VIDEO PICTURE CODING METHOD, VIDEO PICTURE DECODING METHOD, CODING DEVICE, AND DECODING DEVICE

[0001]

TECHNICAL FIELD

[0002] The present invention relates to the field of video picture processing, and in particular, to a video picture coding method, a video picture decoding method, a coding device, and a decoding device.

BACKGROUND

[0003] As Internet technologies develop rapidly and material and spiritual cultures of people become richer, there are more requirements for video applications on the Internet, and in particular, requirements for high-definition video applications. However, a data volume of a high-definition video is huge, and a problem of compression coding of the high-definition video needs to be first resolved, so that the high-definition video can be transmitted on the bandwidth-limited Internet. Currently, two international organizations: the Motion Picture Experts Group (Motion Picture Experts Group, "MPEG" for short) under the International Organization for Standardization (International Organization for Standardization, "ISO" for short)/International Electrotechnical Commission (International Electrotechnical Commission, "IEC" for short) and the Video Coding Experts Group (Video Coding Experts Group, "VCEG" for short) under the International Telecommunication Union-Telecommunication Standardization Sector (International Telecommunication Union-Telecommunication standardization sector, "ITU-T" for short), are dedicated to developing international video coding standards. Established in 1986, the MPEG is dedicated to developing related standards in the multimedia field, where the standards are mainly applied to storage, broadcast and television, streaming media on the Internet or a wireless network, or the like. The ITU-T mainly develops video coding standards oriented to the real-time video communications field, such as videophone and videoconference applications.

possible implementation of the third aspect, the first preset value is 4, and/or the second preset value is 4.

[0049] With reference to any one of the third aspect, or the first to the tenth possible implementations of the third aspect, in an eleventh possible implementation of the third aspect, the second determining module is specifically configured to: determine a third preset value as the motion vector precision of the affine picture block; or determine the motion vector precision of the affine picture block according to a feature of a picture block adjacent to the affine picture block, where the adjacent picture block is a picture block spatially and/or temporally adjacent to the affine picture block.

[0050] With reference to any one of the third aspect, or the first to the eleventh possible implementations of the third aspect, in a twelfth possible implementation of the third aspect, the coding module is specifically configured to: determine a motion vector of each affine motion compensation picture subblock in the affine motion compensation picture subblocks; determine a motion compensation prediction signal of each affine motion compensation picture subblock according to the motion vector of each affine motion compensation picture subblock; determine a prediction residual signal of each affine motion compensation picture subblock according to the motion compensation prediction signal of each affine motion compensation picture subblock; and code the prediction residual signal of each affine motion compensation picture subblock.

[0051] With reference to the twelfth possible implementation of the third aspect, in a thirteenth possible implementation of the third aspect, the coding device further includes: a filtering module, configured to filter signals of boundary pixels of each affine motion compensation picture subblock, where the boundary pixels are pixels in one or more rows at a boundary of each affine motion compensation picture subblock.

[0052] With reference to the thirteenth possible implementation of the third aspect, in a fourteenth possible implementation of the third aspect, the signal of the boundary pixel includes a motion compensation prediction signal and/or a reconstructed signal, and the reconstructed signal is a sum of the motion compensation prediction signal and a reconstructed residual signal.

[0053] According to a fourth aspect, a decoding device is provided and includes: a first determining module, configured to determine a motion vector difference of an affine picture block; a second determining module, configured to determine motion vector precision of the affine picture block; a third determining module, configured to determine a size of an affine motion compensation picture subblock in the affine picture block according to the motion vector difference determined by the first determining module, the motion vector precision determined by the second determining module, and a distance between control points in the affine picture block, where the control points

motion vector precision, and the distance between the control points, and performs coding processing on the affine picture block according to the determined size.

[0101] Therefore, in the video picture coding method according to this embodiment of the present invention, the coding device determines the size of the affine motion compensation picture subblock according to the determined motion vector difference of the affine picture block, the determined motion vector precision, and the distance between the control points, and performs coding processing on the affine picture block according to the size of the affine motion compensation picture subblock. In this way, a picture subblock of an appropriate size is selected in a coding process, so that coding complexity can be reduced, and coding efficiency can be improved.

[0102] It should be understood that, in this embodiment of the present invention, the affine (Affine) picture block is a picture block in which motion vectors of all units comply with same affine models, for example, a same affine model which may be indicated by same parameters, for example, a same group of parameters. The unit is a group of pixels, for example, may be a pixel, or may be a block structure such as 1x3 or 2x4. This is not limited in the present invention.

[0103] It should be understood that, in this embodiment of the present invention, the affine motion compensation (Affine Motion Compensation, "Affine-MC" for short) picture subblock is a picture subblock that is obtained by dividing the affine picture block and used for performing motion compensation prediction, and affine-MC picture subblocks may have a same size or different sizes. This is not limited in the present invention.

[0104] It should also be understood that, in this embodiment of the present invention, any non-overlapping pixels may be selected as control points to determine the motion vector difference of the affine picture block. This is not limited in the present invention.

[0105] Preferably, as shown in FIG. 2, S1100 includes the following steps:

[0106] S1101. Determine a first component of the motion vector difference according to a difference between motion vectors of a first control point and a second control point that are located on a same horizontal line.

[0107] S1102. Determine a second component of the motion vector difference according to a difference between motion vectors of a third control point and a fourth control point that are located on a same vertical line.

[0108] A first horizontal distance exists between the first control point and the second control point, and a first vertical distance exists between the third control point and the fourth control point.

[0109] It should be understood that, in this embodiment of the present invention, the first component of the motion vector difference is a horizontal component of the motion vector difference, and the second component of the motion vector difference is a vertical component of the

motion vector difference.

[0110] It should also be understood that, in this embodiment of the present invention, first, second, third, and fourth are only intended to distinguish between pixels and shall not be construed as any limitation to the protection scope of the present invention. For example, the first control point may also be referred to as the second control point, and the second control point may become the first control point.

[0111] In this embodiment of the present invention, optionally, the first control point and the third control point are the same pixel. That is, a quantity of selected control points is three, and one of the three control points is located on a same horizontal line as one of the other two control points, and is located on a same vertical line as the other one of the two control points.

[0112] In this embodiment of the present invention, optionally, the first control point, the second control point, the third control point, and the fourth control point are vertices of the affine picture block. Assuming that four vertices of one affine picture block are marked as a vertex in an upper left corner, a vertex in a lower left corner, a vertex in an upper right corner, and a vertex in a lower right corner respectively, any three vertices located in two orthogonal directions may be selected to determine a motion vector difference of the affine picture block. For example, the vertex in the upper left corner, the vertex in the lower left corner, and the vertex in the upper right corner may be selected, or the vertex in the upper left corner, the vertex in the upper right corner, and the vertex in the lower right corner may be selected. This is not limited in the present invention.

