

of the affine decoding block may not be required.

[0035] For example, in an application scenario, after the decoder side determines the affine transform model used for the current block, the decoder side obtains control points of a specific quantity (the specific quantity is the same as or different from a quantity of control points of the current block) of the affine decoding block, constructs the affine transform model by using the control points of the specific quantity of the affine decoding block, and then derives the candidate motion vector of the control point of the current block by using the affine transform model.

[0036] According to a second aspect, an embodiment of the present invention provides another motion vector prediction method. The method includes: parsing a bitstream to obtain an index value of a candidate motion vector list; constructing the candidate motion vector list, where the candidate motion vector list includes candidate motion vectors of K control points of a current block, the candidate motion vectors of the K control points of the current block are obtained based on a 2N-parameter affine transform model used for a neighboring block of the current block, the 2N-parameter affine transform model is obtained based on motion vectors of N control points of the neighboring block, N is an integer greater than or equal to 2 and less than or equal to 4, K is an integer greater than or equal to 2 and less than or equal to 4, the neighboring block is a decoded image block spatially adjacent to the current block, and the current block includes a plurality of subblocks; determining, in the candidate motion vector list, target candidate motion vectors of the K control points of the current block based on the index value; obtaining a 6-parameter affine transform model of the current block based on the target candidate motion vectors of the K control points of the current block; and obtaining a predicted motion vector of each subblock of the current block based on the 6-parameter affine transform model of the current block.

[0037] It can be learned that, in this embodiment of the present invention, the 6-parameter affine transform model can be uniformly used to predict the current block in a phase of reconstructing the current block. A larger quantity of parameters of a motion model describing affine motion of the current block indicates higher precision and higher calculation complexity. In this solution, the 6-parameter affine transform model constructed in the reconstruction phase can describe affine transform such as translation, scaling, and rotation of an image block, and achieve a good balance between model complexity and a modeling capability. Therefore, this solution can improve coding efficiency and accuracy in predicting the current block, and satisfy a user requirement.

[0038] According to the second aspect, in a possible implementation, $N=2$ and $K=3$.

[0039] Correspondingly, candidate motion vectors of ~~two~~three control points of the current block are obtained based on a 4-parameter affine transform model used for the neighboring block of the current block.

[0040] According to the second aspect, in a possible implementation, $N=3$ and $K=2$. Correspondingly, candidate motion vectors of two control points of the current block are obtained based on the 6-parameter affine

CLAIMS

1. A motion vector prediction method, wherein the method comprises:

parsing a bitstream to obtain an index value of a candidate motion vector list;

when an affine model of a current block is a $2 \times K$ -parameter affine transform model, and an affine transform model of a neighboring block of the current block is a $2 \times N$ -parameter affine transform model, obtaining, according to the $2 \times N$ -parameter affine transform model used for the neighboring block, candidate motion vectors of K control points of the current block; the $2 \times N$ -parameter affine transform model is obtained based on motion vectors of N control points of the neighboring block, N is an integer greater than or equal to 2 and less than or equal to 4, K is an integer greater than or equal to 2 and less than or equal to 4, N is not equal to K , N is less than K , the neighboring block is a decoded image block spatially adjacent to the current block, and the current block comprises a plurality of subblocks;

constructing the candidate motion vector list, wherein the candidate motion vector list comprises candidate motion vectors of K control points of a current block;

determining, in the candidate motion vector list, target candidate motion vectors of the K control points based on the index value; and

obtaining a predicted motion vector of each subblock of the current block based on the target candidate motion vectors of the K control points.

2. The method according to claim 1, wherein N is equal to 2 and K is equal to 3, and correspondingly, candidate motion vectors of three control points of the current block are obtained based on a 4-parameter affine transform model used for the neighboring block of the current block.

