

CLAIMS

1. An image encoding device comprising:

an image compressor that carries out a transformation process on a difference image between an inputted image and a prediction image, quantizes transform
5 coefficients of the difference image, and outputs the quantized transform coefficients as compressed data;

a filter that carries out a filtering process on a local decoded image which is a result of addition of the difference image decoded from the compressed data and the prediction image; and

10 a variable length encoder that variable-length-encodes the compressed data, an adaptation parameter set and a filter parameter used when the filtering process is carried out by the filter and generates a coded bitstream into which coded data of the compressed data and coded data of the filter parameter are multiplexed,

wherein the filter determines a classification method of a class on each coding
15 block having a largest size, carries out a classification on each pixel within each coding block having the largest size by using the classification method, calculates an offset value for each class for each coding block having the largest size, and carries out a pixel adaptive offset process by which the offset value is added to a pixel value of a pixel belonging to a corresponding class, and

20 the variable length encoder variable-length-encodes a parameter associated with a quantization matrix for generating a quantization matrix used when the transform coefficients are quantized by the image compressor and an index indicating the classification method of a class on each coding block having the largest size, the classification method being determined by the filter, and variable-length-encodes a
25 parameter of the offset value for each class on a basis of a binarization process using a truncated unary code, and

the adaptation parameter set includes a flag showing that the parameter associated with the quantization matrix exists and the parameter associated with the quantization matrix.

2. An image decoding device comprising:

a variable length decoder that variable-length-decodes compressed data, a filter parameter and an adaptation parameter set from coded data multiplexed into a coded bitstream;

5 a difference image generator that inverse-quantizes transform coefficients of a block obtained from the compressed data by using a parameter associated with a quantization matrix included in the adaptation parameter set which is variable-length-decoded by the variable length decoder and inverse-transforms the inverse-quantized transform coefficients to generate a difference image;

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

a filter that carries out a filtering process on the decoded image decoded from the compressed data by using the filter parameter,

wherein the variable length decoder variable-length-decodes, as a filter
15 parameter, an index indicating a classification method of a class on each coding block having a largest size from the coded data, and variable-length-decodes a parameter of an offset value for each class on which a binarization process using a truncated unary code is performed, and

the filter specifies the classification method of a class on each coding block
20 having the largest size by using the index, carries out a classification on each pixel by using the classification method, and carries out a pixel adaptive offset process by which the offset value is added to a pixel value of a pixel belonging to a corresponding class, and

the adaptation parameter set includes a flag showing that the parameter
25 associated with the quantization matrix exists and the parameter associated with the quantization matrix.

3. An image encoding method comprising:

an image compression step of an image compressor carrying out a
30 transformation process on a difference image between an inputted image and a

prediction image, quantizing transform coefficients of the difference image, and outputting the quantized transform coefficients as compressed data;

a filtering process step of a filter carrying out a filtering process on a local decoded image which is a result of addition of the difference image decoded from compressed data and the prediction image; and

a variable length encoding process step of a variable length encoder variable-length-encoding the compressed data, an adaptation parameter set and a filter parameter used when the filtering process is carried out in the filtering process step and generating a coded bitstream into which coded data of the compressed data and coded data of the filter parameter are multiplexed,

wherein the filtering process step includes the steps of determining a classification method of a class on each coding block having a largest size, carrying out a classification on each pixel within each coding block having the largest size by using the classification method, calculating an offset value for each class, and carrying out a pixel adaptive offset process by which the offset value is added to a pixel value of a pixel belonging to a corresponding class, and

the variable length encoding process step includes the steps of variable-length-encoding a parameter associated with a quantization matrix for generating a quantization matrix used when the transform coefficients are quantized in the image compression step and an index indicating the classification method of a class on each coding block having the largest size, the classification method being determined in the filtering process step, and variable-length-encoding a parameter of the offset value for each class on a basis of a binarization process using a truncated unary code, and

the adaptation parameter set includes a flag showing that the parameter associated with the quantization matrix exists and the parameter associated with the quantization matrix.

4. An image decoding method comprising:

a variable length decoding process step of a variable length decoder variable-length-decoding compressed data, a filter parameter and an adaptation parameter set from coded data multiplexed into a coded bitstream;

a difference image generation step of a difference image generator
 5 inverse-quantizing transform coefficients of a block obtained from the compressed data by using a parameter associated with a quantization matrix included in the adaptation parameter set which is variable-length-decoded in the variable length decoding process step and inverse-transforming the inverse-quantized transform coefficients to generate a difference image;

10 a decoded image generation step of a decoded image generator adding the difference image and a prediction image to generate a decoded image; and

a filtering process step of a filter carrying out a filtering process on the decoded image decoded from the compressed data by using the filter parameter,

wherein the variable length decoding process step includes the steps of
 15 variable-length-decoding, as a filter parameter, an index indicating a classification method of a class on each coding block having a largest size from the coded data, and variable-length-decoding a parameter of an offset value for each class on which a binarization process using a truncated unary code is performed, and

the filtering process step includes the steps of specifying the classification
 20 method of a class on each coding block having the largest size by using the index, carrying out a classification on each pixel by using the classification method, and carrying out a pixel adaptive offset process by which the offset value is added to a pixel value of a pixel belonging to a corresponding class, and

the adaptation parameter set includes a flag showing that the parameter
 25 associated with the quantization matrix exists and the parameter associated with the quantization matrix.

5. A computer-readable storage medium storing a bitstream having coded data, the coded data comprising:

variable-length-encoded data obtained by carrying out a transformation process on a difference image data between an inputted image and a prediction image, quantizing transform coefficients of the difference image and variable-length-encoding the quantized transform coefficients as compressed data;

5 variable-length-encoded data of a filter parameter used when a filtering process is carried out on a local decoded image which is a result of addition of the difference image decoded from the compressed data and the prediction image; and

 variable-length-encoded data of an adaptation parameter set
 wherein the filtering process includes

10 determining a classification method of a class on each coding block having a largest size,

 carrying out a classification on each pixel within each coding block having the largest size by using the classification method,

 calculating an offset value for each class, and

15 carrying out a pixel adaptive offset process by which the offset value is added to a pixel value of a pixel belonging to a corresponding class,

 wherein the variable-length-encoded data include

 variable-length-encoded data of a parameter associated with a quantization matrix for generating a quantization matrix used when the transform coefficients of
20 the difference image are quantized,

 variable-length-encoded data of an index indicating the classification method,
 and

 variable-length-encoded data of a parameter of the offset value for each class on a basis of a binarization process using a truncated unary code, and

25 the adaptation parameter set includes a flag showing that the parameter associated with the quantization matrix exists and the parameter associated with the quantization matrix.