CLAIMS

1. An encoding device comprising:

a deriving unit configured to derive a first reference value based on fixed point precision representing roughness of a weighting factor that is used for multiplying a reference image; and

an encoding unit configured to encode a first difference value that is a difference value between the weighting factor and the first reference value and the fixed point precision,

wherein the weighting factor is included in a first range of predetermined bit precision having the first reference value at approximate center, and the first difference value is in the predetermined range.

2. The encoding device according to claim 1, wherein the predetermined range is of -2^n to $2^n -1$.

3. The encoding device according to claim 2, wherein the n is a maximum value of the fixed point precision.

4. The encoding device according to claim 1, wherein the predetermined range is of -128 to 127.

5. The encoding device according to claim 1, wherein the first reference value indicates a factor to be set if a difference of pixel value between a reference image and a target image to be encoded is less than or equal to a specific value.

6. The encoding device according to claim 1, wherein

the deriving unit is configured to further derive a second reference value that is a reference value of an offset used for correcting the pixel value by being added to the reference image, by subtracting a value obtained by multiplying a median value of a maximum pixel value by the weighting factor from the median value,

the encoding unit is configured to further encode a second difference value that is a difference value between the offset and the second reference value, and

the second difference value is included in a second range of predetermined bit precision having a predetermined second value as approximate center.

7. The encoding device according to claim 6, wherein the second range is a fixed range of the predetermined bit precision m.

8. The encoding device according to claim 7, wherein the second range is of $-2^{(m-1)}$ to $2^{(m-1)}-1$.

9. The encoding device according to claim 8, wherein the second range is of -512 to 511.

10. The encoding device according to claim 6, wherein the deriving unit is configured to perform a clipping process such that the offset is included in the second range when the offset is not included in the second range.

11. The encoding device according to claim 6, wherein the first reference value is 2 raised to the power of the fixed point precision.

12. The encoding device according to claim 1, wherein the deriving unit and the encoding unit are implemented using circuitry.

13. The encoding device according to claim 1, wherein the deriving unit and the encoding unit are implemented using a processor.

14. A decoding device comprising:

a first decoding unit configured to decode fixed point precision representing roughness of a weighting factor that is used for multiplying a reference image;

a deriving unit configured to derive a first reference value based on the fixed point precision; and

a second decoding unit configured to decode the weighting factor by adding the first reference value to a first difference value that is a difference value between the weighting factor and the first reference value,

wherein the weighting factor is included in a first range of predetermined bit precision having the first reference value at approximate center, and the first difference value is in a predetermined range.

15. The decoding device according to claim 14, wherein the first range is of -2^n to $2^n -1$.

16. The decoding device according to claim 15, wherein the n is a maximum value of the fixed point precision.

17. The decoding device according to claim 14, wherein the predetermined range is of -128 to 127.

18. The decoding device according to claim 14, wherein the first reference value indicates a factor to be set if a difference of pixel value between a reference image and a target image to be encoded is less than or equal to a specific value.

19. The decoding device according to claim 14, wherein

the deriving unit is configured to further derive a second reference value that is a reference value of an offset used for correcting the pixel value by being added to the reference image, by subtracting a value obtained by multiplying a median value of a maximum pixel value by the weighting factor from the median value,

the second decoding unit is configured to further decode the offset by adding the second reference value to a second difference value that is a difference value between the offset and the second reference value, and

the second difference value is included in a range of the predetermined bit precision having the second reference value as approximate center.

20. The decoding device according to claim 19, wherein the second range is a fixed range of the predetermined bit precision m.

21. The decoding device according to claim 20, wherein the second range is of $-2^{(m-1)}$ to $2^{(m-1)}-1$.

22. The decoding device according to claim 21, wherein the second range is of -512 to 511.

23. The decoding device according to claim 19, wherein the deriving unit is configured to perform a clipping process such that the offset is included in the second range when the offset is not included in the second range.

24. The decoding device according to claim 14, wherein the first reference value is 2 raised to the power of the fixed point precision.