3. The method according to claim 2, wherein the candidate motion vectors of the three control points of the current block comprise a motion vector at a top-left sample location of the current block, a motion vector at a top-right sample location of the current block, and a motion vector at a bottom-left sample location of the current block; and

that the candidate motion vectors of the three control points of the current block are obtained based on the 4-parameter affine transform model used for the neighboring block of the current block comprise that the candidate motion vectors the three control points of the current block are calculated according to the following formulas:

$$\begin{cases} vx_0 = vx_4 + \frac{(vx_5 - vx_4)}{x_5 - x_4} \times (x_0 - x_4) - \frac{(vy_5 - vy_4)}{x_5 - x_4} \times (y_0 - y_4) \\ vy_0 = vx_4 + \frac{(vy_5 - vy_4)}{x_5 - x_4} \times (x_0 - x_4) + \frac{(vx_5 - vx_4)}{x_5 - x_4} \times (y_0 - y_4) \end{cases}$$

$$\begin{cases} vx_0 = vx_4 + \frac{(vx_5 - vx_4)}{x_5 - x_4} \times (x_0 - x_4) - \frac{(vy_5 - vy_4)}{x_5 - x_4} \times (y_0 - y_4) \\ vy_0 = vx_4 + \frac{(vy_5 - vy_4)}{x_5 - x_4} \times (x_0 - x_4) + \frac{(vx_5 - vx_4)}{x_5 - x_4} \times (y_0 - y_4) \end{cases}$$

$$\begin{cases} vx_1 = vx_4 + \frac{(vx_5 - vx_4)}{x_5 - x_4} \times (x_1 - x_4) - \frac{(vy_5 - vy_4)}{x_5 - x_4} \times (y_1 - y_4) \\ vy_1 = vx_4 + \frac{(vy_5 - vy_4)}{x_5 - x_4} \times (x_1 - x_4) + \frac{(vx_5 - vx_4)}{x_5 - x_4} \times (y_1 - y_4) \end{cases}$$

$$\begin{cases} vx_1 = vx_4 + \frac{(vx_5 - vx_4)}{x_5 - x_4} \times (x_1 - x_4) - \frac{(vy_5 - vy_4)}{x_5 - x_4} \times (y_1 - y_4) \\ vy_1 = vx_4 + \frac{(vy_5 - vy_4)}{x_5 - x_4} \times (x_1 - x_4) + \frac{(vx_5 - vx_4)}{x_5 - x_4} \times (y_1 - y_4) \end{cases}$$

$$\begin{cases} vx_2 = vx_4 + \frac{(vx_5 - vx_4)}{x_5 - x_4} \times (x_2 - x_4) - \frac{(vy_5 - vy_4)}{x_5 - x_4} \times (y_2 - y_4) \\ vy_2 = vx_4 + \frac{(vy_5 - vy_4)}{x_5 - x_4} \times (x_2 - x_4) + \frac{(vx_5 - vx_4)}{x_5 - x_4} \times (y_2 - y_4) \end{cases}$$

$$\begin{cases} vx_2 = vx_4 + \frac{(vx_5 - vx_4)}{x_5 - x_4} \times (x_2 - x_4) - \frac{(vy_5 - vy_4)}{x_5 - x_4} \times (y_2 - y_4) \\ vy_2 = vx_4 + \frac{(vy_5 - vy_4)}{x_5 - x_4} \times (x_2 - x_4) + \frac{(vx_5 - vx_4)}{x_5 - x_4} \times (y_2 - y_4) \end{cases}$$

wherein $\underline{vx_0vx_0}$ is a horizontal component of the motion vector corresponding to the top-left sample location of the current block, and $\underline{vy_0vy_0}$ is a vertical component of the motion vector corresponding to the top-left sample location of the current block; $\underline{vx_1vx_1}$ is a horizontal component of the motion vector corresponding to the top-right sample location of the current block, and $\underline{vy_1vy_1}$ is a vertical component of the motion vector corresponding to the top-right sample location of the current block; $\underline{vx_2vx_2}$ is a horizontal component of the motion vector corresponding to the bottom-left sample location of the current block, and $\underline{vy_2vy_2}$ is a vertical component of the motion vector corresponding to the bottom-left sample location of the current block; $\underline{vx_4vx_4}$ is a horizontal component of a motion vector corresponding to a top-left sample location of the neighboring block, and $\underline{vy_4vy_4}$ is a vertical component of the motion vector corresponding to the top-left sample location of the neighboring block; $\underline{vx_5vx_5}$ is a horizontal component of a motion vector corresponding to a top-right sample location of the neighboring block, and $\underline{vy_5vy_5}$ is a vertical component of the motion

