[0006]

Therefore, ~~an object~~ embodiments of this ~~technique is to~~ invention allow a deblocking filtering process to apply filtering appropriately.

SOLUTIONS TO PROBLEMS

[0007]

~~An~~Disclosed herein is an image processing device ~~according to a first aspect of this technique includes~~ including: a decoding unit that decodes an encoded stream encoded in units each having a layer structure to generate an image; a filtering unit that applies a deblocking filter to a block boundary according to a strength of the deblocking filter applied to the block boundary which is a boundary between a block of the image generated by the decoding unit and an adjacent block adjacent to the block; and a controller that controls the filtering unit so that, when strong filtering is applied as the strength of the deblocking filter, a clipping process is applied to the deblocking filter with respect to luminance components of the image generated by the decoding unit.

[0007a]

According to a first aspect of the present invention, there is provided an image processing device comprising: a filtering unit that applies a deblocking filter to a block boundary according to a strength of the deblocking filter applied to the block boundary which is a boundary between a block of an image locally decoded when an image is encoded and an adjacent block adjacent to the block; a controller that controls the filtering

unit so that, when strong filtering is applied as the strength of the deblocking filter, a clipping process is applied to the deblocking filter with respect to luminance components of the locally decoded image; and an encoding unit that encodes the image in units each having a layer structure using an image to which the deblocking filter is applied.

[0008]

The controller may apply the clipping process to values of parts that change when the deblocking filter is applied.

[0009]

The controller applies the clipping process according to the following expressions:

[Mathematical formula 37]

decoding unit.

[0013]

The filter strength determining unit may determine the strength of the deblocking filter using a plurality of lines as processing units.

[0014]

The filter strength determining unit may determine the strength of the deblocking filter using four lines as the processing units.

[0015]

The image processing device further includes: a filtering necessity determining unit that determines whether the deblocking filter is to be applied to the block boundary using a plurality of lines as processing units, and the filter strength determining unit may determine the strength of the deblocking filter when the filtering necessity determining unit determines that the deblocking filter is to be applied.

[0016]

~~An~~Disclosed herein is an image processing method ~~according to the first aspect of this technique~~ that allows an image processing device to execute: decoding an encoded stream encoded in units each having a layer structure to generate an image; applying a deblocking filter to a block boundary according to a strength of the deblocking filter applied to the block boundary which is a boundary between a block of the generated image and an adjacent block adjacent to the block; and controlling so that, when strong filtering is applied as the strength of the deblocking filter, a clipping process is applied to the deblocking filter with respect to luminance

components of the generated image.

[0016a]

According to a second aspect of the present invention, there is provided an image processing method for allowing an image processing device to execute: applying a deblocking filter to a block boundary according to a strength of the deblocking filter applied to the block boundary which is a boundary between a block of an image locally decoded when an image is encoded and an adjacent block adjacent to the block; controlling so that, when strong filtering is applied as the strength of the deblocking filter, a clipping process is applied to the deblocking filter with respect to luminance components of the locally decoded image; and encoding the image in units each having a layer structure using an image to which the deblocking filter is applied.

[0017]

~~An~~Disclosed herein is an image processing device ~~according to a second aspect of this technique includes~~ including: a filtering unit that applies a deblocking filter to a block boundary according to a strength of the deblocking filter applied to the block boundary which is a boundary between a block of an image locally decoded when an image is encoded and an adjacent block adjacent to the block; a controller that controls the filtering unit so that, when strong filtering is applied as the strength of the deblocking filter, a clipping process is applied to the deblocking filter with respect to luminance components of the locally decoded image; and an encoding unit that encodes the image in units each having a layer structure using an image to which the deblocking filter is applied.

[0018]

The controller may apply the clipping process to values of parts that change when the deblocking filter is applied.

[0019]

The controller applies the clipping process according to the following expressions:

[Mathematical formula 38]

strong filtering is to be applied, a clipping process is applied to the deblocking filter with respect to the luminance components of the image generated by the decoding unit.

[0023]

The filter strength determining unit may determine the strength of the deblocking filter using a plurality of lines as processing units.

[0024]

The filter strength determining unit may determine the strength of the deblocking filter using four lines as the processing units.

[0025]

The image processing device further includes: a filtering necessity determining unit that determines whether the deblocking filter is to be applied to the block boundary using a plurality of lines as processing units, and the filter strength determining unit may determine the strength of the deblocking filter when the filtering necessity determining unit determines that the deblocking filter is to be applied.

[0026]

~~An~~Disclosed herein is an image processing method ~~according to the second aspect of this technique~~ that allows an image processing device to execute: applying a deblocking filter to a block boundary according to a strength of the deblocking filter applied to the block boundary which is a boundary between a block of an image locally decoded when an image is encoded and an adjacent block adjacent to the block; controlling so that, when strong filtering is applied as the strength of the deblocking filter, a clipping process

is applied to the deblocking filter with respect to luminance components of the locally decoded image; and encoding the image in units each having a layer structure using an image to which the deblocking filter is applied.

[0027]

~~In a first aspect of the present technique~~According to embodiments of the present invention, an encoded stream encoded in units each having a layer structure is decoded to generate an image; and a deblocking filter is applied to a block boundary according to a strength of the deblocking filter applied to the block boundary which is a boundary between a block of the generated image and an adjacent block adjacent to the block. Moreover, control is performed so that, when strong filtering is applied as the strength of the deblocking filter, a clipping process is applied to the deblocking filter with respect to luminance components of the generated image.

[0028]

~~In a second aspect of the present technique~~According to embodiments of the present invention, a deblocking filter is applied to a block boundary according to a strength of the deblocking filter applied to the block boundary which is a boundary between a block of an image locally decoded when an image is encoded and an adjacent block adjacent to the block. Moreover, control is performed so that, when strong filtering is applied as the strength of the deblocking filter, a clipping process is applied to the deblocking filter with respect to luminance components of the locally decoded image; and the image is encoded in units each having a layer structure using an image to which the deblocking filter is applied.

EFFECTS OF THE INVENTION

[0029]

According to ~~this technique~~ embodiments of the present invention, it is possible to allow a deblocking filtering process to apply filtering appropriately.

BRIEF DESCRIPTION OF THE DRAWINGS

[0030]

Figs. 1(A) and 1(B) are diagrams for describing a conventional deblocking filtering process.

Fig. 2 is a diagram illustrating a configuration when applied to an image encoding device.

Fig. 3 is a flowchart illustrating an image encoding operation.

Fig. 4 is a flowchart illustrating an intra-prediction process.

Fig. 5 is a flowchart illustrating an inter-prediction process.

Fig. 6 is a diagram illustrating a configuration when applied to an image decoding device.

Fig. 7 is a flowchart illustrating an image decoding operation.

Fig. 8 is a diagram for describing a basic operation of a deblocking filtering unit.

Fig. 9 is a diagram illustrating the configuration of a first embodiment of the deblocking filtering unit.

Fig. 10 is a flowchart illustrating the operation of the first embodiment of the deblocking filtering unit.

Fig. 11 is a diagram illustrating the configuration of a filter operation unit.