CLAIMS

1. A deblocking method for deblocking a chroma block edge between a first chroma block of a first image block and a second chroma block of a second image block in an image encoding or an image decoding, comprising:

performing a decision process for the chroma block edge; and

performing a filtering process for the chroma block edge at least based on a threshold parameter (t_C);

wherein the decision process comprises:

determining a first chroma quantization parameter (Qp_{Cp}) for the first chroma block, wherein the first chroma quantization parameter (Qp_{Cp}) is determined based on a first luma quantization parameter (Qp_{YP}) of a first luma block of the first image block and a chroma quantization parameter (QP) mapping table for the first chroma block, wherein the chroma QP mapping table for the first chroma block is a first chroma QP mapping table for a Joint Cb-Cr residual, JCCR, coded block when the first chroma block is the JCCR coded block of the first image block, or the chroma QP mapping table for the first chroma block is a second chroma QP mapping table for a first chroma component (Cb) when the first chroma block is the first chroma component (Cb) of the first image block, or the chroma QP mapping table for the first chroma block is a third chroma QP mapping table for a second chroma component (Cr) when the first chroma block is the second chroma component (Cr) of the first image block;

determining a second chroma quantization parameter (Qp_{Cq}) for the second chroma block, wherein the second chroma quantization parameter (Qp_{Cq}) is determined based on a second luma quantization parameter (Qp_{YQ}) of a second luma block of the second image block and a chroma QP mapping table for the second chroma block, wherein the chroma QP mapping table for the second chroma block is a first chroma QP mapping table for a Joint Cb-Cr residual, JCCR, coded block when the second chroma block is the JCCR coded block of the second image block, or the chroma QP mapping table for the second chroma block is a second chroma QP mapping table for a first chroma component (Cb) when the second chroma block is the first chroma component (Cb) of the second image block, or the chroma QP mapping table for the second chroma block is a third chroma QP mapping table for a second chroma component (Cr) when the second chroma block is the second chroma component (Cr) of the second image block;

determining a third averaged chroma quantization parameter (Qp_C) based on the first chroma quantization parameter (Qp_{Cp}) for the first chroma block and the second chroma quantization parameter (Qp_{Cq}) for the second chroma block; and

determining the threshold parameter (t_C) based on the third averaged chroma quantization parameter (Qp_C);

wherein the determining the threshold parameter (t_C) based on the third averaged chroma quantization parameter (Qp_C) comprises: determining a value of a second threshold variable (t_C') based on the third averaged chroma quantization parameter (Qp_C) using a mapping table; and deriving a value of the threshold (t_C) based on the value of the second threshold variable (t_C'); and

wherein at least one of the first chroma block and the second chroma block is a Joint Cb-Cr residual (JCCR) coded block; and the determining the third averaged chroma quantization parameter (Qp_C) based on the first chroma quantization parameter (Qp_{Cp}) for the first chroma block and the second chroma quantization parameter (Qp_{Cq}) for the second chroma block, comprises:

determining the third averaged chroma quantization parameter (Qp_C) according to the following equation:

$Qp_C = (Qp_Q + Qp_P + 1) >> 1$, wherein Qp_P is based on the first chroma quantization parameter (Qp_{Cp}) for the first chroma block and Qp_Q is based on the second chroma quantization parameter (Qp_{Cq}) for the second chroma block.

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2. The deblocking method of claim 1,

wherein the first chroma block is a Joint Cb-Cr residual (JCCR) coded block of the first image block, and the second chroma block is a Joint Cb-Cr residual (JCCR) coded block of the second image block;

wherein the first chroma blockis a Joint Cb-Cr residual (JCCR) coded block of the first image block, and the second chroma block is a first chroma component of the second image block;

wherein the first chroma block is a Joint Cb-Cr residual (JCCR) coded block of the first image block, and the second chroma block is a second chroma component of the second image block;

wherein the first chroma block is a first chroma component of the first image block, and the second chroma block is a Joint Cb-Cr residual (JCCR) coded block of the second image block;

wherein the first chroma block is a second chroma component of the first image block, and the second chroma block is a Joint Cb-Cr residual (JCCR) coded block of the second image block;

wherein the first chroma block is a first chroma component of the first image block, and the second chroma block is a first chroma component of the second image block; or

wherein the first chroma block is a second chroma component of the first image block, and the second chroma block is a second chroma component of the second image block.

3. The deblocking method of claim 1,

wherein the first chroma QP mapping table, the second chroma QP mapping table and the third chroma QP mapping table are indicated or indexed by a first index value, a second index value and a third index value, respectively.