[0113] In this embodiment of the present invention, optionally, a difference between components in either direction, in components in two directions of the motion vectors of the first control point and the second control point may be determined as the first component of the motion vector difference of the affine picture block, and a difference between components in either direction, in components in two directions of the motion vectors of the third control point and the fourth control point may be determined as the second component of the motion vector difference of the affine picture block; or according to actual requirements for coding complexity and coding efficiency, a numeric value between two differences of components in two directions of the motion vectors of the first control point and the second control point may be determined as the first component, and a numeric value between two differences of components in two directions of the motion vectors of the third control point and the fourth control point may be determined as the second component. This is not limited in the present invention.

[0114] Optionally, as shown in FIG. 3, S1101 specifically includes the following steps:

[0115] S1103. Determine a first horizontal component difference and a first vertical component difference between the motion vectors of the first control point and the second control point.

[0116] S1104. Determine a larger one of the first horizontal component difference and the first vertical component difference as the first component of the motion vector difference.

[0117] Correspondingly, as shown in FIG. 4, S1102 specifically includes the following steps:

[0118] S1105. Determine a second horizontal component difference and a second vertical component difference between the motion vectors of the third control point and the fourth control point.

[0119] S1106. Determine a larger one of the second horizontal component difference and the second vertical component difference as the second component of the motion vector difference.

[0120] That is, if $vx_{(x,y)}$ and $vy_{(x,y)}$ are used to indicate a horizontal component and a vertical component of a motion vector of a pixel in a position (x, y), the motion vector difference of the affine picture block may be determined according to formulas (1) and (2):

$$\Delta mv_{hor} = \max\left(vx_{(x+w,y)} - vx_{(x,y)}, vy_{(x+w,y)} - vy_{x,y}\right) \quad (1)$$

$$\Delta mv_{ver} = \max\left(vx_{(x',y'+h)} - vx_{(x',y')}, vy_{(x',y'+h)} - vy_{x',y'}\right) \quad (2)$$

where max indicates a maximum value, Δmv_{hor} indicates the horizontal component of the motion vector difference of the affine picture block, Δmv_{ver} indicates the vertical component of the motion vector difference of the affine picture block, w indicates the first horizontal distance between the first control point and the second control point, and h indicates the first vertical distance between the third control point and the fourth control point.

[0121] In this embodiment of the present invention, optionally, an affine transformation parameter of a pixel in the affine picture block may be determined, and pixels in the affine picture block have the same affine transformation parameter.

[0122] Correspondingly, S1103 is specifically: determining the first horizontal component difference and the first vertical component difference according to the affine transformation parameter and the first horizontal distance.

[0123] S1105 is specifically: determining the second horizontal component difference and the second vertical component difference according to the affine transformation parameter and the first vertical distance.

[0124] It should be understood that, sequence numbers of the foregoing processes do not mean execution sequences. The execution sequences of the processes should be determined according to functions and internal logic of the processes, and should not be construed as any limitation to the implementation processes of the embodiments of the present invention.

[0125] In this embodiment of the present invention, optionally, an affine transformation model may be a 6-parameter affine transformation model in the prior art, or may be a 4-parameter or

2-parameter affine transformation model. In the 6-parameter affine transformation model, it is assumed that (x, y) are coordinates of a pixel P in a current picture, and (x', y') are coordinates of a pixel P' that is in a reference picture and matches the pixel P, and $a, b, c, d, e,$ and f are affine transformation parameters. If the affine transformation parameters are known, a position (x', y') of the pixel (x, y) in the reference picture may be obtained, and therefore, a prediction signal of the pixel may be obtained from the reference picture:

$$x' = ax + by + e \quad (3)$$

$$y' = cx + dy + f \quad (4)$$

[0126] Generally, the affine transformation parameters may be obtained through computation according to motion vectors of some pixels in the picture block, and a horizontal component and a vertical component of a motion vector may be indicated by formulas (5) and (6) respectively:

$$vx = x - x' \quad (5)$$

$$vy = y - y' \quad (6)$$

[0127] The formula (3) is substituted into the formula (5), and the formula (4) is substituted into the formula (6), to obtain a horizontal component and a vertical component of a motion vector of the pixel whose coordinates are (*x*, *y*), as shown in formulas (7) and (8) respectively:

$$vx = (1-a)x - by - e \quad (7)$$

$$vy = (1-d)y - cx - f \quad (8)$$

[0128] The formula (7) is substituted into the formula (1), and the formula (8) is substituted into the formula (2), so that the formulas (1) and (2) are converted into formulas (9) and (10) respectively:

$$\Delta mv_{hor} = \max((1-a)w, -cw) \quad (9)$$

$$\Delta mv_{ver} = \max(-bh, (1-d)h) \quad (10)$$

[0129] By means of determining the affine transformation parameters a, b, c, and d, and the distance between the control points, the first component and the second component of the motion vector difference of the affine picture block may be determined.

[0130] It should be understood that, when the 4-parameter affine transformation model or the 2-parameter affine transformation model is used, the method for determining the motion vector difference is essentially the same as the determining method when the 6-parameter affine transformation model is used. For brevity, details are not described again herein.

[0131] In this embodiment of the present invention, optionally, in the coding process, the affine transformation parameter may be obtained by computing each parameter iteratively, for example, adding 1 to the parameter *a* to determine whether a motion compensation prediction signal in the

model is optimal. Alternatively, the affine transformation parameter may be obtained through derivation according to an affine transformation parameter of an adjacent affine picture block. However, the present invention is not limited thereto.

[0132] In this embodiment of the present invention, optionally, a motion vector of the first control point, a motion vector of the second control point, a motion vector of the third control point, and a motion vector of the fourth control point may be determined.

[0133] Correspondingly, S1103 is specifically: determining a difference between a horizontal component of the motion vector of the first control point and a horizontal component of the motion vector of the second control point as the first horizontal component difference; and determining a difference between a vertical component of the motion vector of the first control point and a vertical component of the motion vector of the second control point as the first vertical component difference.

[0134] S1105 is specifically: determining a difference between a horizontal component of the motion vector of the third control point and a horizontal component of the motion vector of the fourth control point as the second horizontal component difference; and determining a difference between a vertical component of the motion vector of the third control point and a vertical component of the motion vector of the fourth control point as the second vertical component difference.

[0135] Specifically, the motion vectors of the control points may be directly determined. By means of computing the differences between the components of the motion vectors, the first component and the second component of the motion vector difference of the affine picture block may be directly obtained.

[0136] For example, FIG. 5 is a schematic diagram of an affine picture block and control points according to an embodiment of the present invention. Two control points A and B are on a same horizontal line, and have a distance w. Two control points C and D are on a same vertical line, and have a distance h. If motion vectors of the control points A, B, C, and D are known, the first component and the second component of the motion vector difference of the affine picture block may be determined according to formulas (11) and (12):

$$\Delta mv_{hor} = \max(vx_{\mathrm{B}} - vx_{\mathrm{A}}, vy_{\mathrm{B}} - vy_{\mathrm{A}}) \quad (11)$$

$$\Delta mv_{ver} = \max(vx_{\mathrm{C}} - vx_{\mathrm{D}}, vy_{\mathrm{C}} - vy_{\mathrm{D}}) \quad (12)$$

[0137] In this embodiment of the present invention, optionally, the control points A and C may be the same pixel.