25. The decoding device according to claim 14, wherein the first decoding unit, the deriving unit, and the second decoding unit are implemented using circuitry.

26. The decoding device according to claim 14, wherein the first decoding unit, the deriving unit, and the second decoding unit are implemented using a processor.

27. An encoding method comprising:

deriving a reference value based on fixed point precision representing roughness of a weighting factor that is used for multiplying a reference image; and

encoding a difference value between the weighting factor and the reference value and the fixed point

precision,

wherein the weighting factor is included in a range of predetermined bit precision having the reference value at approximate center, and the difference value is in a predetermined range.

28. A decoding method comprising:

decoding fixed point precision representing roughness of a weighting factor that is used for multiplying a reference image;

deriving a reference value based on the fixed point precision; and

decoding the weighting factor by adding the reference value to a difference value that is a difference value between the weighting factor and the reference value,

wherein the weighting factor is included in a range of predetermined bit precision having the reference value at approximate center, and the difference value is in a predetermined range.

CLAIMS

1. An encoding device~~method~~ comprising ~~the steps of~~:

a deriving unit configured to derive a first reference value ~~that is a reference value of a weighting factor~~ based on fixed point precision representing roughness of a~~the~~ weighting factor that is used for ~~making a motion-compensated prediction of a change in a pixel value by~~ multiplying a reference image ~~by the weighting factor~~; and

an encoding unit configured to encode a first difference value that is a difference value between the weighting factor and the first reference value and the fixed point precision,

wherein the weighting factor is included in a first range of predetermined bit precision having the first reference value at approximate center, and the first difference value is in the predetermined range.

2. The encoding device according to claim 1, wherein the predetermined range is of -128 to 127.

3~~2~~. The encoding device~~method~~ according to claim 1, wherein the first reference value indicates a factor to be set if a difference of pixel value between a reference image and a target image to be encoded is less than or

equal to a specific value~~is a reference value of the weighting factor when the change in the pixel value to which the weighting factor is applied is a predetermined value or less~~.

~~3. The encoding method according to claim 1, wherein the first difference value is included in a fixed range of the predetermined bit precision that does not depend on the fixed point precision.~~

~~4. The encoding method according to claim 1, further comprising the step of performing a clipping process such that the weighting factor is included in the range of the predetermined bit precision when the weighting factor is not included in the range of the predetermined bit precision.~~

~~5. The encoding method according to claim 1, wherein the weighting factor is included in the range of the predetermined bit precision having a value acquired by shifting the first reference value by a predetermined shift amount as approximate center.~~

46. The encoding device~~method~~ according to claim 1, wherein

the ~~step of~~ deriving unit is configured to~~the first reference value includes~~ further derive~~ing~~ a second reference value that is a reference value of an offset used for correcting the pixel value by being added to the reference image, by subtracting a value obtained by multiplying a median value of a maximum pixel value by the weighting factor from~~and by subtracting~~ the median value ~~from a resultant value~~,

the ~~step of~~ encoding unit is configured to~~the first difference value includes~~ further encode~~ing~~ a second difference value that is a difference value between the offset and the second reference value, and

the second difference value~~offset~~ is included in a second~~the~~ range of ~~the~~ predetermined bit precision having a predetermined~~the~~ second ~~reference~~ value as approximate center.

57. The encoding device~~method~~ according to claim 46, wherein the second range~~difference value~~ is a~~included in the~~ fixed range of the predetermined bit precision.

6~~8~~. The encoding device~~method~~ according to claim 4~~7~~, ~~further comprising~~ the deriving unit is configured to~~step of~~ perform~~ing~~ a clipping process such that the offset is included in the first range ~~of the predetermined bit precision~~ when the offset is not included in the first range ~~of the predetermined bit precision~~.

7. The encoding device according to claim 1, wherein the deriving unit derives the first reference value being 2 raised to the power of the fixed point precision.

