

CLAIMS

1. An image encoding device comprising:

5 an image compressor that carries out a transformation process on a difference image between an inputted image and a prediction image, quantizes transform 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
10 result of addition of the difference image decoded from the compressed data and the prediction image; and

 a variable length encoder that variable-length-encodes the compressed data 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
15 data of the filter parameter are multiplexed,

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

 a maximum of the offset value is determined by a bit depth of the local
30 decoded image.

2. An image decoding device comprising:

a variable length decoder that variable-length-decodes compressed data, a filter parameter and a quantization matrix parameter from coded data multiplexed
5 into a coded bitstream;

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

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,

15 wherein the variable length decoder variable-length-decodes, 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-decodes a parameter of an offset value for each class on which a binarization process using a truncated unary code is performed, and

20 the filter specifies the classification method of a class on each coding block 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

25 a maximum of the offset value is determined by a bit depth of the decoded image.

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 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 quantization matrix parameter 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

a maximum of the offset value is determined by a bit depth of the local decoded image.

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 a quantization matrix parameter from coded data multiplexed into a coded bitstream;

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

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,

10 wherein the variable length decoding process includes the steps of
 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

15 the filtering process step includes the steps of specifying the classification
 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

20 a maximum of the offset value is determined by a bit depth of the decoded
 image.

5. A medium storing a bitstream having coded data, the coded data comprising:

variable-length-encoded data obtained by carrying out a transformation
 25 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; and

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
 30 difference image decoded from the compressed data and the prediction image,

wherein the filtering process includes

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

5 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,

wherein the variable-length-encoded data include

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

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

and

15 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

a maximum of the offset value is determined by a bit depth of the local decoded image.