the maximum size is divided hierarchically to specify coded data associated with each of coding blocks having the maximum size and coded data associated with each of coding blocks into which each of the coding blocks having the maximum size is divided hierarchically from coded data multiplexed into a bitstream, and for variable-length-decoding the coded data associated with said each of the coding blocks to acquire compressed data and a coding mode which are associated with said each of the coding blocks;

a prediction image generating unit for carrying out a prediction process corresponding to said coding mode on a coding block specified by said variable length decoding unit to generate a prediction image;

a difference image generating unit for generating a pre-compressed difference image from the compressed data associated with the coding block variable-length-decoded by said variable length decoding unit; and

a decoded image generating unit for adding the difference image generated by said difference image generating unit and the prediction image generated by said prediction image generating unit to generate a decoded image, wherein

said variable length decoding unit variable-length-decodes coded data associated with a partition to acquire an intra merge flag indicating whether or not an intra prediction parameter for a partition adjacent to said partition is identical to that for said partition, and, when said intra merge flag indicates that the intra prediction parameter for

a partition adjacent to said partition is identical to that for said partition, variable-length-decodes said coded data to acquire an intra merge direction for specifying said adjacent partition, otherwise variable-length-decodes said coded data to acquire the intra prediction parameter for said partition.

[6] The moving image decoding device according to claim 5, wherein when the coding mode selected by the encoding controlling unit is an intra prediction mode, the prediction image generating unit carries out an intra-frame prediction process using pixels adjacent to the coding block which is specified by said variable length decoding unit or pixels adjacent to a higher layer coding block to which said coding block belongs to generate a prediction image.

[7] The moving image decoding device according to claim 6, wherein when the coding block which is generated through the hierarchical division is further divided into partitions, the variable length decoding unit specifies coded data associated with each of said partitions from the coded data multiplexed into the bitstream and variable-length-decodes said coded data to acquire compressed data and a coding mode associated with said each of the partitions, and, when the coding mode variable-length-decoded by said variable length decoding unit is intra prediction mode, the prediction image generating unit carries out an intra-frame prediction process using pixels adjacent to said each of the partitions or pixels adjacent to a higher layer partition to which said each of the partitions belongs to generate a prediction image.

[8] A moving image encoding method comprising:

an encoding control processing step of an encoding controlling unit determining a maximum size of a coding block

which is a unit to be processed at a time when a prediction process is carried out, and also determining a hierarchy number upper limit for hierarchical partitioning of the coding block having the maximum size, and selecting a coding mode corresponding to each of coding blocks into which the coding block having the maximum size is divided hierarchically from one or more available coding modes;

a block division processing step of a block dividing unit dividing an inputted image into coding blocks each having the maximum size determined in said encoding control processing step, and also dividing each of said coding blocks hierarchically until its hierarchy number reaches the hierarchy number upper limit determined in said encoding control processing step;

a prediction image generation processing step of a prediction image generating unit carrying out a prediction process corresponding to the coding mode selected in said encoding control processing step on each of coding blocks into which each of said coding blocks having the maximum size is divided in said block division processing step to generate a prediction image;

a difference image generation processing step of a difference image generating unit generating a difference image between said each of the coding blocks into which the inputted image is divided in said block division processing step, and the prediction image generated in said prediction image generation processing step;

an image compression processing step of an image compression unit compressing the difference image generated in said difference image generation processing step, and

outputting compressed data of said difference image; and

a variable length encode processing step of a variable length encoding unit variable-length-encoding the compressed data outputted in said image compression processing step and the coding mode selected in said encoding control processing step to generate a bitstream into which coded data of said compressed data and coded data of said coding mode are multiplexed, wherein

said variable length encoding processing step includes a step of, when variable-length-encoding an intra prediction parameter which is used when a prediction image is generated by said prediction image generating unit, in addition to the compressed data and the coding mode, to multiplex coded data of said intra prediction parameter into said bitstream, variable-length-encoding an intra merge flag indicating whether an intra prediction parameter for each of partitions generated through the division in said block division processing step is identical to that for a partition adjacent to said partition, and, when said intra prediction parameter for said each of partitions is identical to that for an adjacent partition, variable-length-encoding an intra merge direction for specifying said adjacent partition, otherwise variable-length-encoding the intra prediction parameter for said each of partitions generated through the division by said block division processing step.

