CLAIMS

1. An image decoding device comprising:

a decoder that decodes first information about whether or not to carry out a filtering process on a picture, which is a decoded picture and on which the prediction process is carried out, from encoded data, decodes, when the first information indicates that the filtering process is carried out, second information indicating whether a filter parameter for a largest coding block in the picture is same as that for another largest coding block which is adjacent to top or left of the largest coding block, and decodes third information about whether or not to carry out the filtering process on a coding block divided from the largest coding block;

a filter that, when the second information indicates that the filter parameter for the largest coding block is same as that for the another largest coding block and the third information indicates that the filtering process is not carried out on the coding block, carries out the filtering process with the filter parameter on the largest coding block excluding the coding block.

2. An image decoding method comprising:

decoding first information about whether or not to carry out a filtering process on a picture, which is a decoded picture and on which the prediction process is carried out, from encoded data, decoding, when the first information indicates that the filtering process is carried out, second information indicating whether a filter parameter for a largest coding block in the picture is same as that for another largest coding block which is adjacent to top or left of the largest coding block, and decoding third information about whether or not to carry out the filtering process on a coding block divided from the largest coding block;

carrying out the filtering process with the filter parameter on the largest coding block excluding the coding block, when the second information indicates that the filter parameter for the largest coding block is same as that for the another

largest coding block and the third information indicates that the filtering process is not carried out on the coding block.

CLAIMS

[1] An image decoding device comprising:

a variable length decoder that variable-length-decodes compressed data associated with each of coding blocks hierarchically partitioned from encoded data multiplexed into a bitstream and also variable-length-decodes filter parameters for each coding block having a largest size from said encoded data;

a predictor that carries out a prediction process on said coding block to generate a prediction image;

a difference image generator that generates a difference image from said compressed data;

a decoded image generator that adds said difference image and said prediction image to generate a decoded image; and

a filter that carries out a filtering process using said filter parameters on said decoded image and outputs the decoded image filtering-processed thereby, wherein

said variable length decoder variable-length-decodes a flag disposed for each coding block having said largest size and indicating whether filter parameters for a coding block to be decoded having said largest size are same as those for another coding block having said largest size and adjacent to top or left, and, when said flag indicates that the parameters are the same as those for the other coding block, sets the filter parameters of the other coding block having said largest size and adjacent to top or left as the filter parameters for the coding block to be decoded

having said largest size.

[2] The image decoding device according to claim 1, wherein said variable length decoder variable-length-decodes the filter parameters for each coding block having said largest size, an index indicating a class classifying method, and an offset of each class, and said filter carries out a pixel adaptive offset process of performing a class classification of each pixel in the decoded image generated by said decoded image generator into one class for each coding block having the largest size by using the class classifying method specified by the index indicating said class classifying method, and adding the offset of said each class to a pixel value of each pixel belonging to the corresponding class.

[3] The image decoding device according to claim 2, wherein said variable length decoder variable-length-decodes a coding mode associated with each of the coding blocks hierarchically partitioned from the encoded data multiplexed into the bitstream, and wherein said video decoding device includes an intra predictor that, when said coding mode is an intra coding mode, carries out an intra-frame prediction process corresponding to said intra coding mode on each prediction block which is a unit for prediction process at a time of carrying out the prediction process on said coding block to generate a prediction image, and the said decoded image generator adds the difference image generated by said difference image generator and the prediction image generated by said intra predictor to generate the decoded image.

[4] The image decoding device according to claim 3, wherein said video decoding device includes a motion-compensated predictor that, when the coding mode

associated with the coding block variable-length-decoded by said variable length decoder is an inter coding mode, carries out a motion-compensated prediction process on each prediction block, which is a unit for prediction process at a time of carrying out the prediction process on the coding block, by using a reference image to generate a prediction image, and said decoded image generator adds the difference image generated by said difference image generator and the prediction image generated by said intra predictor or said motion-compensated predictor to generate the decoded image and said filter carries out the filtering process on the decoded image acquired by said decoded image generator and outputs the decoded image filtering-processed thereby to said motion-compensated predictor as a reference image.