4. The deblocking method of claim 3,

wherein the first index value is 3, the second index value is 1 and the third index is 2; or

wherein the first index value is 2, the second index value is 0 and the third index is 1.

5. The deblocking method of any one of the claims 1 to 4, wherein

if the first chroma block is a Joint Cb-Cr residual (JCCR) coded block of the first image block, the first chroma quantization parameter (Qp_{Cp}) is derived based on a chroma QP value that corresponds to a clipped value of the first luma quantization parameter (Qp_{YP}) in the first chroma QP mapping table;

if the first chroma block is a first chroma component of the first image block, the first chroma quantization parameter (Qp_{Cp}) is derived based on a chroma QP value that corresponds to a clipped value of the first luma quantization parameter (Qp_{YP}) in the second chroma QP mapping table; or

if the first chroma block is a second chroma component of the first image block, the first chroma quantization parameter (Qp_{Cp}) is derived based on a chroma QP value that

corresponds to a clipped value of the first luma quantization parameter (Qp_{YP}) in the third chroma QP mapping table.

6. The deblocking method of any one of the claims 1 to 4, wherein

if the second chroma block is a Joint Cb-Cr residual (JCCR) coded block of the second image block, the second chroma quantization parameter (Qp_{Cq}) is derived based on a chroma QP value that corresponds to a clipped value of the second luma quantization parameter (Qp_{YQ}) in the first chroma QP mapping table;

if the second chroma block is a first chroma component of the second image block, the second chroma quantization parameter (Qp_{Cq}) is derived based on a chroma QP value that corresponds to a clipped value of the second luma quantization parameter (Qp_{YQ}) in the second chroma QP mapping table; or

if the second chroma block is a second chroma component of the second image block, the second chroma quantization parameter (Qp_{Cq}) is derived based on a chroma QP value that corresponds to a clipped value of the second luma quantization parameter (Qp_{YQ}) in the third chroma QP mapping table.

7. The deblocking method of any one of the claims 1 to 4, wherein the determining a first chroma quantization parameter (Qp_{Cp}) for the first chroma block based on a first luma quantization parameter (Qp_{YP}) of a first luma block of the first image block and a chroma quantization parameter (QP) mapping table for the first chroma block comprises:

obtaining a clipped QP value (qPi_{Chroma}) based on the first luma quantization parameter (Qp_{YP}) of the first luma block;

determining a chroma QP value (qPi_{Cb}, qPi_{Cr}, qPi_{CbCr}) for the first chroma block based on the clipped QP value (qPi_{Chroma}) by using the chroma QP mapping table for the first chroma block; and

determining the first chroma quantization parameter (Qp_{Cp}) for the first chroma block based on a clipped value of the chroma QP value (qPi_{Cb}, qPi_{Cr}, qPi_{CbCr}).

8. The deblocking method of any one of the claims 1 to 4, wherein the determining a second chroma quantization parameter (Qp_{Cq}) for the second chroma block based on a

second luma quantization parameter (Qp_{YQ}) of a second luma block of the second image block and the chroma QP mapping table for the second chroma block comprises:

obtaining a clipped QP value (qPi_{Chroma}) based on the second luma quantization parameter (Qp_{YQ}) of the second luma block;

determining a chroma QP value (qPi_{Cb}, qPi_{Cr}, qPi_{CbCr}) for the second chroma block based on the clipped QP value (qPi_{Chroma}) by using the chroma QP mapping table for the second chroma block; and

determining the second chroma quantization parameter (Qp_{Cq}) for the second chroma block based on a clipped value of the chroma QP value (qPi_{Cb}, qPi_{Cr}, qPi_{CbCr}).

9. The deblocking method of any one of the preceding claims,

wherein Qp_P is obtained by subtracting an offset value (QpBdOffset) from the first chroma quantization parameter (Qp_{Cp}) for the first chroma block; and

wherein Qp_Q is obtained by subtracting the offset value (QpBdOffset) from the second chroma quantization parameter (Qp_{Cq}) for the second chroma block.

10. The deblocking method of any one of the preceding claims, wherein the first image block and the second image block are transform blocks or the first image block and the second image block are coding blocks.