vector corresponding to the top-right sample location of the neighboring block; $\underline{x_0x_0}$ is a horizontal coordinate of the top-left sample location of the current block, and $\underline{y_0y_0}$ is a vertical coordinate of the top-left sample location of the current block; $\underline{x_1x_1}$ is a horizontal coordinate of the top-right sample location of the current block, and $\underline{y_1y_1}$ is a vertical coordinate of the top-right sample location of the current block; $\underline{x_2x_2}$ is a horizontal coordinate of the bottom-left sample location of the current block, and $\underline{y_2y_2}$ is a vertical coordinate of the bottom-left sample location of the current block; $\underline{x_4x_4}$ is a horizontal coordinate of the top-left sample location of the neighboring block, and $\underline{y_4y_4}$ is a vertical coordinate of the top-left sample location of the neighboring block; and $\underline{x_5x_5}$ is a horizontal coordinate of the top-right sample location of the neighboring block.

4. The method according to claim 1, wherein N is equal to 3 and K is equal to 2, and correspondingly, candidate motion vectors of two control points of the current block are obtained based on a 6 parameter affine transform model used for the neighboring block of the current block.

5. The method according to claim 4, wherein the candidate motion vectors of the two control points of the current block comprise a motion vector at a top-left sample location of the current block and a motion vector at a top-right sample location of the current block; and that the candidate motion vectors of the two control points of the current block are obtained based on the 6 parameter affine transform model used for the neighboring block of the current block comprises that the candidate motion vectors of the two control points of the current block are calculated according to the following formulas:

$$\begin{cases} vx_0 = vx_4 + \frac{(vx_5 - vx_4)}{x_5 - x_4} \times (x_0 - x_4) + \frac{(vx_6 - vx_4)}{y_6 - y_4} \times (y_0 - y_4) \\ vy_0 = vx_4 + \frac{(vy_5 - vy_4)}{x_5 - x_4} \times (x_0 - x_4) + \frac{(vy_6 - vy_4)}{y_6 - y_4} \times (y_0 - y_4) \\ vx_1 = vx_4 + \frac{(vx_5 - vx_4)}{x_5 - x_4} \times (x_1 - x_4) + \frac{(vx_6 - vx_4)}{y_6 - y_4} \times (y_1 - y_4) \\ vy_1 = vx_4 + \frac{(vy_5 - vy_4)}{x_5 - x_4} \times (x_1 - x_4) + \frac{(vy_6 - vy_4)}{y_6 - y_4} \times (y_1 - y_4) \end{cases}$$

wherein $\underline{vx_0}$ is a horizontal component of the motion vector corresponding to the top left sample location of the current block, and $\underline{vy_0}$ is a vertical component of the motion vector corresponding to the top left sample location of the current block; $\underline{vx_1}$ is a horizontal component of the motion vector corresponding to the top-right sample location of the current block, and $\underline{vy_1}$ is a vertical component of the motion vector corresponding to the

top-right sample location of the current block; $\overline{vx_4}$ is a horizontal component of a motion vector corresponding to
 a top-left sample location of the neighboring block, and $\overline{vy_4}$ is a vertical component of the motion vector
 corresponding to the top-left sample location of the neighboring block; $\overline{vx_5}$ is a horizontal component of a motion
 vector corresponding to a top-right sample location of the neighboring block, and $\overline{vy_5}$ is a vertical component of
 the motion vector corresponding to the top-right sample location of the neighboring block; $\overline{vx_6}$ is a horizontal
 component of a motion vector corresponding to a bottom-left sample location of the neighboring block, and $\overline{vy_6}$
 is a vertical component of the motion vector corresponding to the bottom-left sample location of the neighboring
 block; $\overline{x_0}$ is a horizontal coordinate of the top-left sample location of the current block, and $\overline{y_0}$ is a vertical
 coordinate of the top-left sample location of the current block; $\overline{x_1}$ is a horizontal coordinate of the top-right sample
 location of the current block, and $\overline{y_1}$ is a vertical coordinate of the top-right sample location of the current block;
 $\overline{x_4}$ is a horizontal coordinate of the top-left sample location of the neighboring block, and $\overline{y_4}$ is a vertical
 coordinate of the top-left sample location of the neighboring current block; $\overline{x_5}$ is a horizontal coordinate of the
 top-right sample location of the neighboring block; and $\overline{y_6}$ is a vertical coordinate of the bottom-left sample
 location of the neighboring block.

