

[0008]

Further, with image compression technology, standardization is being studied for HEVC (High Efficiency Video Coding) which realizes even higher encoding efficiency than the H.264/AVC format. With this HDVC, basic units called coding units (CU: Coding Unit) which are extensions of the concept of macroblocks. In the event that each block illustrated in Fig. 2 is a coding unit, the decoding order is the order of blocks with numbers sequentially increasing from "0". In the event that the decoding order is not raster scan order in this way, moving from block "7" to block "8", for example, or from block "15" to block "16", may conceivably lead to a greater difference value since the spatial distance is great.

[0009]

Embodiments of the present invention seek to improve the encoding efficiency of quantization parameters.

Solution to Problem

[0010]

Disclosed herein is an image decoding device, including: an information acquiring unit configured to take quantization parameters of decoded blocks spatially or temporally adjacent to a block to be decoded, as selection candidates, and extract, from stream information, difference information indicating

difference as to a prediction quantization parameter selected from the selection candidates; and a quantization parameter calculating unit configured to calculate, from the prediction quantization parameter and the difference information, a quantization parameter of the block to be decoded.

[0011]

With the above disclosed device, difference information indicating difference as to a prediction quantization parameter selected from selection candidates, which are quantization parameters of decoded blocks spatially or temporally adjacent to a block to be decoded, is extracted from stream information. Also, with the image decoding device, at least blocks where quantization parameters are redundant or blocks where inverse quantization using quantization parameters is not performed are excluded from quantization parameters of decoded blocks spatially or temporally adjacent to the block to be decoded, and selection candidates are taken. For setting of the prediction quantization parameter, a quantization parameter is selected in an order indicated by identification information included in the stream information, with the adjacent decoded blocks in a predetermined order, for example. Alternatively, determination is performed of selection candidates in an order set beforehand, and the prediction quantization parameter is set based on the determination result. Alternatively, one or the other is

selected of processing of setting to the prediction quantization parameter a quantization parameter in an order indicated by identification information included in the stream information, and processing of determining selection candidates in an order set beforehand and setting the prediction quantization parameter, based on the determination result included in the stream information. Further, with the above disclosed image decoding device, a quantization parameter of the block to be decoded is calculated by adding difference which the difference information indicates to the prediction quantization parameter. Further, in the event that there is no selection candidate, a quantization parameter of an initial value in a slice is taken as the prediction quantization parameter. Also, including a quantization parameter updated last in the selection candidates is also performed.

[0012]

Disclosed herein is an image decoding method, including: a process of taking quantization parameters of decoded blocks spatially or temporally adjacent to a block to be decoded, as selection candidates, and extracting, from stream information, difference information indicating difference as to a prediction quantization parameter selected from the selection candidates; and a process of calculating, from the prediction quantization parameter and the difference information, a

quantization parameter of the block to be decoded.

According to a first aspect of the present invention, there is provided an image encoding method, comprising: ~~obtaining setting, when if~~ a block adjacent to the left of a current block and a block adjacent above the current block are ~~referenceable~~ available, a prediction quantization parameter derived from an average value of a quantization parameter of the block adjacent to the left and a quantization parameter of the block adjacent above; ~~obtaining setting, when if~~ the block adjacent to the left and the block adjacent above are not ~~referenceable~~ available, the prediction quantization parameter derived from a quantization parameter of a processing unit not adjacent to the current block; generating a difference information indicating a difference between the ~~obtained~~ the prediction quantization parameter and a quantization parameter of the current block; and ~~transmitting bit~~ generating stream information including the difference information.

[0013]

With embodiments of the above encoding device, at least blocks where quantization parameters are redundant or blocks where quantization using quantization parameters is not performed are excluded from quantization parameters of encoded blocks spatially or temporally adjacent to the block to be encoded, and selection candidates are taken. Also, a quantization parameter updated last or the like is also

included in the selection candidates. A quantization parameter of which the difference as to the quantization parameter set from these selection candidates is the smallest, is selected as the prediction quantization parameter, and identification information for selecting the prediction quantization parameter from the selection candidates is generated. For example, identification information is the order of blocks corresponding to the selected quantization parameter, with the adjacent encoded blocks in a predetermined order. Also, the predetermined array is an order of array where priority is given to one of an encoded block adjacent to the left side, an encoded block adjacent above, and an encoded block temporally adjacent. Also, the order of array of adjacent encoded blocks can be switched. Further, quantization parameters of encoded blocks temporally adjacent may be reordered in accordance with parameter values, with the order of selected quantization parameters being taken as identification information. Also, determination of selection candidates may be performed in an order set beforehand, with the prediction quantization parameter being selected based on the determination result. Further, with embodiments of the above image encoding device, difference information indicating the difference between the prediction quantization parameter and the set quantization parameter is generated. Also, in the event that there is no selection candidate, difference information indicating

difference between a quantization parameter of an initial value in a slice, and the set quantization parameters, is generated. Also, selection can be made between processing of setting a quantization parameter of which the difference as to the set quantization parameter is the smallest as the prediction quantization parameter, and processing of performing determination of selection candidates in an order set beforehand and selecting the prediction quantization parameter based on the determination result, and determination information indicating the selected processing is generated. The generated difference information, identification information, and determination information are included in stream information generated by performing encoding processing of the block to be encoded using the set quantization parameter.

