

CLAIMS

1. A deblocking method, for deblocking a chroma block edge (903, 913, 923, 933, 943, 953, 963, 973) between a first chroma block (901, 911, 921, 931, 941, 951, 961, 971) of a first image block (601, 601') and a second chroma block (902, 912, 922, 932, 942, 952, 962, 972) of a second image block (602, 602'), in an image encoding and/or an image decoding, wherein the deblocking method comprises:
- performing a decision process for the chroma block edge, wherein the decision process comprises:
 - determining a first chroma quantization parameter ($Q_{p_{Cp}}$) for the first chroma block (901, 911, 921, 931, 941, 951, 961, 971) based on a first luma quantization parameter ($Q_{p_{Yp}}$) of a first luma block (801) of the first image block (601, 601') and a chroma quantization parameter (QP) mapping table for the first chroma block;
 - determining a second chroma quantization parameter ($Q_{p_{Cq}}$) for the second chroma block (902, 912, 922, 932, 942, 952, 962, 972) based on a second luma quantization parameter ($Q_{p_{Yq}}$) of a second luma block (802) of the second image block (602, 602') and a chroma QP mapping table for the second chroma block;
 - determining a third chroma quantization parameter (Q_{p_c}) based on the first chroma quantization parameter ($Q_{p_{Cp}}$) for the first chroma block (901, 911, 921, 931, 941, 951, 961, 971) and the second chroma quantization parameter ($Q_{p_{Cq}}$) for the second chroma block (902, 912, 922, 932, 942, 952, 962, 972); and
 - determining a threshold parameter (t_c) based on the third chroma quantization parameter (Q_{p_c});
 - performing a filtering process for the chroma block edge (903, 913, 923) at least based on the threshold parameter.
2. The deblocking method of claim 1, wherein at least one of the first chroma block (901, 911, 921, 931, 941, 951, 961, 971) and the second chroma block (902, 912, 922, 932, 942, 952, 962, 972) is a Joint Cb-Cr residual (JCCR) coded block.
3. The deblocking method of claim 1, wherein the first chroma block (901, 911, 921, 931, 941, 951, 961, 971) is a Joint Cb-Cr (JCCR) coded block of the first image block (601, 601'), and the second chroma block is a Joint Cb-Cr (JCCR) coded block of the second image block (602, 602');

wherein the first chroma block (901, 911, 921, 931, 941, 951, 961, 971) is a Joint Cb-Cr (JCCR) coded block of the first image block (601, 601'), and the second chroma block is a first chroma component of the second image block (602, 602');

wherein the first chroma block (901, 911, 921, 931, 941, 951, 961, 971) is a Joint Cb-Cr (JCCR) coded block of the first image block (601, 601'), and the second chroma block is a second chroma component of the second image block (602, 602');

wherein the first chroma block (901, 911, 921, 931, 941, 951, 961, 971) is a first chroma component of the first image block (601, 601'), and the second chroma block is a Joint Cb-Cr (JCCR) coded block of the second image block (602, 602');

wherein the first chroma block (901, 911, 921, 931, 941, 951, 961, 971) is a second chroma component of the first image block (601, 601'), and the second chroma block is a Joint Cb-Cr (JCCR) coded block of the second image block (602, 602');

wherein the first chroma block (901, 911, 921, 931, 941, 951, 961, 971) is a first chroma component of the first image block (601, 601'), and the second chroma block is a first chroma component of the second image block; or

wherein the first chroma block (901, 911, 921, 931, 941, 951, 961, 971) is a second chroma component of the first image block (601, 601'), and the second chroma block is a second chroma component of the second image block.

4. The deblocking method of any one of the claims 1 to 3, wherein the chroma quantization parameter (QP) mapping table for the first chroma block or the second chroma block comprises at least one of:

a first chroma QP mapping table for a joint Cb-Cr coded block.

a second chroma QP mapping table for a first chroma component, or

a third chroma QP mapping table for a second chroma component.

5. The deblocking method of claim 4,

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.

6. The deblocking method of claim 5,

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.