64. The method according to any one of claims 1 to 53, wherein the obtaining a predicted motion vector of each
 subblock of the current block based on the target candidate motion vectors of the K control points comprises:

obtaining a $2 \times K$ -parameter affine transform model of the current block based on the target candidate motion
 vectors of the K control points; and

obtaining the predicted motion vector of each subblock of the current block based on the $2 \times K$ -parameter affine
 transform model.

75. The method according to claim 64, wherein the obtaining a $2 \times K$ -parameter affine transform model based on
 the target candidate motion vectors of the K control points comprises:

obtaining motion vectors of the K control points based on the target candidate motion vectors of the K control
 points and motion vector differences of the K control points, wherein the motion vector differences of the K control
 points are obtained by parsing the bitstream; and

obtaining the $2 \times K$ -parameter affine transform model of the current block based on the motion vectors of the K
 control points.

86. The method according to any one of claims 1 to 53, wherein after the determining, in the candidate motion vector list, target candidate motion vectors of the K control points of the current block based on the index value, the method further comprises: obtaining the 6-parameter affine transform model of the current block based on the target candidate motion vectors of the K control points of the current block; and

5 correspondingly, the obtaining a predicted motion vector of each subblock of the current block based on the target candidate motion vectors of the K control points comprises:

obtaining the predicted motion vector of each subblock of the current block based on the 6-parameter affine transform model of the current block.

97. A decoding device, wherein the device comprises:

10 a storage unit, configured to store video data in a form of a bitstream;

an entropy decoding unit, configured to parse the bitstream to obtain an index value of a candidate motion vector list; and

a prediction processing unit, configured to: when an affine model of a current block is a $2 \times K$ -parameter affine transform model, and an affine transform model of a neighboring block of the current block is a $2 \times N$ -parameter affine transform model, obtain, according to the $2 \times N$ -parameter affine transform model used for the neighboring block, candidate motion vectors of K control points of the current block; the $2 \times N$ -parameter affine transform model is obtained based on motion vectors of N control points of the neighboring block, N is an integer greater than or

equal to 2 and less than or equal to 4, K is an integer greater than or equal to 2 and less than or equal to 4, N is not equal to K, N is less than K, the neighboring block is a decoded image block spatially adjacent to the current block,

20 and the current block comprises a plurality of subblocks; and construct the candidate motion vector list, wherein the candidate motion vector list comprises candidate motion vectors of K control points of a current block; determine, in the candidate motion vector list, target candidate motion vectors of the K control points of the current block based on the index value; and obtain a predicted motion vector of each subblock of the current block based on the target candidate motion vectors of the K control points of the current block.

25 108. The device according to claim 97, wherein N is equal to 2 and K is equal to 3, and correspondingly, candidate motion vectors of three control points of the current block are obtained based on a 4-parameter affine transform model used for the neighboring block of the current block.

119. The device according to claim 108, wherein the candidate motion vectors of the three control points of the current block comprise a motion vector at a top-left sample location of the current block, a motion vector at a top-right sample location of the current block, and a motion vector at a bottom-left sample location of the current block; and

the prediction processing unit is configured to calculate the candidate motion vectors of the three control points of the current block according to the following formulas:

$$\begin{cases} vx_0 = vx_4 + \frac{(vx_5 - vx_4)}{x_5 - x_4} \times (x_0 - x_4) - \frac{(vy_5 - vy_4)}{x_5 - x_4} \times (y_0 - y_4) \\ vy_0 = vx_4 + \frac{(vy_5 - vy_4)}{x_5 - x_4} \times (x_0 - x_4) + \frac{(vx_5 - vx_4)}{x_5 - x_4} \times (y_0 - y_4) \end{cases}$$

$$\begin{cases} vx_0 = vx_4 + \frac{(vx_5 - vx_4)}{x_5 - x_4} \times (x_0 - x_4) - \frac{(vy_5 - vy_4)}{x_5 - x_4} \times (y_0 - y_4) \\ vy_0 = vx_4 + \frac{(vy_5 - vy_4)}{x_5 - x_4} \times (x_0 - x_4) + \frac{(vx_5 - vx_4)}{x_5 - x_4} \times (y_0 - y_4) \end{cases}$$