[5] The image decoding device according to claim 4, wherein said variable length decoder variable-length-decodes block partitioning information from the encoded data multiplexed into the bitstream, and variable-length-decodes compressed data, a coding mode, a prediction parameter showing an intra prediction parameter or an inter prediction parameter, a quantization parameter, and a transformation block size which are associated with each coding block which is driven from said block partitioning information, and said difference image generator inverse-quantizes the compressed data associated with the coding block variable-length-decoded by said variable length decoder by using the quantization parameter associated with said coding block and carries out an inverse transformation process on the compressed data inverse-quantized thereby for each block having said transformation block size to generate the pre-compressed difference image.

[6] An image encoding device comprising:

a coding parameter determinator that determines a largest size of a coding block which is a unit to be processed at a time when an encoding process is carried out;

a block partitioner that partitions an inputted image into coding blocks each having the largest size determined by said coding parameter determinator, and also partitions each of said coding blocks hierarchically;

a predictor that carries out a prediction process on said coding block to generate a prediction image;

a difference image generator that generates a difference image between an inputted image of said coding block and said prediction image;

an image compressor that compresses said difference image and outputs compressed data about said difference image;

a local decoded image generator that decodes said compressed data and adds the difference image decoded and said prediction image to generate a local decoded image;

a filter that carries out a filtering process on said local decoded image; and

a variable length encoder that variable-length-encodes said compressed data and filter parameters for each coding block having the largest size, and that generates a bitstream into which encoded data of said compressed data and encoded data of said filter parameters are multiplexed, wherein

said variable length encoder variable-length-encodes a flag disposed for each coding block having said largest size and indicating whether filter parameters for a coding block to be encoded having said largest size are same as those for another coding block having said largest size and adjacent to top or left.

[7] The image encoding device according to claim 6, wherein said filter carries out a pixel adaptive offset process of determining a class classifying method for each coding block having the largest size determined by said coding parameter determinator, performing a class classification of each pixel of the local decoded image in the coding block having the largest size into one class by using said class classifying method, and adding an offset of each class to a pixel value of each pixel belonging to said class, and wherein said variable length encoder encodes, as filter parameters, the index indicating the class classifying method which is determined for each coding block having the largest size by said filter and the offset of each class for each coding block having the largest size.

[8] The image encoding device according to claim 7, wherein said video encoding device includes an intra predictor that, when an intra coding mode is assigned by said coding parameter determinator as the coding mode corresponding to the coding block partitioned by said block partitioner, carries out an intra-frame prediction process corresponding to said intra coding mode on each prediction block which is a unit for prediction process at a time of carrying out the prediction process on said coding block to generate a prediction image, and wherein said difference image generator generates a difference image between the coding block partitioned by said block partitioner and the prediction image generated by said

intra predictor, and said local decoded image generator adds the difference image decoded and the prediction image generated by said intra predictor to generate the local decoded image.

[9] The image encoding device according to claim 8, wherein said image encoding device includes a motion-compensated predictor that, when an inter coding mode is determined by said coding parameter determinator as the coding mode corresponding to the coding block partitioned by said block partitioner, carries out a motion-compensated prediction process on each prediction block which is a unit for prediction process at a time of carrying out the prediction process on said coding block by using a reference image to generate a prediction image, and wherein said difference image generator generates a difference image between the coding block partitioned by said block partitioner and the prediction image generated by said motion-compensated predictor, said local decoded image generator adds the difference image decoded and the prediction image generated by said motion-compensated predictor to generate the local decoded image, and said filter that carries out the filtering process on the local decoded image generated by said local decoded image generator, and outputs the local decoded image filtering-processed thereby to said motion-compensated predictor as a reference image.