7. The deblocking method of any one of the claims 4 to 6, wherein
if the first chroma block (901, 911, 921, 931, 941, 951, 961, 971) is a Joint Cb-Cr (JCCR)
coded block of the first image block (601, 601'), the first chroma quantization parameter ($Q_{p_{Cp}}$)
5 is derived based on a chroma QP value that corresponds to a clipped value of the first luma
quantization parameter ($Q_{p_{Yp}}$) in the first chroma QP mapping table;
if the first chroma block (901, 911, 921, 931, 941, 951, 961, 971) is a first chroma component
of the first image block (601, 601'), the first chroma quantization parameter ($Q_{p_{Cp}}$) is derived
based on a chroma QP value that corresponds to a clipped value of the first luma quantization
10 parameter ($Q_{p_{Yp}}$) in the second chroma QP mapping table; or
if the first chroma block (901, 911, 921, 931, 941, 951, 961, 971) is a second chroma component
of the first image block (601, 601'), the first chroma quantization parameter ($Q_{p_{Cp}}$) is derived
based on a chroma QP value that corresponds to a clipped value of the first luma quantization
parameter ($Q_{p_{Yp}}$) in the third chroma QP mapping table.
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8. The deblocking method of any one of the claims 4 to 6, wherein
if the second chroma block (902, 912, 922, 932, 942, 952, 962, 972) is a Joint Cb-Cr (JCCR)
coded block of the second image block (602, 602'), the second chroma quantization parameter
($Q_{p_{Cq}}$) is derived based on a chroma QP value that corresponds to a clipped value of the second
20 luma quantization parameter ($Q_{p_{Yq}}$) in the first chroma QP mapping table;
if the second chroma block (902, 912, 922, 932, 942, 952, 962, 972) is a first chroma component
of the second image block (602, 602'), the second chroma quantization parameter ($Q_{p_{Cq}}$) is
derived based on a chroma QP value that corresponds to a clipped value of the second luma
quantization parameter ($Q_{p_{Yq}}$) in the second chroma QP mapping table; or
25 if the second chroma block (902, 912, 922, 932, 942, 952, 962, 972) is a second chroma
component of the second image block (602, 602'), the second chroma quantization parameter
($Q_{p_{Cq}}$) is derived based on a chroma QP value that corresponds to a clipped value of the second
luma quantization parameter ($Q_{p_{Yq}}$) in the third chroma QP mapping table.
- 30 9. The deblocking method of any one of the claims 1 to 6, wherein the determining a first
chroma quantization parameter ($Q_{p_{Cp}}$) for the first chroma block (901, 911, 921, 931, 941, 951,
961, 971) based on a first luma quantization parameter ($Q_{p_{Yp}}$) of a first luma block (801) of
the first image block (601, 601') and the chroma 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 (801);
- determining a chroma QP value (qPi_{Cb} , qPi_{Cr} , qPi_{CbCr}) for the first chroma block (901, 911, 921, 931, 941, 951, 961, 971) based on the clipped QP value (qPi_{Chroma}) by using the chroma QP mapping table for the first chroma block; and
- 5 determining the first chroma quantization parameter (Qp_{Cp}) for the first chroma block (901, 911, 921, 931, 941, 951, 961, 971) based on a clipped value of the chroma QP value (qPi_{Cb} , qPi_{Cr} , qPi_{CbCr}).
- 10 10. The deblocking method of any one of the claims 1 to 6, wherein the determining a second chroma quantization parameter (Qp_{Cq}) for the second chroma block (902, 912, 922, 932, 942, 952, 962, 972) based on a second luma quantization parameter (Qp_{YQ}) of a second luma block (802) of the second image block (602, 602') and the chroma QP mapping table for the second chroma block, comprises:
- 15 obtaining a clipped QP value (qPi_{Chroma}) based on the second luma quantization parameter (Qp_{YQ}) of the second luma block (802);
- determining a chroma QP value (qPi_{Cb} , qPi_{Cr} , qPi_{CbCr}) for the second chroma block (902, 912, 922, 932, 942, 952, 962, 972) based on the clipped QP value (qPi_{Chroma}) by using the chroma QP mapping table for the second chroma block; and
- 20 determining the second chroma quantization parameter (Qp_{Cq}) for the second chroma block (902, 912, 922, 932, 942, 952, 962, 972) based on a clipped value of the chroma QP value (qPi_{Cb} , qPi_{Cr} , qPi_{CbCr}).
11. The deblocking method of any one of the claims 1 to 6, wherein determining the third chroma quantization parameter (Qp_C) based on the first chroma quantization parameter (Qp_{Cp}) for the first chroma block (901, 911, 921, 931, 941, 951, 961, 971) and the second chroma quantization parameter (Qp_{Cq}) for the second chroma block (902, 912, 922, 932, 942, 952, 962, 972), comprises:
- 25 determining the third chroma quantization parameter (Qp_C) according to the following equation,
- 30
$$Qp_C = (Qp_Q + Qp_P + 1) \gg 1$$
- wherein Qp_P is based on the first chroma quantization parameter (Qp_{Cp}) for the first chroma block (901, 911, 921, 931, 941, 951, 961, 971) and Qp_Q is based on the second chroma quantization parameter (Qp_{Cq}) for the second chroma block (902, 912, 922, 932, 942, 952, 962, 972).