11. A deblocking filter apparatus for use in an image encoder or an image decoder, for deblocking a chroma block edge between a first chroma block of a first image block and a second chroma block of a second image block,

wherein the deblocking filter apparatus is configured to:

perform a decision process for the chroma block edge, and

perform a filtering process for the chroma block edge at least based on a threshold parameter (t_C);

wherein the decision process comprises:

determining a first chroma quantization parameter (Qp_{Cp}) for the first chroma block, wherein the first chroma quantization parameter (Qp_{Cp}) is determined based on a first luma quantization parameter (Qp_{YP}) of a first luma block of the first image block and a chroma quantization parameter (QP) mapping table for the first chroma

block, wherein the chroma QP mapping table for the first chroma block is a first chroma QP mapping table for a Joint Cb-Cr residual, JCCR, coded block when the first chroma block is the JCCR coded block of the first image block, or the chroma QP mapping table for the first chroma block is a second chroma QP mapping table for a first chroma component (Cb) when the first chroma block is the first chroma component (Cb) of the first image block, or the chroma QP mapping table for the first chroma block is a third chroma QP mapping table for a second chroma component (Cr) when the first chroma block is the second chroma component (Cr) of the first image block;

determining a second chroma quantization parameter (Qp_{Cq}) for the second chroma block, the second chroma quantization parameter (Qp_{Cq}) is determined based on a second luma quantization parameter (Qp_{YQ}) of a second luma block of the second image block and a chroma QP mapping table for the second chroma block, wherein the chroma QP mapping table for the second chroma block is a first chroma QP mapping table for a Joint Cb-Cr residual, JCCR, coded block when the second chroma block is the JCCR coded block of the second image block, or the chroma QP mapping table for the second chroma block is a second chroma QP mapping table for a first chroma component(Cb) when the second chroma block is the first chroma component (Cb) of the second image block, or the chroma QP mapping table for the second chroma block is a third chroma QP mapping table for a second chroma component (Cr) when the second chroma block is the second chroma component (Cr) of the second image block;

determining a third averaged chroma quantization parameter (Qp_C) based on the first chroma quantization parameter (Qp_{Cp}) for the first chroma block and the second chroma quantization parameter (Qp_{Cq}) for the second chroma block; and

determining the threshold parameter (t_C) based on the third averaged chroma quantization parameter (Qp_C);

wherein the determining the threshold parameter (t_C) based on the third averaged chroma quantization parameter (Qp_C) comprises: determining a value of a second threshold variable (t_C') based on the third averaged chroma quantization parameter (Qp_C) using a mapping table; and deriving a value of the threshold (t_C) based on the value of the second threshold variable (t_C'); and

wherein at least one of the first chroma block and the second chroma block is a Joint Cb-Cr residual (JCCR) coded block; and the determining the third

averaged chroma quantization parameter (Qp_C) based on the first chroma quantization parameter (Qp_{Cp}) for the first chroma block and the second chroma quantization parameter (Qp_{Cq}) for the second chroma block, comprises:

determining the third averaged chroma quantization parameter (Qp_C) according to the following equation:

$Qp_C = (Qp_Q + Qp_P + 1) >> 1$, wherein Qp_P is based on the first chroma quantization parameter (Qp_{Cp}) for the first chroma block and Qp_Q is based on the second chroma quantization parameter (Qp_{Cq}) for the second chroma block.

12. The apparatus of claim 11,

wherein the first chroma block is a Joint Cb-Cr residual (JCCR) coded block of the first image block, and the second chroma block is a Joint Cb-Cr residual (JCCR) coded block of the second image block;

wherein the first chroma block is a Joint Cb-Cr residual (JCCR) coded block of the first image block, and the second chroma block is a first chroma component of the second image block;

wherein the first chroma block is a Joint Cb-Cr residual (JCCR) coded block of the first image block, and the second chroma block is a second chroma component of the second image block;

wherein the first chroma block is a first chroma component of the first image block, and the second chroma block is a Joint Cb-Cr residual (JCCR) coded block of the second image block;

wherein the first chroma block is a second chroma component of the first image block, and the second chroma block is a Joint Cb-Cr residual (JCCR) coded block of the second image block;

wherein the first chroma block is a first chroma component of the first image block, and the second chroma block is a first chroma component of the second image block; or

wherein the first chroma block is a second chroma component of the first image block, and the second chroma block is a second chroma component of the second image block.

13. The apparatus of claim 11,

wherein the first chroma QP mapping table, the second chroma QP mapping table and the third chroma QP mapping table are indicated or indexed by a first index value, a second index value and a third index value, respectively.

14. The apparatus of claim 13,

wherein the first index value is 3, the second index value is 1 and the third index is 2; or

wherein the first index value is 2, the second index value is 0 and the third index is 1.