[10] The image encoding device according to claim 9, wherein said coding parameter determinator determines a quantization parameter and a transformation block partitioning state, which are used when the difference image is compressed, for each coding block, and also determines an intra prediction parameter or an inter prediction parameter, which is used when the prediction process is carried out, for each prediction block

of said coding block, said image compressor carries out the transformation process on the difference image generated by said difference image generator for each transformation block determined by said coding parameter determinator and also quantizes transform coefficients on which said transformation process is carried out by using the quantization parameter determined by said coding parameter determinator and outputs the transform coefficients quantized thereby as the compressed data about said difference image, and said variable length encoder variable-length-encodes the compressed data outputted from said image compressor, the coding mode selected by said coding parameter determinator, a prediction parameter showing the intra prediction parameter or the inter prediction parameter, the quantization parameter and transformation block partitioning information, and the filter parameters used when the filtering process is carried out by said filter to generate the bitstream into which the encoded data of said compressed data, the encoded data of said coding mode, encoded data of said prediction parameter, encoded data of said quantization parameter, encoded data of said transformation block partitioning information, and the encoded data of said filter parameters are multiplexed.

[11] An image decoding method comprising:

a variable length decoding processing step of variable-length-decoding block partitioning information from encoded data multiplexed into a bitstream and also variable-length-decoding filter parameters for each coding block unit having a largest size from said encoded data;

a prediction processing step of carrying out a prediction process on said coding block to generate a

prediction image;

a difference image generation processing step of generating a difference image from said compressed data;

a decoded image generation processing step of adding said difference image and said prediction image to generate a decoded image; and

a filtering processing step of carrying out a filtering process on said decoded image and outputting the decoded image filtering-processed thereby,

wherein in said variable length decoding processing step, a flag disposed for each coding block having said largest size and indicating whether filter parameters for a coding block to be decoded having said largest size are same as those for another coding block having said largest size and adjacent to top or left is variable-length-decoded, and, when said flag indicates that the parameters are the same as those for the other coding block, the filter parameters of the other coding block having said largest size and adjacent to top or left are set as the filter parameters for the coding block to be decoded having said largest size.

[12] An image encoding method comprising:

a coding parameter determination processing step of determining a largest size of a coding block which is a unit to be processed at a time when an encoding process is carried out;

a block partitioning processing step of a partitioning an inputted image into coding blocks each having the largest size determined in said coding parameter determination processing step, and also partitioning each of said coding blocks hierarchically;

a prediction processing step of process to generate a prediction image;

a difference image generation processing step of generating a difference image between an inputted image of said coding block and said prediction image;

an image compression processing step of compressing said difference image and outputting compressed data about said difference image;

a local decoded image generation processing step of decoding said compressed data, and adding the difference image decoded and said prediction image to generate a local decoded image;

a filtering processing step of carrying out a filtering process on said local decoded image; and

a variable length encoding processing step of variable-length-encoding said compressed data and filter parameters for each coding block having the largest size which are used when the filtering process is carried out

in said filtering processing step, and generating a bitstream into which encoded data of said compressed data and encoded data of said filter parameters are multiplexed,

wherein in said variable length encoding processing step, a flag disposed for each coding block having said largest size and indicating whether filter parameters for a coding block to be encoded having said largest size are same as those for another coding block having said largest size and adjacent to top or left are variable-length-encoded.

[13] An image decoding device comprising:

a variable length decoder that variable-length-decodes compressed data associated with each of coding blocks hierarchically partitioned from encoded data multiplexed into a bitstream and also variable-length-decodes, as filter parameters, an index indicating a class classifying method for each coding block having a largest size and an offset of each class for each coding block having the largest size from said encoded data;

a predictor that carries out a prediction process on said coding block to generate a prediction image;

a difference image generator that generates a pre-compressed difference image from the compressed data associated with the coding block variable-length-decoded by said variable length decoder;

a decoded image generator that adds the difference image generated by said difference image generator and the prediction image generated by said predictor to generate a decoded image; and

a filter that carries out a filtering process using said

filter parameters on the decoded image generated by said decoded image generator and outputs the decoded image filtering-processed thereby as a reproduced image, wherein

said filter carries out a pixel adaptive offset process of performing a class classification of each pixel in the decoded image generated by said decoded image generator into one class for each coding block having the largest size by using the class classifying method specified by the index indicating said class classifying method, and adding the offset of each class to a pixel value of each pixel belonging to said class.