12. The deblocking method of claim 11,
wherein Q_{pP} is obtained by subtracting an offset value ($Q_{pBdOffset}$) from the first chroma
quantization parameter (Q_{pCp}) for the first chroma block (901, 911, 921, 931, 941, 951, 961,
5 971); and
wherein Q_{pQ} is obtained by subtracting the offset value ($Q_{pBdOffset}$) from the second chroma
quantization parameter (Q_{pCq}) for the second chroma block (902, 912, 922, 932, 942, 952, 962,
972).
- 10 13. The deblocking method of any one of the preceding claims,
wherein the joint Cb-Cr coded block is coded using a JCCR mode and the JCCR mode is a
second mode of a set of available JCCR modes.
14. The deblocking method of any one of the preceding claims, wherein the first image block
15 and the second image block are transform blocks;
or
the first image block and the second image block are coding blocks.
15. A deblocking filter apparatus (220, 320, 1000) for use in an image encoder (20,400,500)
20 and/or an image decoder (30, 400,500), for deblocking a chroma block edge (903, 913, 923)
between a first chroma block (901, 911, 921, 931, 941, 951, 961, 971) of a first image block
(601, 601') and a second chroma block (902, 912, 922, 932, 942, 952, 962, 972) of a second
image block (602, 602'),
wherein the deblocking filter apparatus is configured to:
- 25 - perform a decision process for the chroma block edge, wherein the decision process
comprises:
- determining a first chroma quantization parameter (Q_{pCp}) for the first chroma block
(901, 911, 921, 931, 941, 951, 961, 971) based on a first luma quantization
parameter (Q_{pYP}) of a first luma block (801) of the first image block (601, 601')
30 and a chroma quantization parameter (QP) mapping table for the first chroma block;
 - determining a second chroma quantization parameter (Q_{pCq}) for the second chroma
block (902, 912, 922, 932, 942, 952, 962, 972) based on a second luma quantization
parameter (Q_{pYQ}) of a second luma block (802) of the second image block (602,
602') and a chroma QP mapping table for the second chroma block;

