Solution to Problem

[0008]

According to a first aspect of the present disclosure, there is provided an image processing apparatus including: a decoding unit configured to generate a decoded image by decoding a coded stream; a determination unit configured to adopt a block boundary of the decoded image as a target and independently determine deblocking filter application necessity for each of U and V color difference components with respect to: color difference components of the decoded image based on boundary strength that is calculated using a transform coefficient of the U color difference component and a transform coefficient of the V color difference component; and a filtering unit configured to apply a deblocking filter to color difference components of pixels located in a vicinity of the block boundary based on a determination result of the deblocking filter application necessity.

[0009]

According to a second aspect of the present disclosure, there is provided an image processing method including: generating a decoded image by decoding a coded stream; adopting a block boundary of the decoded image as a target; independently determining deblocking filter application necessity for each of U and V color difference components with respect to: color difference components of the decoded image based on boundary strength that is calculated using a transform coefficient of the U color difference component and a transform coefficient of the V color difference component; and applying a deblocking filter to color difference components of pixels located in a vicinity of the block boundary based on a determination result of the deblocking filter application necessity.

[0010]

According to a third aspect of the present disclosure, there is provided an image processing apparatus including: a determination unit configured to adopt, as a target, a block boundary of a decoded image that is locally decoded, and independently determine deblocking filter application

necessity for each of U and V color difference components with respect to: color difference components of the decoded image based on boundary strength that is calculated using a transform coefficient of the U color difference component and a transform coefficient of the V color difference component; a filtering unit configured to apply a deblocking filter to color difference components of pixels located in a vicinity of the block boundary based on a determination result of the deblocking filter application necessity; and a coding unit configured to encode an image using the decoded image to which the deblocking filter is applied by the filtering unit.

[0011]

According to a fourth aspect of the present disclosure, there is provided an image processing method including: adopting, as a target, a block boundary of a decoded image that is locally decoded; independently determining deblocking filter application necessity for each of U and V color difference components with respect to: color difference components of the decoded image based on boundary strength that is calculated using a transform coefficient of the U color difference component and a transform coefficient of the V color difference component; applying a deblocking filter to color difference components of pixels located in a vicinity of the block boundary based on a determination result of the deblocking filter application necessity; and coding an image using the decoded image to which the deblocking filter is applied.

Advantageous Effects of Invention

[0012] As described above, according to embodiments of the present disclosure, it is possible to more appropriately apply a deblocking filter to color difference components of a decoded image.

[0013] Further, the effects described above are not limitative. That is, with or in the place of the above effects, any of the effects described in the present specification or other effects that may be recognized from

Claims

1. An image processing apparatus comprising:

a decoding unit configured to generate a decoded image by decoding a coded stream;

a determination unit configured to adopt a block boundary of the decoded image as a target and independently determine deblocking filter application necessity for each of U and V color difference components with respect to:

color difference components of the decoded image based on boundary strength that is calculated using a transform coefficient of the U color difference component and a transform coefficient of the V color difference component; and

a filtering unit configured to apply a deblocking filter to color difference components of pixels located in a vicinity of the block boundary based on a determination result of the deblocking filter application necessity.

2. The image processing apparatus according to claim 1, wherein

the color difference related parameter includes information on transform coefficients of color difference components, and

the boundary strength is calculated based on whether significant coefficients of the color difference components are present in blocks that sandwich the block boundary as a target for calculation of the boundary strength.

3. The image processing apparatus according to claim 2, wherein the boundary strength is calculated by independently determining whether a significant coefficient

of each of components is present in the blocks that sandwich the block boundary as the target for the calculation of the boundary strength.

4. The image processing apparatus according to claim 1, wherein

the boundary strength is represented by a plurality of bits, and

the plurality of bits include at least one bit corresponding to each of components.

5. The image processing apparatus according to claim 1, wherein the determination unit determines the deblocking filter application necessity through determination based on the boundary strength and large block determination using block sizes of blocks that sandwich the block boundary.

6. The image processing apparatus according to claim 5, wherein if the boundary strength has a value related to inter prediction, the determination unit performs the large block determination.

