

VIDEO IMAGE ENCODING METHOD, VIDEO IMAGE DECODING METHOD, ENCODING DEVICE, AND DECODING DEVICE

TECHNICAL FIELD

[0002] The present invention relates to the field of video image processing, and in particular, to a video image encoding method, a video image decoding method, an encoding
10 device, and a decoding device.

BACKGROUND

[0003] In various video codecs, motion estimation/motion compensation is a key technology that affects encoding performance. In existing various video codecs, assuming that an object always holds a translation motion, and that all parts of the entire object move in
15 a same direction and at a same speed, a block-based motion compensation technique is used. However, all these methods are based on a translational motion model (Translational Motion Model), and are improvements made based on a block-based motion compensation method. In the real world, motions are diversified. Irregular motions such as an affine motion, scaling, rotation, and shearing are universal. Existence of these motions spoils motion prediction
20 effects of block-based motion compensation. Since the 1990s, video encoding experts

What is claimed is:

1. A video image decoding method comprising:
determining a motion vector group and a motion model transmission vector of a current decoding block according to a bitstream, wherein the motion vector group comprises at least one motion vector of the current decoding block, and the motion model transmission vector comprises at least four components;
determining prediction values of a first component set of a motion model initialization vector of the current decoding block according to the at least one motion vector of the motion vector group, wherein the motion model initialization vector comprises at least four components; and
determining a motion model optimization vector of the current decoding block according to the prediction values of the first component set and the motion model transmission vector, so as to decode the current decoding block according to the motion model optimization vector.
2. The method according to claim 1 further comprising:
determining a motion model quantization precision of the current decoding block;
quantizing the motion model optimization vector according to the motion model quantization precision; and
decoding the current decoding block according to a quantized motion model optimization vector.
3. The method according to claim 2, wherein determining the motion model quantization precision of the current decoding block comprises:
determining the motion model quantization precision according to a size of the current decoding block and precision information.
4. The method according to claim 3, wherein the size of the current decoding block comprises a width of the current decoding block and a height of the current decoding block, and the precision information comprises a quantization precision of the motion vector group; and
wherein determining the motion model quantization precision according to the size of the current decoding block and the precision information comprises:
determining the motion model quantization precision Q according to the following formula:
$$Q=1/(S \times P), S=\max(W, H)$$

wherein P is the quantization precision of the motion vector group, W is the width of the current decoding block, and H is the height of the current decoding block.
5. The method according to claim 2, wherein the motion model initialization vector, the motion model transmission vector, and the motion model optimization vector each comprise six components, the motion vector group comprises three motion vectors, and the three motion vectors are in a one-to-one correspondence to three pixels in the current decoding block.
6. The method according to claim 5, wherein the first component set comprises at least one component of the six components of the motion model initialization vector, and the six components a_i of the motion model initialization vector are determined according to the following formulas:

$$\begin{aligned}
a_0 &= -v_{x0} \\
a_1 &= -v_{y0} \\
a_2 &= \frac{W - (v_{x1} - v_{y0})}{W} \\
a_3 &= \frac{v_{y0} - v_{y1}}{W} \\
a_4 &= \frac{v_{x0} - v_{x2}}{H} \\
a_5 &= \frac{H - v_{y0} + v_{y2}}{H}
\end{aligned}$$

wherein $i=0, 1, 2, 3, 4, 5$, W is the width of the current decoding block, H is the height of the current decoding block, v_{xj} is an x-directional component of the motion vector v_j , v_{yj} is a y-directional component of the motion vector v_j , and $j=0, 1, 2$.

7. The method according to claim 6, wherein the first component set comprises two components of the motion model initialization vector; and

wherein determining the motion model optimization vector of the current decoding block according to the prediction values of the first component set and the motion model transmission vector comprises:

determining that the motion model optimization vector of the current decoding block is $(a_0', a_1', a_2', a_3', a_4', a_5')$, where $(\Delta a_0, \Delta a_1) = (a_0', a_1') - (\overline{a_0}, \overline{a_1})$, $(\Delta a_2, \Delta a_3, \Delta a_4, \Delta a_5) = (a_2', a_3', a_4', a_5')$, Δa_i is the motion model transmission vector, and $\overline{a_0}$ and $\overline{a_1}$ are numeric values obtained after prediction values a_0 and a_1 of the first component set are quantized.

8. The method according to claim 6, wherein the first component set comprises the six components of the motion model initialization vector; and

wherein the method further comprises:

determining that the motion model optimization vector of the current decoding block is $(a_0', a_1', a_2', a_3', a_4', a_5')$, wherein $\Delta a_i = a_i' - a_i$, Δa_i is the motion model transmission vector, a_i is the prediction value of the first component set, and $i=0, 1, 2, 3, 4, 5$.

9. The method according to claim 1, wherein determining the motion vector group and the motion model transmission vector of the current decoding block comprises:

determining a target candidate block of the current decoding block and a motion vector of the target candidate block according to the bitstream;

obtaining a picture order count of a reference frame of the current decoding block and a picture order count of a reference frame of the target candidate block; determining a first motion vector in the motion vector group according to a ratio of the picture order count of the reference frame of the current decoding block to the picture order count of the reference frame of the target candidate block, wherein a ratio of the first motion vector to the motion vector of the target candidate block is the same as the ratio of the picture order count of the reference frame of the current decoding block to the picture order count of the reference frame of the target candidate block; and

determining the motion vector group according to the first motion vector.