- determining a third chroma quantization parameter (Q_{pc}) based on the first chroma quantization parameter (Q_{pcp}) for the first chroma block (901, 911, 921, 931, 941, 951, 961, 971) and the second chroma quantization parameter (Q_{pcq}) for the second chroma block (902, 912, 922, 932, 942, 952, 962, 972); and
 - 5 - determining a threshold parameter (t_c) based on the third chroma quantization parameter (Q_{pc});
 - perform a filtering process for the chroma block edge (903, 913, 923) at least based on the threshold parameter.
- 10 16. The deblocking filter apparatus of claim 15, wherein at least one of the first chroma block (901, 911, 921, 931, 941, 951, 961, 971) and the second chroma block (902, 912, 922, 932, 942, 952, 962, 972) is a Joint Cb-Cr residual (JCCR) coded block.
17. The deblocking filter apparatus of claim 15,
- 15 wherein the first chroma block (901, 911, 921, 931, 941, 951, 961, 971) is a Joint Cb-Cr (JCCR) coded block of the first image block (601, 601'), and the second chroma block is a Joint Cb-Cr (JCCR) coded block of the second image block (602, 602');
- wherein the first chroma block (901, 911, 921, 931, 941, 951, 961, 971) is a Joint Cb-Cr (JCCR) coded block of the first image block (601, 601'), and the second chroma block is a first chroma
- 20 component of the second image block (602, 602');
- wherein the first chroma block (901, 911, 921, 931, 941, 951, 961, 971) is a Joint Cb-Cr (JCCR) coded block of the first image block (601, 601'), and the second chroma block is a second chroma component of the second image block (602, 602');
- wherein the first chroma block (901, 911, 921, 931, 941, 951, 961, 971) is a first chroma
- 25 component of the first image block (601, 601'), and the second chroma block is a Joint Cb-Cr (JCCR) coded block of the second image block (602, 602');
- wherein the first chroma block (901, 911, 921, 931, 941, 951, 961, 971) is a second chroma component of the first image block (601, 601'), and the second chroma block is a Joint Cb-Cr (JCCR) coded block of the second image block (602, 602');
- 30 wherein the first chroma block (901, 911, 921, 931, 941, 951, 961, 971) is a first chroma component of the first image block (601, 601'), and the second chroma block is a first chroma component of the second image block; or

wherein the first chroma block (901, 911, 921, 931, 941, 951, 961, 971) is a second chroma component of the first image block (601, 601'), and the second chroma block is a second chroma component of the second image block.

5 18. The deblocking filter apparatus of any one of the claims 15 to 17, wherein the chroma quantization parameter (QP) mapping table for the first chroma block or the second chroma block comprises at least one of:

a first chroma QP mapping table for a joint Cb-Cr coded block.

a second chroma QP mapping table for a first chroma component, or

10 a third chroma QP mapping table for a second chroma component.

19. The deblocking filter apparatus of claim 18,

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

15 and a third index value, respectively.

20. The deblocking filter apparatus of claim 19,

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.

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21. The deblocking filter apparatus of any one of the claims 18 to 20, wherein

if the first chroma block (901, 911, 921, 931, 941, 951, 961, 971) is a Joint Cb-Cr (JCCR) coded block of the first image block (601, 601'), the first chroma quantization parameter ($Q_{p_{cp}}$) is derived based on a chroma QP value that corresponds to a clipped value of the first luma quantization parameter ($Q_{p_{yp}}$) in the first chroma QP mapping table;

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if the first chroma block (901, 911, 921, 931, 941, 951, 961, 971) is a first chroma component of the first image block (601, 601'), the first chroma quantization parameter ($Q_{p_{cp}}$) is derived based on a chroma QP value that corresponds to a clipped value of the first luma quantization parameter ($Q_{p_{yp}}$) in the second chroma QP mapping table; or

30 if the first chroma block (901, 911, 921, 931, 941, 951, 961, 971) is a second chroma component of the first image block (601, 601'), the first chroma quantization parameter ($Q_{p_{cp}}$) is derived based on a chroma QP value that corresponds to a clipped value of the first luma quantization parameter ($Q_{p_{yp}}$) in the third chroma QP mapping table.