[0138] In this embodiment of the present invention, optionally, the control points A, B, C, and D may be vertices of the affine picture block. In this case, a distance between the control points A and

B is a width *W* of the affine picture block, and a distance between the control points C and D is a height *H* of the affine picture block.

[0139] In this embodiment of the present invention, optionally, the first control point and the second control point are two adjacent pixels, and the third control point and the fourth control point are two adjacent pixels.

[0140] S1103 and S1105 are specifically: determining a motion vector of a first pixel, a motion vector of a second pixel, and a motion vector of a third pixel, where the first pixel, the second pixel, and the third pixel are non-overlapping pixels; determining a second horizontal distance and a second vertical distance between the first pixel and the second pixel; determining a third horizontal distance and a third vertical distance between the first pixel and the third pixel; and determining the first horizontal component difference, the first vertical component difference, the second horizontal component difference, and the second vertical component difference according to the motion vector of the first pixel, the motion vector of the second pixel, the motion vector of the third pixel, the second horizontal distance, the second vertical distance, the third horizontal distance, and the third vertical distance.

[0141] Specifically, assuming that A, B, and C are any three non-overlapping pixels in the picture block, positions of the three pixels are shown in FIG. 6, and motion vectors of the three pixels are (vx_A, vy_A), (vx_B, vy_B), and (vx_C, vy_C) respectively. A distance between the pixel A and the pixel B in a horizontal direction is w_1, and a distance in a vertical direction is h_1. A distance between the pixel A and the pixel C in the horizontal direction is w_2, and a distance in the vertical direction is h_2. A distance between the pixel B and the pixel C in the horizontal direction is $w_2 - w_1$, and a distance in the vertical direction is $h_1 + h_2$. It is assumed that horizontal component differences of motion vectors of two adjacent pixels in the horizontal direction are Δmvx_{hor} and Δmvy_{hor} respectively, and vertical component differences of motion vectors of two adjacent pixels in the vertical direction are Δmvx_{ver} and Δmvy_{ver} respectively. Because motion vectors in the picture block change linearly, Δmvx_{hor}, Δmvy_{hor}, Δmvx_{ver}, and Δmvy_{ver} may be determined by determining motion vectors of the pixels A, B, and C. In this way, motion vector differences of adjacent pixels in the picture block may be determined, and specifically, may be determined according to formulas (13) to (16):

$$vx_B = vx_A + w_1 \cdot \Delta mvx_{hor} + h_1 \cdot \Delta mvx_{ver} \quad (13)$$

$$vy_B = vy_A + w_1 \cdot \Delta mvy_{hor} + h_1 \cdot \Delta mvy_{ver} \quad (14)$$

$$vx_C = vx_A + w_2 \cdot \Delta mvx_{hor} + h_2 \cdot \Delta mvx_{ver} \quad (15)$$

$$vy_C = vy_A + w_2 \cdot \Delta mvy_{hor} + h_2 \cdot \Delta mvy_{ver} \quad (16)$$

or may be determined according to formulas (13) and (14) and formulas (17) and (18):

$$vx_C = vx_B + (w_2 - w_1) \cdot \Delta mvx_{hor} + (h_2 + h_1) \cdot \Delta mvx_{ver} \quad (17)$$

$$vy_C = vy_B + (w_2 - w_1) \cdot \Delta mvy_{hor} + (h_2 + h_1) \cdot \Delta mvy_{ver} \quad (18)$$

[0142] In this embodiment of the present invention, optionally, the coding device may obtain motion vectors of all control points by performing a motion estimation search; may obtain motion vectors of all control points from adjacent picture blocks; may compute motion vectors of all control points according to the affine transformation model; may obtain motion vectors of some control points by performing a motion estimation search, and obtain motion vectors of other control points from adjacent picture blocks; may obtain motion vectors of some control points by performing an affine motion estimation search, and obtain motion vectors of other control points through computation according to the affine transformation model; or may obtain motion vectors of some control points from adjacent picture blocks, and compute motion vectors of other control points according to the affine transformation model. However, the present invention is not limited thereto.

[0143] Optionally, in S1200, a third preset value may be determined as the motion vector precision of the affine picture block; or the motion vector precision of the affine picture block may be determined according to a feature of a picture block adjacent to the affine picture block, where the adjacent picture block is a picture block spatially and/or temporally adjacent to the affine picture block.

[0144] Specifically, a value of a motion vector of the affine picture block may be an integer. In this case, the motion vector is of integer-pixel precision, that is, the pixel precision is 1. Alternatively, a value of a motion vector may not be an integer. In this case, the motion vector is of sub-pixel precision, including precision such as 1/2, 1/4, or 1/8. FIG. 7 shows a 4x4 picture block, where × indicates a pixel in an integer-pixel position, and a captured picture has only pixels in integer-pixel positions. O indicates a pixel in a 1/2 precision position, and needs to be obtained by interpolating a pixel in an integer-pixel position. Values of pixels in other precision positions need to be obtained by further interpolating pixels in integer-pixel precision positions or pixels in 1/2 precision positions. If a motion vector of a current pixel is an integer, the motion vector points to a position of × in the reference picture. If the motion vector of the current pixel is of 1/2 precision, the motion vector points to a position of O in the reference picture.

[0145] The motion vector precision of the affine picture block is highest precision of motion vectors of all pixels in the affine picture block. The motion vector precision of the affine picture block may be preset, for example, integer-pixel precision, or precision such as 1/2, 1/4, 1/8, or 1/16. Alternatively, the motion vector precision may be determined according to a feature of a picture block adjacent to the affine picture block. For example, if an adjacent picture is relatively smooth, it may be predicted that the current affine picture block is also relatively smooth. Therefore, higher motion vector precision such as 1/8 or 1/16 precision may be selected. Otherwise, lower motion vector precision such as integer-pixel precision or 1/2 precision may be selected. The obtained precision is indicated by $MvAc$.

[0146] Optionally, as shown in FIG. 8, S1300 specifically includes the following steps:

[0147] S1301. Determine a ratio of a product of the motion vector precision and the first horizontal distance to the first component of the motion vector difference as a length of the affine motion compensation picture subblock in a horizontal direction.

[0148] S1302. Determine a ratio of a product of the motion vector precision and the first vertical distance to the second component of the motion vector difference as a length of the affine motion compensation picture subblock in a vertical direction.

[0149] Specifically, generally obtained motion vector differences Δmv_{hor} and Δmv_{ver} are relatively small, indicating that precision of a motion vector of each pixel is excessively high, for example, 1/32 or 1/64. Excessively high motion vector precision contributes little to compression efficiency of a video, and causes a huge amount of computation. Therefore, the affine picture block is divided into multiple affine-MC picture subblocks according to previously obtained expected motion vector precision $MvAc$ to ensure that motion vector precision of each affine-MC picture subblock reaches $MvAc$.