7. The image processing apparatus according to claim 5, wherein the determination unit performs the large block determination based on sizes of the blocks sandwiching the block boundary, the sizes being sizes in a direction perpendicular to the block boundary.

8. The image processing apparatus according to claim 7, wherein the determination unit performs the large block determination based on whether the sizes of the blocks sandwiching the block boundary is larger than 8, the sizes being sizes in the direction perpendicular to the block

boundary.

9. The image processing apparatus according to claim 1, wherein the filtering unit applies, as the deblocking filter, one of a weak filter and a strong filter to the color difference components of the pixels located in the vicinity of the block boundary.

10. The image processing apparatus according to claim 9, wherein a coefficient of the strong filter is set to 2 at a center position of an application target range of the strong filter, and set to 1 at other positions.

11. The image processing apparatus according to claim 9, wherein the filtering unit adopts three pixels on both sides from the block boundary as an application target range of the strong filter, and applies the strong filter to color difference components of pixels included in the application target range by using three pixels on both sides of a center position of the application target range as reference pixels.

12. The image processing apparatus according to claim 11, wherein the filtering unit performs padding and uses, as a pixel value of the reference pixel, a pixel value of a fourth pixel from the block boundary in place of pixels separated by five pixels or more from the block boundary.

13. The image processing apparatus according to claim 10, wherein the filtering unit applies the strong filter by performing a clipping process based on a parameter tC that is identified based on a quantization parameter.

14. The image processing apparatus according to claim 9, wherein

the determination unit further determines filter strength of the deblocking filter that is applied to the color difference components of the pixels located in the vicinity of the block boundary, and

the filtering unit applies one of the weak filter and the strong filter to the color difference components of the pixels located in the vicinity of the block boundary in accordance with the filter strength determined by the determination unit.

15. The image processing apparatus according to claim 14, wherein the determination unit determines the filter strength after determination on the deblocking filter application necessity.

16. The image processing apparatus according to claim 15, wherein the determination unit determines the filter strength based on waveforms of the color difference components of the pixels located in the vicinity of the block boundary.

17. The image processing apparatus according to claim 16, wherein

the determination unit determines the filter strength based on a condition on flatness of color difference components of pixels included in two lines among the pixels located in the vicinity of the block boundary, a condition on continuity of the color difference components, and a condition on a gap between the color difference components, and

the filtering unit applies the strong filter if it is

determined all of the condition on the flatness, the condition on the continuity, and the condition on the gap are met, and applies the weak filter if it is determined at least one of the conditions is not met.

18. An image processing method comprising:

generating a decoded image by decoding a coded stream;

adopting a block boundary of the decoded image as a target;

independently determining deblocking filter application necessity for each of U and V color difference components with respect to:

color difference components of the decoded image based on boundary strength that is calculated using a transform coefficient of the U color difference component and a transform coefficient of the V color difference component; and

applying a deblocking filter to color difference components of pixels located in a vicinity of the block boundary based on a determination result of the deblocking filter application necessity.

19. An image processing apparatus comprising:

a determination unit configured to adopt, as a target, a block boundary of a decoded image that is locally decoded, and independently determine deblocking filter application necessity for each of U and V color difference components with respect to:

color difference components of the decoded image based on boundary strength that is calculated using a transform coefficient of the U color difference component and a transform

coefficient of the V color difference component;

a filtering unit configured to apply a deblocking filter to color difference components of pixels located in a vicinity of the block boundary based on a determination result of the deblocking filter application necessity; and

a coding unit configured to encode an image using the decoded image to which the deblocking filter is applied by the filtering unit.

20. An image processing method comprising:

adopting, as a target, a block boundary of a decoded image that is locally decoded;

independently determining deblocking filter application necessity for each of U and V color difference components with respect to:

color difference components of the decoded image based on boundary strength that is calculated using a transform coefficient of the U color difference component and a transform coefficient of the V color difference component;

applying a deblocking filter to color difference components of pixels located in a vicinity of the block boundary based on a determination result of the deblocking filter application necessity; and

coding an image using the decoded image to which the deblocking filter is applied.