8~~9~~. A decoding device~~method~~ comprising ~~the steps of~~:

a first decoding unit configured to decode~~deriving a first reference value that is a reference value of a weighting factor based on~~ fixed point precision representing roughness of a~~the~~ weighting factor that is used for ~~making a motion compensated prediction of a change in a pixel value by~~ multiplying a reference image ~~by the weighting factor~~;

a deriving unit configured to derive a first reference value based on the fixed point precision; and

a second decoding unit configured to decode the weighting factor by adding the first reference value to a

first difference value that is a difference value between the weighting factor and the first reference value,

wherein the weighting factor is included in a first range of predetermined bit precision having the first reference value at approximate center, and the first difference value is in a predetermined range.

9. The decoding device according to claim 8, wherein the predetermined range is of -128 to 127.

10. The decoding device~~method~~ according to claim 8~~9~~, wherein the first reference value indicates a factor to be set if a difference of pixel value between a reference image and a target image to be encoded is less than or equal to a specific value~~is a reference value of the weighting factor of a case where the change in the pixel value to which the weighting factor is applied is a predetermined value or less~~.

~~11. The decoding method according to claim 9, wherein the first difference value is included in a fixed range of the predetermined bit precision that does not depend on the fixed point precision.~~

~~12. The decoding method according to claim 9, further comprising the step of performing a clipping process such that the weighting factor is included in the range of the predetermined bit precision when the weighting factor is not included in the range of the predetermined bit precision.~~

~~13. The decoding method according to claim 9, wherein the weighting factor is included in the range of the predetermined bit precision having a value acquired by shifting the first reference value by a predetermined shift amount as approximate center.~~

11~~14~~. The decoding device~~method~~ according to claim 8~~9~~, wherein

the ~~step of~~ deriving unit is configured to~~the first reference value includes~~ further derive~~ing~~ a second reference value that is a reference value of an offset used for correcting the pixel value by being added to the reference image, by subtracting a value obtained by multiplying a median value of a maximum pixel value by the weighting factor from~~and subtracting~~ the median value ~~from a resultant value~~,

the secondstep of decoding unit is configured to furtherthe weighting factor includes decodeing the offset by adding the second reference value to a second difference value that is a difference value between the offset and the second reference value, and

the second difference valueoffset is included in athe range of the predetermined bit precision having the second reference value as approximate center.

12215. The decoding devicemethod according to claim 1114, wherein the range of the second difference value is aincluded in the fixed range of the predetermined bit precision.

13316. The decoding devicemethod according to claim 1115, whereinfurther comprising the deriving unit is configured tostep of performing a clipping process such that the offset is included in the first range of the predetermined bit precision when the offset is not included in the first range of the predetermined bit precision.

14. The decoding device according to claim 8, wherein the deriving unit derives the first reference value being 2 raised to the power of the fixed point precision.

15~~17~~. An encoding method~~device~~ comprising:

~~an encoding unit configured to~~ derivinge a reference value ~~of a weighting factor~~ based on fixed point precision representing roughness of a~~the~~ weighting factor that is used for ~~making a motion compensated prediction of a change in a pixel value by~~ multiplying a reference image ~~by the weighting factor~~; and

encoding~~es~~ a difference value between the weighting factor and the reference value and the fixed point precision,

wherein the weighting factor is included in a range of predetermined bit precision having the reference value at approximate center, and the difference value is in a predetermined range.

16~~18~~. A decoding method~~device~~ comprising:

~~a~~ decoding ~~unit configured to derive a reference value of a weighting factor based on~~ fixed point precision representing roughness of a~~the~~ weighting factor that is used for ~~making a motion compensated prediction of a change in a pixel value by~~ multiplying a reference image ~~by the weighting factor,~~;

deriving a reference value based on the fixed point precision; and

decoding the weighting factor by addings the reference value to a difference value that is a difference value between the weighting factor and the reference value, ~~and decodes the weighting factor,~~

wherein the weighting factor is included in a range of predetermined bit precision having the reference value at approximate center, and the difference value is in a predetermined range.