[0150] In this embodiment of the present invention, optionally, assuming that the horizontal distance between the first control point and the second control point is w, and that the vertical distance between the third control point and the fourth control point is h, and assuming that a width of the affine-MC picture subblock is $aMcW$ and that a height of the affine-MC picture subblock is $aMcH$, $aMcW$ and $aMcH$ may be determined according to formulas (19):

$$\frac{\Delta mv_{hor}}{w}=\frac{MvAc}{aMcW} \text{ and } \frac{\Delta mv_{ver}}{h}=\frac{MvAc}{aMcH} \quad (19)$$

[0151] This is equivalent to:

$$aMcW=\frac{MvAc}{\Delta mv_{hor}}\times w \text{ and } aMcH=\frac{MvAc}{\Delta mv_{ver}}\times h.$$

[0152] In this embodiment of the present invention, optionally, when the first control point, the

second control point, the third control point, and the fourth control point are vertices of the affine picture block, the horizontal distance between the first control point and the second control point is the width W of the affine picture block, and the vertical distance between the third control point and the fourth control point is the height H of the affine picture block. In this case, the width $aMcW$ and the height $aMcH$ of the affine-MC picture subblock may be determined according to formulas (20):

$$\frac{\Delta mv_{hor}}{W}=\frac{MvAc}{aMcW} \quad \text{and} \quad \frac{\Delta mv_{ver}}{H}=\frac{MvAc}{aMcH} \qquad (20)$$

[0153] This is equivalent to:

$$aMcW=\frac{MvAc}{\Delta mv_{hor}}\times \mathrm{W} \quad \text{and} \quad aMcH=\frac{MvAc}{\Delta mv_{ver}}\times H .$$

[0154] In this embodiment of the present invention, optionally, when the first control point and the second control point are adjacent control points, and the third control point and the fourth control point are adjacent control points, the first horizontal distance between the first control point and the second control point is 1, that is, the first control point is separated from the second control point by an integer quantity of pixels; the first vertical distance between the third control point and the fourth control point is 1, that is, the third control point is separated from the fourth control point by an integer quantity of pixels. In this case, the formulas (19) may be simplified to formulas (21):

$$\Delta mv_{hor}=\frac{MvAc}{aMcW} \quad \text{and} \quad \Delta mv_{ver}=\frac{MvAc}{aMcH} \qquad (21)$$

[0155] This is equivalent to:

$$aMcW=\frac{MvAc}{\Delta mv_{hor}} \quad \text{and} \quad aMcH=\frac{MvAc}{\Delta mv_{ver}} .$$

[0156] Therefore, in the video picture coding method according to this embodiment of the present invention, the coding device determines the size of the affine motion compensation picture subblock according to the determined motion vector difference of the affine picture block, the determined motion vector precision, and the distance between the control points, and performs coding processing on the affine picture block according to the size of the affine motion compensation picture subblock. In this way, a picture subblock of an appropriate size is selected in the coding process, so that coding complexity can be reduced and coding efficiency can be improved, while motion compensation prediction efficiency in affine transformation is maintained.

[0157] Optionally, as shown in FIG. 9, S1300 includes the following steps.

[0158] S1303. When a ratio of a product of the motion vector precision and the first horizontal distance to the first component of the motion vector difference is greater than or equal to a first preset value, determine the ratio as a length of the affine motion compensation picture subblock in a

horizontal direction; or

when a ratio of a product of the motion vector precision and the first horizontal distance to the first component of the motion vector difference is less than the first preset value, determine the first preset value as a length of the affine motion compensation picture subblock in a horizontal direction.

[0159] S1304. When a ratio of a product of the motion vector precision and the first vertical distance to the second component of the motion vector difference is greater than or equal to a second preset value, determine the ratio as a length of the affine motion compensation picture subblock in a vertical direction; or

when a ratio of a product of the motion vector precision and the first vertical distance to the second component of the motion vector difference is less than the second preset value, determine the second preset value as a length of the affine motion compensation picture subblock in a vertical direction.

[0160] Specifically, for a hardware implementation in the coding process, a lower limit may be set for the width and the height of the affine-MC picture subblock. When the computed width or height is less than the preset lower limit, the preset lower limit is determined as the width or the height of the affine-MC picture subblock. Preferably, the lower limit may be set to 4, but may also be set to another numeric value according to an actual requirement. For example, a lower limit of the width may be set to 2, and a specified value of the height is set to 3; or a lower limit of the width is set to 1, and a specified value of the height is set to 2. This is not limited in the present invention.

[0161] Optionally, as shown in FIG. 10, S1400 includes the following steps:

[0162] S1401. Determine a motion vector of each affine motion compensation picture subblock in the affine motion compensation picture subblocks.

[0163] S1402. Determine a motion compensation prediction signal of each affine motion compensation picture subblock according to the motion vector of each affine motion compensation picture subblock.

[0164] S1403. Determine a prediction residual signal of each affine motion compensation picture subblock according to the motion compensation prediction signal of each affine motion compensation picture subblock.

[0165] S1404. Code the prediction residual signal of each affine motion compensation picture subblock.

[0166] It should be understood that, in this embodiment of the present invention, each affine-MC picture subblock may include multiple pixels, and a motion vector of a pixel needs to be selected from each affine-MC picture subblock as a motion vector of the affine-MC picture subblock.

[0167] Optionally, in S1401, a motion vector of a pixel in a central position of the affine-MC picture subblock may be selected as the motion vector of the affine-MC picture subblock; an average value of motion vectors of all pixels in the affine-MC picture subblock may be used as the motion vector of the affine-MC picture subblock; or a motion vector of a pixel in an upper left corner of the affine-MC picture subblock may be selected as the motion vector of the affine-MC picture subblock. However, the present invention is not limited thereto.

[0168] In this embodiment of the present invention, optionally, signals of boundary pixels of each affine motion compensation picture subblock are filtered, and the boundary pixels are pixels in one or more rows at a boundary of each affine motion compensation picture subblock.

[0169] In this embodiment of the present invention, optionally, the signal of the boundary pixel includes a motion compensation prediction signal and/or a reconstructed signal, and the reconstructed signal is a sum of the motion compensation prediction signal and a reconstructed residual signal.

[0170] Specifically, as shown in FIG. 11, a thick solid line block indicates an affine picture block, a thin solid line block indicates an affine-MC picture subblock, a dashed line block indicates pixels at boundaries of adjacent affine-MC picture subblocks, and a cross indicates a pixel. A region of a dashed line block in FIG. 11 includes pixels of adjacent affine-MC picture subblocks in two rows or two columns at boundaries of the affine-MC picture subblocks, or may include one row or one column, or three rows or three columns at the boundaries of the affine-MC picture subblocks. Because motion vectors of adjacent affine-MC picture subblocks may be different, prediction signals obtained from the reference picture are not adjacent in the reference picture. This causes discontinuity of prediction signals at the boundaries of the adjacent affine-MC picture subblocks, and therefore causes discontinuity of residuals, and affects coding efficiency of the residuals. Therefore, filtering the motion compensation prediction signals at the boundaries of the affine-MC picture subblocks is considered.