[0014]

According to a second aspect of the present invention, there is provided an image encoding apparatus comprising: a circuitry configured to: ~~obtain~~ set, ~~when~~ if a block adjacent to the left of a current block and a block adjacent above the current block are ~~referenceable~~ available, a prediction quantization parameter derived from an average value of a quantization parameter of the block adjacent to the left and a quantization parameter of the block adjacent above; ~~obtain~~ set, ~~when~~ if the block adjacent to the left and the block adjacent

above are not ~~referenceable~~ available, the prediction quantization parameter derived from a quantization parameter of a processing unit not adjacent to the current block; generate a difference information indicating a difference between the ~~obtained~~ set prediction quantization parameter and a quantization parameter of the current block; and ~~transmit~~ generate stream information including the difference information.

Advantageous Effects of Invention

[0015]

According to the above aspects, quantization parameters of encoded blocks spatially or temporally adjacent to a block to be encoded are taken as selection candidates, and a prediction quantization parameter is selected from the selection candidates in accordance with the quantization parameter set to the block to be encoded. Difference information indicating difference between the prediction quantization parameter and the quantization parameters set as to the block to be encoded is generated. Accordingly, the difference of quantization parameters can be prevented from becoming a great value, and encoding efficiency of quantization parameters can be improved.

[0016]

Also, in a case of decoding stream information where

CLAIMS

1. An image encoding method, comprising:

setting, if a block adjacent to the left of a current block and a block adjacent above the current block are available, a prediction quantization parameter derived from an average value of a quantization parameter of the block adjacent to the left and a quantization parameter of the block adjacent above;

setting, if the block adjacent to the left and the block adjacent above are not available, the prediction quantization parameter derived from a quantization parameter of a processing unit not adjacent to the current block;

generating a difference information indicating a difference between the set prediction quantization parameter and a quantization parameter of the current block; and

generating stream information including the difference information.

2. The image encoding method of claim 1,

wherein the quantization parameter of the processing unit not adjacent to the current block is an initial value of a quantization parameter in a slice.

3. The image encoding method of claim 1,

wherein, if the block adjacent to the left and the block adjacent above are not available, a quantization parameter of a previous block is derived to set the prediction quantization parameter.

4. The image encoding method of claim 1,
wherein the block is a coding unit, and the coding unit has a hierarchical structure defined by a hierarchical depth.
5. The image encoding method of claim 4, further comprising:
performing a quantization by a transform unit included in the coding unit, based on the quantization parameter of the current block.
6. The image encoding method of claim 1, further comprising:
encoding the difference information.
7. An information processing apparatus comprising:
a circuitry configured to:
set, if a block adjacent to the left of a current block and a block adjacent above the current block are available, a prediction quantization parameter derived from an average value of a quantization parameter of the block adjacent to the left and a quantization parameter of the block adjacent above;
set, if the block adjacent to the left and the block adjacent above are not available, the prediction quantization parameter derived from a quantization parameter of a processing unit not adjacent to the current block;
generate a difference information indicating a difference between the set prediction quantization parameter and a quantization parameter of the current block; and

generate stream information including the difference information.

8. The information processing apparatus of claim 7, wherein the quantization parameter of the processing unit not adjacent to the current block is an initial value of a quantization parameter in a slice.

9. The information processing apparatus of claim 7, wherein, if the block adjacent to the left and the block adjacent above are not available, a quantization parameter of a previous block is derived to set the prediction quantization parameter.

10. The information processing apparatus of claim 7, wherein the block is a coding unit, and the coding unit has a hierarchical structure defined by a hierarchical depth.

11. The information processing apparatus of claim 10, wherein the processing circuitry is further configured to:

perform a quantization by a transform unit included in the coding unit, based on the calculated quantization parameter of the current block.

12. The information processing apparatus of claim 7, wherein the processing circuitry is further configured to:

encode the difference information.

CLAIMS

1. An image encoding method, comprising:

obtaining, when a block adjacent to the left of a current block and a block adjacent above the current block are referenceable, a prediction quantization parameter derived from an average value of a quantization parameter of the block adjacent to the left and a quantization parameter of the block adjacent above;

obtaining, when the block adjacent to the left and the block adjacent above are not referenceable, the prediction quantization parameter derived from a quantization parameter of a processing unit not adjacent to the current block;

generating a difference information indicating a difference between the obtained prediction quantization parameter and a quantization parameter of the current block; and

transmitting bit stream information including the difference information.

2. The image encoding method of Claim 1,

wherein, when the block adjacent to the left and the block adjacent above are not referenceable, a quantization parameter of a previous block is derived to obtain the prediction quantization parameter.

3. The image encoding method of Claim 1,

wherein the block is a coding unit, and the coding unit has a hierarchical structure defined by a hierarchical depth.