$$\begin{cases} vx_1 = vx_4 + \frac{(vx_5 - vx_4)}{x_5 - x_4} \times (x_1 - x_4) - \frac{(vy_5 - vy_4)}{x_5 - x_4} \times (y_1 - y_4) \\ vy_1 = vx_4 + \frac{(vy_5 - vy_4)}{x_5 - x_4} \times (x_1 - x_4) + \frac{(vx_5 - vx_4)}{x_5 - x_4} \times (y_1 - y_4) \end{cases}$$

$$\begin{cases} vx_1 = vx_4 + \frac{(vx_5 - vx_4)}{x_5 - x_4} \times (x_1 - x_4) - \frac{(vy_5 - vy_4)}{x_5 - x_4} \times (y_1 - y_4) \\ vy_1 = vx_4 + \frac{(vy_5 - vy_4)}{x_5 - x_4} \times (x_1 - x_4) + \frac{(vx_5 - vx_4)}{x_5 - x_4} \times (y_1 - y_4) \end{cases}$$

$$\begin{cases} vx_2 = vx_4 + \frac{(vx_5 - vx_4)}{x_5 - x_4} \times (x_2 - x_4) - \frac{(vy_5 - vy_4)}{x_5 - x_4} \times (y_2 - y_4) \\ vy_2 = vx_4 + \frac{(vy_5 - vy_4)}{x_5 - x_4} \times (x_2 - x_4) + \frac{(vx_5 - vx_4)}{x_5 - x_4} \times (y_2 - y_4) \end{cases}$$

$$\begin{cases} vx_2 = vx_4 + \frac{(vx_5 - vx_4)}{x_5 - x_4} \times (x_2 - x_4) - \frac{(vy_5 - vy_4)}{x_5 - x_4} \times (y_2 - y_4) \\ vy_2 = vx_4 + \frac{(vy_5 - vy_4)}{x_5 - x_4} \times (x_2 - x_4) + \frac{(vx_5 - vx_4)}{x_5 - x_4} \times (y_2 - y_4) \end{cases}$$

wherein $\underline{vx_0vx_0}$ is a horizontal component of the motion vector corresponding to the top-left sample

location of the current block, and $\underline{vy_0vy_0}$ is a vertical component of the motion vector corresponding to the

top-left sample location of the current block; $\underline{vx_1vx_1}$ is a horizontal component of the motion vector

corresponding to the top-right sample location of the current block, and $\underline{vy_1vy_1}$ is a vertical component of the

motion vector corresponding to the top-right sample location of the current block; $\underline{vx_2vx_2}$ is a horizontal

component of the motion vector corresponding to the bottom-left sample location of the current block, and

$\underline{vy_2vy_2}$ is a vertical component of the motion vector corresponding to the bottom-left sample location of the

current block; $\underline{vx_4vx_4}$ is a horizontal component of a motion vector corresponding to a top-left sample location

of the neighboring block, and $\underline{vy_4vy_4}$ is a vertical component of the motion vector corresponding to the top-left

sample location of the neighboring block; $\underline{vx_5vx_5}$ is a horizontal component of a motion vector corresponding

to a top-right sample location of the neighboring block, and $\underline{vy_5vy_5}$ is a vertical component of the motion vector corresponding to the top-right sample location of the neighboring block; $\underline{x_0x_0}$ is a horizontal coordinate of the top-left sample location of the current block, and $\underline{y_0y_0}$ is a vertical coordinate of the top-left sample location of the current block; $\underline{x_1x_1}$ is a horizontal coordinate of the top-right sample location of the current block, and $\underline{y_1y_1}$ is a vertical coordinate of the top-right sample location of the current block; $\underline{x_2x_2}$ is a horizontal coordinate of the bottom-left sample location of the current block, and $\underline{y_2y_2}$ is a vertical coordinate of the bottom-left sample location of the current block; $\underline{x_4x_4}$ is a horizontal coordinate of the top-left sample location of the neighboring block, and $\underline{y_4y_4}$ is a vertical coordinate of the top-left sample location of the neighboring block; and $\underline{x_5x_5}$ is a horizontal coordinate of the top-right sample location of the neighboring block.

12. The device according to claim 9, wherein N is equal to 3 and K is equal to 2, and correspondingly, candidate motion vectors of two control points of the current block are obtained based on a 6-parameter affine transform model used for the neighboring block of the current block.