[0171] A reconstructed signal is generally obtained by adding a reconstructed residual signal to a motion compensation prediction signal. Generally, lossy coding is used for the residual signal. This causes distortion between the reconstructed residual signal and an original residual signal. Distortion directions of pixels at the boundaries of adjacent affine-MC picture subblocks may be inconsistent. For example, a right pixel of a first affine-MC picture subblock becomes larger due to distortion, and a left pixel of a right adjacent affine-MC picture subblock becomes smaller due to distortion. This causes discontinuity of pixel values at boundaries of reconstructed pixels of the affine-MC picture subblocks, and impairs subjective and objective effects. Therefore, the reconstructed signals need to be filtered.

[0172] In this embodiment of the present invention, optionally, filtering may be performing by

using a low-pass filter, so that pixel values in the boundary region change more smoothly. For example, filtering is performed by using a Gauss filter. However, the present invention is not limited thereto.

[0173] In this embodiment of the present invention, optionally, filtering may be performed by using an overlapped block motion compensation (Overlapped block motion compensation, "OBMC" for short) method. Motion compensation prediction is performed on a to-be-filtered pixel by using a motion vector of an affine-MC picture subblock adjacent to the to-be-filtered pixel, and weighted averaging is performed on the obtained motion compensation prediction signal and a motion compensation prediction signal obtained by using a motion vector of the to-be-filtered pixel, to obtain a final motion compensation prediction signal.

[0174] To better prove beneficial effects of this embodiment of the present invention relative to the prior art, an LDP test structure is used to test coding complexity and coding efficiency when the method in this embodiment of the present invention and the method in the prior art are used to perform coding. A result is shown in Table 1.

Table 1

Class	**Sequence**	**The method in the present invention relative to the method in the prior art**
LDP	Tractor	–0.2%
	BlueSky	0.0%
	SpinCalendar	0.0%
	Jets	–0.5%
	Enct	86%
	Dect	78%

[0175] As can be seen from Table 1, using the video picture coding method in this embodiment of the present invention can improve coding efficiency and reduce a coding time.

[0176] Therefore, in the video picture coding method according to this embodiment of the present invention, the coding device determines the size of the affine motion compensation picture subblock according to the determined motion vector difference of the affine picture block, the determined motion vector precision, and the distance between the control points, and performs coding processing on the affine picture block according to the size of the affine motion

CLAIMS

What is claimed is:

1. A video picture coding method, the method comprising:

determining a motion vector difference of an affine picture block;

determining motion vector precision of the affine picture block;

determining a size of an affine motion compensation picture subblock in the affine picture block according to the motion vector difference, the motion vector precision, and a distance between control points in the affine picture block, wherein the control points are pixels used to determine the motion vector difference; and

performing coding processing on the affine picture block according to the size of the affine motion compensation picture subblock.

2. The method according to claim 1, wherein the determining a motion vector difference of an affine picture block comprises:

determining a first component of the motion vector difference according to a difference between motion vectors of a first control point and a second control point that are located on a same horizontal line; and

determining a second component of the motion vector difference according to a difference between motion vectors of a third control point and a fourth control point that are located on a same vertical line; wherein a first horizontal distance exists between the first control point and the second control point, and a first vertical distance exists between the third control point and the fourth control point.

3. The method according to claim 2, wherein the determining a first component of the motion vector difference according to a difference between motion vectors of a first control point and a second control point that are located on a same horizontal line comprises:

determining a first horizontal component difference and a first vertical component difference between the motion vectors of the first control point and the second control point; and

determining a larger one of the first horizontal component difference and the first vertical component difference as the first component of the motion vector difference; and

the determining a second component of the motion vector difference according to a difference between motion vectors of a third control point and a fourth control point that are located on a same vertical line comprises:

determining a second horizontal component difference and a second vertical component difference between the motion vectors of the third control point and the fourth control point; and

determining a larger one of the second horizontal component difference and the second vertical component difference as the second component of the motion vector difference.

4. The method according to claim 3, wherein the method further comprises:

determining an affine transformation parameter of a pixel in the affine picture block, wherein pixels in the affine picture block have the same affine transformation parameter;

the determining a first horizontal component difference and a first vertical component difference between the motion vectors of the first control point and the second control point comprises:

determining the first horizontal component difference and the first vertical component difference according to the affine transformation parameter and the first horizontal distance; and

the determining a second horizontal component difference and a second vertical component difference between the motion vectors of the third control point and the fourth control point comprises:

determining the second horizontal component difference and the second vertical component difference according to the affine transformation parameter and the first vertical distance.

5. The method according to claim 4, wherein the determining a size of an affine motion compensation picture subblock according to the motion vector difference, the motion vector precision, and a distance between control points in the affine picture block comprises:

determining a ratio of a product of the motion vector precision and the first horizontal distance to the first component of the motion vector difference as a length of the affine motion compensation picture subblock in a horizontal direction; and

determining a ratio of a product of the motion vector precision and the first vertical distance to the second component of the motion vector difference as a length of the affine motion compensation picture subblock in a vertical direction.

6. The method according to claim 4, wherein the determining a size of an affine motion compensation picture subblock in the affine picture block according to the motion vector difference, the motion vector precision, and a distance between control points in the affine picture block comprises:

when a ratio of a product of the motion vector precision and the first horizontal distance to the first component of the motion vector difference is greater than or equal to a first preset value, determining the ratio as a length of the affine motion compensation picture subblock in a horizontal direction; or

when a ratio of a product of the motion vector precision and the first horizontal distance to the first component of the motion vector difference is less than the first preset value, determining the first preset value as a length of the affine motion compensation picture subblock in a horizontal direction; and

when a ratio of a product of the motion vector precision and the first vertical distance to the second component of the motion vector difference is greater than or equal to a second preset value, determining the ratio as a length of the affine motion compensation picture subblock in a vertical direction; or

when a ratio of a product of the motion vector precision and the first vertical distance to the second component of the motion vector difference is less than the second preset value, determining the second preset value as a length of the affine motion compensation picture subblock in a vertical direction.

7. The method according to claim 6, wherein at least one of the first preset value and the second preset value is 4.

8. The method according to claim 3, wherein the method further comprises:

determining a motion vector of the first control point, a motion vector of the second control point, a motion vector of the third control point, and a motion vector of the fourth control point;

the determining a first horizontal component difference and a first vertical component difference between the motion vectors of the first control point and the second control point comprises:

determining a difference between a horizontal component of the motion vector of the first control point and a horizontal component of the motion vector of the second control point as the first horizontal component difference; and

determining a difference between a vertical component of the motion vector of the first control point and a vertical component of the motion vector of the second control point as the first vertical component difference; and

the determining a second horizontal component difference and a second vertical component difference between the motion vectors of the third control point and the fourth control point comprises:

determining a difference between a horizontal component of the motion vector of the third control point and a horizontal component of the motion vector of the fourth control point as the second horizontal component difference; and

determining a difference between a vertical component of the motion vector of the third control point and a vertical component of the motion vector of the fourth control point as the second vertical component difference.