4. The image encoding method of Claim 3, further comprising:
performing a quantization by a transform unit included in the coding unit, based on the quantization parameter of the current block.
5. The image encoding method of Claim 1,
wherein the quantization parameter of the processing unit not adjacent to the current block is an initial value of a quantization parameter in a slice.
6. The image encoding method of claim 1, further comprising:
in an audio call mode, configuring a communication unit to perform the steps of:
performing demodulation processing of audio data and frequency conversion processing of audio data to generate transmission signals;
supplying transmission signals to an antenna so as to be transmitted to a base station;
performing amplification, frequency conversion processing and demodulation processing of signals received at the antenna; and
supplying the audio data to an audio codec.
7. The image encoding method of claim 6, further comprising:
in a data communication mode, configuring the communication unit to perform the steps of:
generating email data based on user instructions at an operating unit;
performing modulation processing or frequency conversion

processing of the email data;

transmitting the obtained transmission signals from the antenna;
and

performing amplification, frequency conversion processing and demodulation processing of the signals received by the antenna to restore the email data.

8. The image encoding method of claim 7, further comprising:

configuring the communication unit to perform the steps of:

performing demodulation processing or frequency conversion processing of multiplexed data and transmitting the signals from the antenna; and

performing amplification, frequency conversion processing or demodulation processing of signals received at the antenna to restore multiplexed data.

9. The image encoding method of 8, further comprising:

configuring a camera unit supplying image data to an image processing unit to perform encoding processing of the image data and generate the bit stream information therefrom.

10. The image encoding method of claim 9, further comprising:

configuring a multiplex separating unit multiplexing bit stream information generated at the image processing unit and audio data supplied from the audio codec by a predetermined

format and supplying the multiplexed data to the communication unit.

11. The image encoding method of claim 10, further comprising:
 configuring a control unit to perform the steps of:
 receiving text data input from an operating unit and displaying the input text to a display unit; and
 generating the email data based on the user instructions at the operating unit, wherein the email data is supplied to the communication unit.

12. An image encoding apparatus comprising:
 a circuitry configured to:
 obtain, when a block adjacent to the left of a current block and a block adjacent above the current block are referenceable, a prediction quantization parameter derived from an average value of a quantization parameter of the block adjacent to the left and a quantization parameter of the block adjacent above;
 obtain, when the block adjacent to the left and the block adjacent above are not referenceable, the prediction quantization parameter derived from a quantization parameter of a processing unit not adjacent to the current block;
 generate a difference information indicating a difference between the obtained prediction quantization parameter and a quantization parameter of the current block; and

transmit bit stream information including the difference information.

13. The image encoding apparatus of Claim 12, wherein the quantization parameter of the processing unit not adjacent to the current block is an initial value of a quantization parameter in a slice.

14. The image encoding apparatus of Claim 13, wherein when the block adjacent to the left and the block adjacent above are not referenceable, a quantization parameter of a previous block is derived to obtain the prediction quantization parameter.

15. The image encoding apparatus of Claim 12,
wherein the block is a coding unit, and the coding unit has a hierarchical structure defined by a hierarchical depth.

16. The image encoding apparatus of Claim 15, wherein the processing circuitry is further configured to:

perform a quantization by a transform unit included in the coding unit, based on the quantization parameter of the current block.

17. The image encoding apparatus of claim 12, further comprising:

wherein the processing circuitry is further configured to encode the current block according to the quantization parameter.

18. The image encoding apparatus of claim 12, further comprising a communication unit, wherein in an audio call mode, the communication unit is configured to:

perform demodulation processing of audio data and frequency conversion processing of audio data to generate transmission signals;

supply transmission signals to an antenna so as to be transmitted to a base station;

perform amplification, frequency conversion processing and demodulation processing of signals received at the antenna; and

supply the audio data to an audio codec.

19. The image encoding apparatus of claim 18, wherein in a data communication mode, the communication unit is configured to:

generate email data based on user instructions at an operating unit;

perform modulation processing or frequency conversion processing of the email data;

transmit the obtained transmission signals from the antenna; and

perform amplification, frequency conversion processing and demodulation processing of the signals received by the antenna to restore the email data.

20. The image encoding apparatus of claim 19, wherein the communication unit is configured to:

perform demodulation processing or frequency conversion processing of multiplexed data and transmit the signals from the

antenna; and

perform amplification, frequency conversion processing or demodulation processing of signals received at the antenna to restore multiplexed data.

21. The image encoding apparatus of claim 20, further comprising a camera unit for supplying image data to an image processing unit to perform encoding processing of the image data and generate the bit stream information therefrom.

22. The image encoding apparatus of claim 21, further comprising a multiplex separating unit for multiplexing the bit stream information generated at the image processing unit and audio data supplied from the audio codec by a predetermined format and supplying the multiplexed data to the communication unit.

23. The image encoding apparatus of claim 22, further comprising a control unit configured to:

receive text data input from an operating unit and display the input text to a display unit; and

generate the email data based on the user instructions at the operating unit, wherein the email data is supplied to the communication unit.