15. The apparatus of any one of the claims 11 to 14, wherein

if the first chroma block is a Joint Cb-Cr residual (JCCR) coded block of the first image block, the first chroma quantization parameter (Qp_{Cp}) is derived based on a chroma QP value that corresponds to a clipped value of the first luma quantization parameter (Qp_{YP}) in the first chroma QP mapping table;

if the first chroma block is a first chroma component of the first image block, the first chroma quantization parameter (Qp_{Cp}) is derived based on a chroma QP value that corresponds to a clipped value of the first luma quantization parameter (Qp_{YP}) in the second chroma QP mapping table; or

if the first chroma block is a second chroma component of the first image block, the first chroma quantization parameter (Qp_{Cp}) is derived based on a chroma QP value that corresponds to a clipped value of the first luma quantization parameter (Qp_{YP}) in the third chroma QP mapping table.

16. The apparatus of any one of the claims 11 to 14, wherein

if the second chroma block is a Joint Cb-Cr residual (JCCR) coded block of the second image block, the second chroma quantization parameter (Qp_{Cq}) is derived based on a chroma QP value that corresponds to a clipped value of the second luma quantization parameter (Qp_{YQ}) in the first chroma QP mapping table;

if the second chroma block is a first chroma component of the second image block, the second chroma quantization parameter (Qp_{Cq}) is derived based on a chroma QP value that corresponds to a clipped value of the second luma quantization parameter (Qp_{YQ}) in the second chroma QP mapping table; or

if the second chroma block is a second chroma component of the second image block, the second chroma quantization parameter (Qp_{Cq}) is derived based on a chroma QP value that corresponds to a clipped value of the second luma quantization parameter (Qp_{YQ}) in the third chroma QP mapping table.

17. The apparatus of any one of the claims 11 to 14, wherein the determining a first chroma quantization parameter (Qp_{Cp}) for the first chroma block based on a first luma quantization parameter (Qp_{YP}) of a first luma block of the first image block and a chroma quantization parameter (QP) mapping table for the first chroma block, comprises:

obtaining a clipped QP value (qPi_{Chroma}) based on the first luma quantization parameter (Qp_{YP}) of the first luma block;

determining a chroma QP value (qPi_{Cb}, qPi_{Cr}, qPi_{CbCr}) for the first chroma block based on the clipped QP value (qPi_{Chroma}) by using the chroma QP mapping table for the first chroma block; and

determining the first chroma quantization parameter (Qp_{Cp}) for the first chroma block based on a clipped value of the chroma QP value (qPi_{Cb}, qPi_{Cr}, qPi_{CbCr}).

18. The apparatus of any one of the claims 11 to 14, wherein the determining a second chroma quantization parameter (Qp_{Cq}) for the second chroma block based on a second luma quantization parameter (Qp_{YQ}) of a second luma block of the second image block and the chroma QP mapping table for the second chroma block, comprises:

obtaining a clipped QP value (qPi_{Chroma}) based on the second luma quantization parameter (Qp_{YQ}) of the second luma block;

determining a chroma QP value (qPi_{Cb}, qPi_{Cr}, qPi_{CbCr}) for the second chroma block based on the clipped QP value (qPi_{Chroma}) by using the chroma QP mapping table for the second chroma block; and

determining the second chroma quantization parameter (Qp_{Cq}) for the second chroma block based on a clipped value of the chroma QP value (qPi_{Cb}, qPi_{Cr}, qPi_{CbCr}).

19. The apparatus of any one of the preceding claims,

wherein Qp_P is obtained by subtracting an offset value (QpBdOffset) from the first chroma quantization parameter (Qp_{Cp}) for the first chroma block; and

wherein Qp_Q is obtained by subtracting the offset value (QpBdOffset) from the second chroma quantization parameter (Qp_{Cq}) for the second chroma block.

20. The apparatus of any one of the preceding claims, wherein the first image block and the second image block are transform blocks or the first image block and the second image block are coding blocks.

21. A device, comprising a deblocking filter apparatus of any of the claims 1 to 10.

22. A device, comprising:

one or more processors; and

a non-transitory computer-readable storage medium coupled to the processors and storing programming for execution by the processors, wherein the programming, when executed by the processors, configures the device to carry out the method according to any one of claims 1 to 10.

23. A computer program product with program instructions for performing the method according to any of the claims 1 to 10 when the program instructions runs on a computer.

24. A non-transitory computer-readable media storing computer instructions that when executed by one or more processors, cause the one or more processors to perform the method according to any of the claims 1 to 10.