9. The method according to claim 3, wherein the first control point and the second control point are two adjacent pixels, and the third control point and the fourth control point are two adjacent pixels; and

the determining a first horizontal component difference and a first vertical component difference between the motion vectors of the first control point and the second control point, and the determining a second horizontal component difference and a second vertical component difference between the motion vectors of the third control point and the fourth control point comprise:

determining a motion vector of a first pixel, a motion vector of a second pixel, and a motion vector of a third pixel, wherein the first pixel, the second pixel, and the third pixel are non-overlapping pixels;

determining a second horizontal distance and a second vertical distance between the first pixel and the second pixel;

determining a third horizontal distance and a third vertical distance between the first pixel and the third pixel; and

determining the first horizontal component difference, the first vertical component difference, the second horizontal component difference, and the second vertical component difference according to the motion vector of the first pixel, the motion vector of the second pixel, the motion vector of the third pixel, the second horizontal distance, the second vertical distance, the third horizontal distance, and the third vertical distance.

10. The method according to claim 2, wherein the first control point and the third control point are the same pixel.

11. The method according to claim 2, wherein the first control point, the second control point, the third control point, and the fourth control point are vertices of the affine picture block, and the affine picture block is rectangular.

12. The method according to claim 1, wherein determining the motion vector precision of the affine picture block comprises:

determining a third preset value as the motion vector precision of the affine picture block; or

determining the motion vector precision of the affine picture block according to a feature of a picture block adjacent to the affine picture block, wherein the adjacent picture block is a picture block spatially or temporally adjacent to the affine picture block.

13. The method according to claim 1, wherein the performing coding processing on the affine picture block according to the size of the affine motion compensation picture subblock comprises:

determining a motion vector of each affine motion compensation picture subblock in the affine motion compensation picture subblocks;

determining a motion compensation prediction signal of each affine motion compensation picture subblock according to the motion vector of each affine motion compensation picture subblock;

determining a prediction residual signal of each affine motion compensation picture subblock according to the motion compensation prediction signal of each affine motion compensation picture subblock; and

coding the prediction residual signal of each affine motion compensation picture subblock.

14. The method according to claim 13, wherein the method further comprises:

filtering signals of boundary pixels of each affine motion compensation picture subblock, wherein the boundary pixels are pixels in one or more rows at a boundary of each affine motion compensation picture subblock.

15. The method according to claim 14, wherein the signal of the boundary pixel comprises a motion compensation prediction signal or a reconstructed signal, and the reconstructed signal is a sum of the motion compensation prediction signal and a reconstructed residual signal.

16. A video picture decoding method, the method comprising:

determining a motion vector difference of an affine picture block;

determining motion vector precision of the affine picture block;

determining a size of an affine motion compensation picture subblock in the affine picture block according to the motion vector difference, the motion vector precision, and a distance between control points in the affine picture block, wherein the control points are pixels used to determine the motion vector difference; and

performing decoding processing on the affine picture block according to the size of the affine motion compensation picture subblock.

17. The method according to claim 16, wherein the determining a motion vector difference of an affine picture block comprises:

determining a first component of the motion vector difference according to a difference between motion vectors of a first control point and a second control point that are located on a same horizontal line; and

determining a second component of the motion vector difference according to a difference between motion vectors of a third control point and a fourth control point that are

located on a same vertical line; wherein a first horizontal distance exists between the first control point and the second control point, and a first vertical distance exists between the third control point and the fourth control point.

18. The method according to claim 17, wherein the determining a first component of the motion vector difference according to a difference between motion vectors of a first control point and a second control point that are located on a same horizontal line comprises:

determining a first horizontal component difference and a first vertical component difference between the motion vectors of the first control point and the second control point; and

determining a larger one of the first horizontal component difference and the first vertical component difference as the first component of the motion vector difference; and

the determining a second component of the motion vector difference according to a difference between motion vectors of a third control point and a fourth control point that are located on a same vertical line comprises:

determining a second horizontal component difference and a second vertical component difference between the motion vectors of the third control point and the fourth control point; and

determining a larger one of the second horizontal component difference and the second vertical component difference as the second component of the motion vector difference.

19. The method according to claim 18, wherein the method further comprises:

determining an affine transformation parameter of a pixel in the affine picture block, wherein pixels in the affine picture block have the same affine transformation parameter;

the determining a first horizontal component difference and a first vertical component difference between the motion vectors of the first control point and the second control point comprises:

determining the first horizontal component difference and the first vertical component difference according to the affine transformation parameter and the first horizontal distance; and

the determining a second horizontal component difference and a second vertical component difference between the motion vectors of the third control point and the fourth control point comprises:

determining the second horizontal component difference and the second vertical component difference according to the affine transformation parameter and the first vertical distance.

20. The method according to claim 19, wherein the determining a size of an affine motion compensation picture subblock according to the motion vector difference, the motion vector precision, and a distance between control points in the affine picture block comprises:

determining a ratio of a product of the motion vector precision and the first horizontal distance to the first component of the motion vector difference as a length of the affine motion compensation picture subblock in a horizontal direction; and

determining a ratio of a product of the motion vector precision and the first vertical distance to the second component of the motion vector difference as a length of the affine motion compensation picture subblock in a vertical direction.

21. The method according to claim 19, wherein the determining a size of an affine motion compensation picture subblock in the affine picture block according to the motion vector difference, the motion vector precision, and a distance between control points in the affine picture block comprises:

when a ratio of a product of the motion vector precision and the first horizontal distance to the first component of the motion vector difference is greater than or equal to a first preset value, determining the ratio as a length of the affine motion compensation picture subblock in a horizontal direction; or

when a ratio of a product of the motion vector precision and the first horizontal distance to the first component of the motion vector difference is less than the first preset value, determining the first preset value as a length of the affine motion compensation picture subblock in a horizontal direction; and

when a ratio of a product of the motion vector precision and the first vertical distance to the second component of the motion vector difference is greater than or equal to a second preset value, determining the ratio as a length of the affine motion compensation picture subblock in a vertical direction; or

when a ratio of a product of the motion vector precision and the first vertical distance to the second component of the motion vector difference is less than the second preset value, determining the second preset value as a length of the affine motion compensation picture subblock in a vertical direction.

22. The method according to claim 21, wherein at least one of the first preset value and the second preset value is 4.

23. The method according to claim 18, wherein the method further comprises:

determining a motion vector of the first control point, a motion vector of the second control point, a motion vector of the third control point, and a motion vector of the fourth control point;

the determining a first horizontal component difference and a first vertical component difference between the motion vectors of the first control point and the second control point comprises: determining a difference between a horizontal component of the motion vector of the first control point and a horizontal component of the motion vector of the second control point as the first horizontal component difference; and

determining a difference between a vertical component of the motion vector of the first control point and a vertical component of the motion vector of the second control point as the first vertical component difference; and

the determining a second horizontal component difference and a second vertical component difference between the motion vectors of the third control point and the fourth control point comprises:

determining a difference between a horizontal component of the motion vector of the third control point and a horizontal component of the motion vector of the fourth control point as the second horizontal component difference; and

determining a difference between a vertical component of the motion vector of the third control point and a vertical component of the motion vector of the fourth control point as the second vertical component difference.