13. The device according to claim 12, wherein the candidate motion vectors of the two control points of the current block comprise a motion vector at a top-left sample location of the current block and a motion vector at a top-right sample location of the current block; and

the prediction processing unit is configured to calculate the candidate motion vectors of the two control points of the current block according to the following formulas:

$$\begin{cases} vx_0 = vx_4 + \frac{(vx_5 - vx_4)}{x_5 - x_4} \times (x_0 - x_4) + \frac{(vy_5 - vy_4)}{y_5 - y_4} \times (y_0 - y_4) \\ vy_0 = vx_4 + \frac{(vy_5 - vy_4)}{x_5 - x_4} \times (x_0 - x_4) + \frac{(vx_5 - vx_4)}{y_5 - y_4} \times (y_0 - y_4) \\ vx_1 = vx_4 + \frac{(vx_5 - vx_4)}{x_5 - x_4} \times (x_1 - x_4) + \frac{(vy_5 - vy_4)}{y_5 - y_4} \times (y_1 - y_4) \\ vy_1 = vx_4 + \frac{(vy_5 - vy_4)}{x_5 - x_4} \times (x_1 - x_4) + \frac{(vx_5 - vx_4)}{y_5 - y_4} \times (y_1 - y_4) \end{cases}$$

wherein $\underline{vx_0}$ is a horizontal component of the motion vector corresponding to the top-left sample location of the current block, and $\underline{vy_0}$ is a vertical component of the motion vector corresponding to the top-left sample location of the current block; $\underline{vx_1}$ is a horizontal component of the motion vector corresponding to the top-right sample location of the current block, and $\underline{vy_1}$ is a vertical component of the motion vector corresponding to the

~~top right sample location of the current block; $\overline{vx_4}$ is a horizontal component of a motion vector corresponding to a top left sample location of the neighboring block, and $\overline{vy_4}$ is a vertical component of the motion vector corresponding to the top left sample location of the neighboring block; $\overline{vx_5}$ is a horizontal component of a motion vector corresponding to a top right sample location of the neighboring block, and $\overline{vy_5}$ is a vertical component of the motion vector corresponding to the top right sample location of the neighboring block; $\overline{vx_6}$ is a horizontal component of a motion vector corresponding to a bottom left sample location of the neighboring block, and $\overline{vy_6}$ is a vertical component of the motion vector corresponding to the bottom left sample location of the neighboring block; $\overline{x_0}$ is a horizontal coordinate of the top left sample location of the current block, and $\overline{y_0}$ is a vertical coordinate of the top left sample location of the current block; $\overline{x_1}$ is a horizontal coordinate of the top right sample location of the current block, and $\overline{y_1}$ is a vertical coordinate of the top right sample location of the current block; $\overline{x_4}$ is a horizontal coordinate of the top left sample location of the neighboring block, and $\overline{y_4}$ is a vertical coordinate of the top left sample location of the neighboring current block; $\overline{x_5}$ is a horizontal coordinate of the top right sample location of the neighboring block; and $\overline{y_6}$ is a vertical coordinate of the bottom left sample location of the neighboring block.~~

~~1410.~~ The device according to any one of claims ~~9-7~~ to ~~139~~, wherein the prediction processing unit is specifically configured to:

obtain a $2 \times K$ -parameter affine transform model of the current block based on the target candidate motion vectors of the K control points of the current block; and

obtain the predicted motion vector of each subblock of the current block based on the $2 \times K$ -parameter affine transform model of the current block.

~~1511.~~ The device according to claim ~~1410~~, wherein the prediction processing unit is specifically configured to:

obtain motion vectors of the K control points of the current block based on the target candidate motion vectors of the K control points of the current block and motion vector differences of the K control points of the current block, wherein the motion vector differences of the K control points of the current block are obtained by parsing the bitstream; and

obtain the $2 \times K$ -parameter affine transform model of the current block based on the motion vectors of the K control points of the current block.

1612. The device according to any one of claims 9-7 to 139, wherein after determining, in the candidate motion vector list, the target candidate motion vectors of the K control points of the current block based on the index value, the prediction processing unit is further configured to:

5 obtain the 6-parameter affine transform model of the current block based on the target candidate motion vectors of the K control points of the current block; and

obtain the predicted motion vector of each subblock of the current block based on the 6-parameter affine transform model of the current block.