[9] A moving image decoding method comprising:

a variable length decode processing step of a variable length decoding unit specifying a maximum size of a coding block which is a unit to be processed at a time when a prediction process is carried out, and also determining a number of

hierarchical layers of coding blocks into which a coding block having the maximum size is divided hierarchically to specify coded data associated with each of coding blocks having the maximum size and coded data associated with each of coding blocks into which each of the coding blocks having the maximum size is divided hierarchically from coded data multiplexed into a bitstream, and variable-length-decoding the coded data associated with said each of the coding blocks to acquire compressed data and a coding mode which are associated with said each of the coding blocks;

a prediction image generation processing step of a prediction image generating unit carrying out a prediction process corresponding to said coding mode on a coding block specified in said variable length decode processing step to generate a prediction image;

a difference image generation processing step of a difference image generating unit generating a pre-compressed difference image from the compressed data associated with the coding block variable-length-decoded in said variable length decode processing step; and

a decoded image generation processing step of a decoded image generating unit adding the difference image generated in said difference image generation processing step and the prediction image generated in said prediction image generation processing step to generate a decoded image, wherein

said variable length decode processing step includes a step of variable-length-decoding coded data associated with a partition to acquire an intra merge flag indicating whether or not an intra prediction parameter for a partition adjacent to said partition is identical to that for said partition, and,

when said intra merge flag indicates that the intra prediction parameter for a partition adjacent to said partition is identical to that for said partition, variable-length-decoding said coded data to acquire an intra merge direction for specifying said adjacent partition, otherwise variable-length-decoding said coded data to acquire the intra prediction parameter for said partition.

CLAIMS

[1] An image coding device comprising:
a variable length coding unit for performing a variable length coding on an intra prediction parameter used to generate a prediction image by performing a prediction process corresponding to a coding mode,

said variable length coding unit performing a variable length coding on an intra merge flag indicating whether or not said intra prediction parameter for a partition is identical to an intra prediction parameter for a neighboring partition located above or to the left of said partition,

wherein when there are two or more neighboring partitions located above or to the left of said partition, a first partition in a direction away from top left of said partition is regarded as said neighboring partition;

wherein when said intra prediction parameter for said partition is identical to said intra prediction parameter for said neighboring partition located above or to the left of said partition, said variable length coding unit performs a variable length coding on an intra merge direction specifying one of neighboring partitions located above and to the left of said partition of which intra prediction parameter is identical to said intra prediction parameter, and

when said intra prediction parameter for said partition is not identical to said intra prediction parameter for said neighboring partition located above or to the left of said partition, said variable length coding unit performs a variable length coding on said intra prediction parameter for said partition.

[2] An image decoding device comprising:
a variable length decoding unit for performing a variable length decoding on an intra prediction parameter used to generate a prediction image by performing a prediction process corresponding to a coding mode,

said variable length decoding unit performing a variable length decoding on an intra merge flag indicating whether or not said intra prediction parameter for a partition is identical to an intra prediction parameter for a neighboring partition located above or to the left of said partition,

wherein when there are two or more neighboring partitions located above or to the left of said partition, a first partition in a direction away from top left of said partition is regarded as said neighboring partition;

wherein when said intra prediction parameter for said partition is identical to said intra prediction parameter for said neighboring partition located above or to the left of said partition, said variable length decoding unit performs a variable length decoding on an intra merge direction specifying one of neighboring partitions located above and to the left of said partition of which intra prediction parameter is identical to said intra prediction parameter, and

when said intra prediction parameter for said partition is not identical to said intra prediction parameter for said neighboring partition located above or to the left of said partition, said variable length decoding unit performs a variable length decoding on said intra prediction parameter for said partition.