22. The deblocking filter apparatus of any one of the claims 18 to 20, wherein
 if the second chroma block (902, 912, 922, 932, 942, 952, 962, 972) is a Joint Cb-Cr (JCCR)
 coded block of the second image block (602, 602'), the second chroma quantization parameter
 (Q_{pCq}) is derived based on a chroma QP value that corresponds to a clipped value of the second
 5 luma quantization parameter (Q_{pYQ}) in the first chroma QP mapping table;
 if the second chroma block (902, 912, 922, 932, 942, 952, 962, 972) is a first chroma component
 of the second image block (602, 602'), the second chroma quantization parameter (Q_{pCq}) is
 derived based on a chroma QP value that corresponds to a clipped value of the second luma
 quantization parameter (Q_{pYQ}) in the second chroma QP mapping table; or
 10 if the second chroma block (902, 912, 922, 932, 942, 952, 962, 972) is a second chroma
 component of the second image block (602, 602'), the second chroma quantization parameter
 (Q_{pCq}) is derived based on a chroma QP value that corresponds to a clipped value of the second
 luma quantization parameter (Q_{pYQ}) in the third chroma QP mapping table.
- 15 23. The deblocking filter apparatus of any one of the claims 15 to 20, wherein the determining
 a first chroma quantization parameter (Q_{pCp}) for the first chroma block (901, 911, 921, 931,
 941, 951, 961, 971) based on a first luma quantization parameter (Q_{pYP}) of a first luma block
 (801) of the first image block (601, 601') and the chroma QP mapping table for the first
 chroma block, comprises:
 20 obtaining a clipped QP value (qPi_{Chroma}) based on the first luma quantization parameter (Q_{pYP})
 of the first luma block (801);
 determining a chroma QP value (qPi_{Cb} , qPi_{Cr} , qPi_{CbCr}) for the first chroma block (901, 911, 921,
 931, 941, 951, 961, 971) based on the clipped QP value (qPi_{Chroma}) by using the chroma QP
 mapping table for the first chroma block; and
 25 determining the first chroma quantization parameter (Q_{pCp}) for the first chroma block (901,
 911, 921, 931, 941, 951, 961, 971) based on a clipped value of the chroma QP value (qPi_{Cb} , qPi_{Cr} ,
 qPi_{CbCr}).
24. The deblocking filter apparatus of any one of the claims 15 to 20, wherein the determining
 30 a second chroma quantization parameter (Q_{pCq}) for the second chroma block (902, 912, 922,
 932, 942, 952, 962, 972) based on a second luma quantization parameter (Q_{pYQ}) of a second
 luma block (802) of the second image block (602, 602') 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 (802);
- determining a chroma QP value (qPi_{Cb} , qPi_{Cr} , qPi_{CbCr}) for the second chroma block (902, 912, 922, 932, 942, 952, 962, 972) based on the clipped QP value (qPi_{Chroma}) by using the chroma QP mapping table for the second chroma block; and
- 5 determining the second chroma quantization parameter (Qp_{Cq}) for the second chroma block (902, 912, 922, 932, 942, 952, 962, 972) based on a clipped value of the chroma QP value (qPi_{Cb} , qPi_{Cr} , qPi_{CbCr}).
- 10 25. The deblocking filter apparatus of any one of the claims 15 to 20, wherein determining the third chroma quantization parameter (Qp_C) based on the first chroma quantization parameter (Qp_{Cp}) for the first chroma block (901, 911, 921, 931, 941, 951, 961, 971) and the second chroma quantization parameter (Qp_{Cq}) for the second chroma block (902, 912, 922, 932, 942, 952, 962, 972), comprises:
- 15 determining the third chroma quantization parameter (Qp_C) according to the following equation,
- $$Qp_C = (Qp_Q + Qp_P + 1) \gg 1$$
- wherein Qp_P is based on the first chroma quantization parameter (Qp_{Cp}) for the first chroma block (901, 911, 921, 931, 941, 951, 961, 971) and Qp_Q is based on the second chroma quantization parameter (Qp_{Cq}) for the second chroma block (902, 912, 922, 932, 942, 952, 962, 972).
- 20 972).
26. The deblocking filter apparatus of claim 25,
- wherein Qp_P is obtained by subtracting an offset value ($QpBdOffset$) from the first chroma quantization parameter (Qp_{Cp}) for the first chroma block (901, 911, 921, 931, 941, 951, 961, 971); and
- 25 wherein Qp_Q is obtained by subtracting the offset value ($QpBdOffset$) from the second chroma quantization parameter (Qp_{Cq}) for the second chroma block (902, 912, 922, 932, 942, 952, 962, 972).
27. The deblocking filter apparatus of any one of the preceding claims,
- wherein the joint Cb-Cr coded block is coded using a JCCR mode and the JCCR mode is a second mode of a set of available JCCR modes.
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28. The deblocking filter 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.

5 29. A device, comprising a deblocking filter apparatus (220, 320, 1000) of any of the claims 1 to 14.

30. A device, comprising:

one or more processors; and

10 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 14.

31. A computer program product with a program code for performing the method according to any of the claims 1 to 14 when the computer program runs on a computer.

15 32. 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 14.