24. The method according to claim 18, wherein the first control point and the second control point are two adjacent pixels, and the third control point and the fourth control point are two adjacent pixels; and

the determining a first horizontal component difference and a first vertical component difference between the motion vectors of the first control point and the second control point, and the determining a second horizontal component difference and a second vertical component difference between the motion vectors of the third control point and the fourth control point comprise:

determining a motion vector of a first pixel, a motion vector of a second pixel, and a motion vector of a third pixel, wherein the first pixel, the second pixel, and the third pixel are non-overlapping pixels;

determining a second horizontal distance and a second vertical distance between the first pixel and the second pixel;

determining a third horizontal distance and a third vertical distance between the first pixel and the third pixel; and

determining the first horizontal component difference, the first vertical component difference, the second horizontal component difference, and the second vertical component difference according to the motion vector of the first pixel, the motion vector of the second pixel, the motion vector of the third pixel, the second horizontal distance, the second vertical distance, the third horizontal distance, and the third vertical distance.

25. The method according to claim 17, wherein the first control point and the third control point are the same pixel.

26. The method according to claim 17, wherein the first control point, the second control point, the third control point, and the fourth control point are vertices of the affine picture block, and the affine picture block is rectangular.

27. The method according to claim 16, wherein determining the motion vector precision of the affine picture block comprises:

determining a third preset value as the motion vector precision of the affine picture block; or

determining the motion vector precision of the affine picture block according to a feature of a picture block adjacent to the affine picture block, wherein the adjacent picture block is a picture block spatially or temporally adjacent to the affine picture block.

28. The method according to claim 16, wherein the performing decoding processing on the affine picture block according to the size of the affine motion compensation picture subblock comprises:

determining a motion vector of each affine motion compensation picture subblock in the affine motion compensation picture subblocks;

determining a motion compensation prediction signal of each affine motion compensation picture subblock according to the motion vector of each affine motion compensation picture subblock;

determining a prediction residual signal of each affine motion compensation picture subblock according to the motion compensation prediction signal of each affine motion compensation picture subblock; and

decoding the prediction residual signal of each affine motion compensation picture subblock.

29. The method according to claim 28, wherein the method further comprises:

filtering signals of boundary pixels of each affine motion compensation picture subblock, wherein the boundary pixels are pixels in one or more rows at a boundary of each affine motion compensation picture subblock.

30. The method according to claim 29, wherein the signal of the boundary pixel comprises a motion compensation prediction signal or a reconstructed signal, and the reconstructed signal is a sum of the motion compensation prediction signal and a reconstructed residual signal.

31. A coding device comprising:

a processor;

a memory storing a program to be executed in the processor, the program comprising a plurality of modules of instruction, the plurality of modules comprising:

a first determining module, configured to determine a motion vector difference of an affine picture block;

a second determining module, configured to determine motion vector precision of the affine picture block;

a third determining module, configured to determine a size of an affine motion compensation picture subblock in the affine picture block according to the motion vector difference determined by the first determining module, the motion vector precision determined by the second determining module, and a distance between control points in the affine picture block, wherein the control points are pixels used to determine the motion vector difference; and

a coding module, configured to perform coding processing on the affine picture block according to the size of the affine motion compensation picture subblock that is determined by the third determining module.

32. The coding device according to claim 31, wherein the first determining module comprises instructions for:

determining a first component of the motion vector difference according to a difference between motion vectors of a first control point and a second control point that are located on a same horizontal line; and

determining a second component of the motion vector difference according to a difference between motion vectors of a third control point and a fourth control point that are located on a same vertical line; wherein a first horizontal distance exists between the first control point and the second control point, and a first vertical distance exists between the third control point and the fourth control point.

33. The coding device according to claim 32, wherein the first determining module comprises instructions for:

determining a first horizontal component difference and a first vertical component difference between the motion vectors of the first control point and the second control point;

determining a larger one of the first horizontal component difference and the first vertical component difference as the first component of the motion vector difference;

determining a second horizontal component difference and a second vertical component difference between the motion vectors of the third control point and the fourth control point; and

determining a larger one of the second horizontal component difference and the second vertical component difference as the second component of the motion vector difference.

34. The coding device according to claim 33, wherein the first determining module comprises instructions for:

determining an affine transformation parameter of a pixel in the affine picture block, wherein pixels in the affine picture block have the same affine transformation parameter;

determining the first horizontal component difference and the first vertical component difference according to the affine transformation parameter and the first horizontal distance; and

determining the second horizontal component difference and the second vertical component difference according to the affine transformation parameter and the first vertical distance.

35. The coding device according to claim 34, wherein the third determining module comprises instructions for:

determining a ratio of a product of the motion vector precision and the first horizontal distance to the first component of the motion vector difference as a length of the affine motion compensation picture subblock in a horizontal direction; and

determining a ratio of a product of the motion vector precision and the first vertical distance to the second component of the motion vector difference as a length of the affine motion compensation picture subblock in a vertical direction.

36. The coding device according to claim 34, wherein the third determining module comprises instructions for:

when a ratio of a product of the motion vector precision and the first horizontal distance to the first component of the motion vector difference is greater than or equal to a first preset value, determining the ratio as a length of the affine motion compensation picture subblock in a horizontal direction; or

when a ratio of a product of the motion vector precision and the first horizontal distance to the first component of the motion vector difference is less than the first preset value, determining the first preset value as a length of the affine motion compensation picture subblock in a horizontal direction; and

when a ratio of a product of the motion vector precision and the first vertical distance to the second component of the motion vector difference is greater than or equal to a second

preset value, determining the ratio as a length of the affine motion compensation picture subblock in a vertical direction; or

when a ratio of a product of the motion vector precision and the first vertical distance to the second component of the motion vector difference is less than the second preset value, determining the second preset value as a length of the affine motion compensation picture subblock in a vertical direction.

37. The coding device according to claim 36, wherein at least one of the first preset value and the second preset value is 4.

38. The coding device according to claim 33, wherein the first determining module comprises instructions for:

determining a motion vector of the first control point, a motion vector of the second control point, a motion vector of the third control point, and a motion vector of the fourth control point;

determining a difference between a horizontal component of the motion vector of the first control point and a horizontal component of the motion vector of the second control point as the first horizontal component difference;

determining a difference between a vertical component of the motion vector of the first control point and a vertical component of the motion vector of the second control point as the first vertical component difference;

determining a difference between a horizontal component of the motion vector of the third control point and a horizontal component of the motion vector of the fourth control point as the second horizontal component difference; and

determining a difference between a vertical component of the motion vector of the third control point and a vertical component of the motion vector of the fourth control point as the second vertical component difference.