10. The method according to claim 1, wherein determining the motion vector group and the motion model transmission vector of the current decoding block according to the bitstream comprises:
 - determining a motion vector of a target candidate block of the current decoding block according to the bitstream;
 - determining the motion vector of the target candidate block of the current decoding block as a first motion vector in the motion vector group; determining a second motion vector in the motion vector group according to the first motion vector; and
 - determining the motion vector group according to the first motion vector and the second motion vector.
11. A decoding device for video image decoding comprising:
 - a processor, and
 - a memory coupled to the processor and storing processor-executable instructions which when executed causes the processor to implement operations including:
 - determining a motion vector group and a motion model transmission vector of a current decoding block according to a bitstream, wherein the motion vector group comprises at least one motion vector of the current decoding block, and the motion model transmission vector comprises at least four components;
 - determining prediction values of a first component set of a motion model initialization vector of the current decoding block according to the at least one motion vector of the motion vector group, wherein the motion model initialization vector comprises at least four components; and
 - determining a motion model optimization vector of the current decoding block according to the prediction values of the first component set and the motion model transmission vector, so as to decode the current decoding block according to the motion model optimization vector.
12. The decoding device according to claim 11, wherein the operations include:
 - determining a motion model quantization precision of the current decoding block;
 - quantizing the motion model optimization vector according to the motion model quantization precision; and
 - the current decoding block according to a quantized motion model optimization vector.
13. The decoding device according to claim 12, wherein the operations include:
 - determining the motion model quantization precision according to a size of the current decoding block and precision information.
14. The decoding device according to claim 13, wherein the size of the current decoding block comprises a width of the current decoding block and a height of the current decoding block, and the precision information comprises a quantization precision of the motion vector group; and
 - wherein the operations include:
 - determining the motion model quantization precision Q according to the following formula: $Q=1/(S \times P)$, $S=\max(W,H)$ wherein P is the quantization precision of the motion vector group, W is the width of the current decoding block, and H is the height of the current decoding block.

15. The decoding device according to claim 12, wherein the motion model initialization vector, the motion model transmission vector, and the motion model optimization vector each comprise six components, the motion vector group comprises three motion vectors, and the three motion vectors are in a one-to-one correspondence to three pixels in the current decoding block.

16. The decoding device according to claim 15, wherein the first component set comprises at least one component of the six components of the motion model initialization vector, and wherein the operations include:

determining the six components a_i of the motion model initialization vector according to the following formulas:

$$\begin{aligned} a_0 &= -v_{x0} \\ a_1 &= -v_{y0} \\ a_2 &= \frac{W - (v_{x1} - v_{y0})}{W} \\ a_3 &= \frac{v_{y0} - v_{y1}}{W} \\ a_4 &= \frac{v_{x0} - v_{x2}}{H} \\ a_5 &= \frac{H - v_{y0} + v_{y2}}{H} \end{aligned}$$

wherein $i=0, 1, 2, 3, 4, 5$, W is the width of the current decoding block, H is the height of the current decoding block, v_{xj} is an x-directional component of the motion vector v_j , v_{yj} is a y-directional component of the motion vector v_j , and $j=0, 1, 2$.

17. The decoding device according to claim 16, wherein the first component set comprises two components of the motion model initialization vector; and

wherein the operations include:

determining that the motion model optimization vector of the current decoding block is $(a_0', a_1', a_2', a_3', a_4', a_5')$, where $(\Delta a_0, \Delta a_1) = (a_0', a_1') - (\overline{a_0}, \overline{a_1})$, $(\Delta a_2, \Delta a_3, \Delta a_4, \Delta a_5) = (a_2', a_3', a_4', a_5')$, Δa_i is the motion model transmission vector, and $\overline{a_0}$ and $\overline{a_1}$ are numeric values obtained after prediction values a_0 and a_1 of the first component set are quantized.

18. The decoding device according to claim 16, wherein the first component set comprises the six components of the motion model initialization vector; and wherein operations include:

determining that the motion model optimization vector of the current decoding block is $(a_0', a_1', a_2', a_3', a_4', a_5')$, wherein $\Delta a_i = a_i' - a_i$, Δa_i is the motion model transmission vector, a_i is the prediction value of the first component set, and $i=0, 1, 2, 3, 4, 5$.

19. The decoding device according to claim 11, wherein the operations include:

determining a target candidate block of the current decoding block and a motion vector of the target candidate block according to the bitstream;

obtaining a picture order count of a reference frame of the current decoding block and a picture order count of a reference frame of the target candidate block;

determining a first motion vector in the motion vector group according to a ratio of the picture order count of the reference frame of the current decoding block to the picture order count of the

reference frame of the target candidate block, wherein a ratio of the first motion vector to the motion vector of the target candidate block is the same as the ratio of the picture order count of the reference frame of the current decoding block to the picture order count of the reference frame of the target candidate block; and

determining the motion vector group according to the first motion vector.

20. The decoding device according to claim 11, wherein the operations include:

determining a motion vector of a target candidate block of the current decoding block according to the bitstream;

determining the motion vector of the target candidate block of the current decoding block as a first motion vector in the motion vector group;

determining a second motion vector in the motion vector group according to the first motion vector; and

determining the motion vector group according to the first motion vector and the second motion vector.