39. The coding device according to claim 33, wherein the first control point and the second control point are two adjacent pixels, and the third control point and the fourth control point are two adjacent pixels; and

the first determining module comprises instructions for:

determining a motion vector of a first pixel, a motion vector of a second pixel, and a motion vector of a third pixel, wherein the first pixel, the second pixel, and the third pixel are non-overlapping pixels;

determining a second horizontal distance and a second vertical distance between the first pixel and the second pixel;

determining a third horizontal distance and a third vertical distance between the first pixel and the third pixel; and

determining the first horizontal component difference, the first vertical component difference, the second horizontal component difference, and the second vertical component difference according to the motion vector of the first pixel, the motion vector of the second pixel, the motion vector of the third pixel, the second horizontal distance, the second vertical distance, the third horizontal distance, and the third vertical distance.

40. The coding device according to claim 32, wherein the first control point and the third control point are the same pixel.

41. The coding device according to claim 32, wherein the first control point, the second control point, the third control point, and the fourth control point are vertices of the affine picture block, and the affine picture block is rectangular.

42. The coding device according to claim 31, wherein the second determining module comprises instructions for:

determining a third preset value as the motion vector precision of the affine picture block; or

determining the motion vector precision of the affine picture block according to a feature of a picture block adjacent to the affine picture block, wherein the adjacent picture block is a picture block spatially or temporally adjacent to the affine picture block.

43. The coding device according to claim 31, wherein the coding module comprises instructions for:

determining a motion vector of each affine motion compensation picture subblock in the affine motion compensation picture subblocks;

determining a motion compensation prediction signal of each affine motion compensation picture subblock according to the motion vector of each affine motion compensation picture subblock;

determining a prediction residual signal of each affine motion compensation picture subblock according to the motion compensation prediction signal of each affine motion compensation picture subblock; and

code the prediction residual signal of each affine motion compensation picture subblock.

44. The coding device according to claim 43, wherein the plurality of modules further comprises:

a filtering module, configured to filter signals of boundary pixels of each affine motion compensation picture subblock, wherein the boundary pixels are pixels in one or more rows at a boundary of each affine motion compensation picture subblock.

45. The coding device according to claim 44, wherein the signal of the boundary pixel comprises a motion compensation prediction signal or a reconstructed signal, and the reconstructed signal is a sum of the motion compensation prediction signal and a reconstructed residual signal.

46. A decoding device comprising:

a processor;

a memory storing a program to be executed in the processor, the program comprising a plurality of modules of instruction, the plurality of modules comprising:

a first determining module, configured to determine a motion vector difference of an affine picture block;

a second determining module, configured to determine motion vector precision of the affine picture block;

a third determining module, configured to determine a size of an affine motion compensation picture subblock in the affine picture block according to the motion vector difference determined by the first determining module, the motion vector precision determined by the second determining module, and a distance between control points in the

affine picture block, wherein the control points are pixels used to determining the motion vector difference; and

a decoding module, configured to perform decoding processing on the affine picture block according to the size of the affine motion compensation picture subblock that is determined by the third determining module.

47. The decoding device according to claim 46, wherein the first determining module comprises instructions for:

determining a first component of the motion vector difference according to a difference between motion vectors of a first control point and a second control point that are located on a same horizontal line; and

determining a second component of the motion vector difference according to a difference between motion vectors of a third control point and a fourth control point that are located on a same vertical line; wherein a first horizontal distance exists between the first control point and the second control point, and a first vertical distance exists between the third control point and the fourth control point.

48. The decoding device according to claim 47, wherein the first determining module comprises instructions for:

determining a first horizontal component difference and a first vertical component difference between the motion vectors of the first control point and the second control point;

determining a larger one of the first horizontal component difference and the first vertical component difference as the first component of the motion vector difference;

determining a second horizontal component difference and a second vertical component difference between the motion vectors of the third control point and the fourth control point; and

determining a larger one of the second horizontal component difference and the second vertical component difference as the second component of the motion vector difference.

49. The decoding device according to claim 48, wherein the first determining module comprises instructions for:

determining an affine transformation parameter of a pixel in the affine picture block, wherein pixels in the affine picture block have the same affine transformation parameter;

determining the first horizontal component difference and the first vertical component difference according to the affine transformation parameter and the first horizontal distance; and

determining the second horizontal component difference and the second vertical component difference according to the affine transformation parameter and the first vertical distance.

50. The decoding device according to claim 49, wherein the third determining module comprises instructions for:

determining a ratio of a product of the motion vector precision and the first horizontal distance to the first component of the motion vector difference as a length of the affine motion compensation picture subblock in a horizontal direction; and

determining a ratio of a product of the motion vector precision and the first vertical distance to the second component of the motion vector difference as a length of the affine motion compensation picture subblock in a vertical direction.

51. The decoding device according to claim 49, wherein the third determining module comprises instructions for:

when a ratio of a product of the motion vector precision and the first horizontal distance to the first component of the motion vector difference is greater than or equal to a first preset value, determining the ratio as a length of the affine motion compensation picture subblock in a horizontal direction; or

when a ratio of a product of the motion vector precision and the first horizontal distance to the first component of the motion vector difference is less than the first preset value, determining the first preset value as a length of the affine motion compensation picture subblock in a horizontal direction; and

when a ratio of a product of the motion vector precision and the first vertical distance to the second component of the motion vector difference is greater than or equal to a second preset value, determining the ratio as a length of the affine motion compensation picture subblock in a vertical direction; or

when a ratio of a product of the motion vector precision and the first vertical distance to the second component of the motion vector difference is less than the second preset value, determining the second preset value as a length of the affine motion compensation picture subblock in a vertical direction.

52. The decoding device according to claim 51, wherein at least one of the first preset value and the second preset value is 4.

53. The decoding device according to claim 48, wherein the first determining module comprises instructions for:

determining a motion vector of the first control point, a motion vector of the second control point, a motion vector of the third control point, and a motion vector of the fourth control point;

determining a difference between a horizontal component of the motion vector of the first control point and a horizontal component of the motion vector of the second control point as the first horizontal component difference;

determining a difference between a vertical component of the motion vector of the first control point and a vertical component of the motion vector of the second control point as the first vertical component difference;

determining a difference between a horizontal component of the motion vector of the third control point and a horizontal component of the motion vector of the fourth control point as the second horizontal component difference; and

determining a difference between a vertical component of the motion vector of the third control point and a vertical component of the motion vector of the fourth control point as the second vertical component difference.

54. The decoding device according to claim 48, wherein the first control point and the second control point are two adjacent pixels, and the third control point and the fourth control point are two adjacent pixels; and

the first determining module comprises instructions for:

determining a motion vector of a first pixel, a motion vector of a second pixel, and a motion vector of a third pixel, wherein the first pixel, the second pixel, and the third pixel are non-overlapping pixels;

determining a second horizontal distance and a second vertical distance between the first pixel and the second pixel;

determining a third horizontal distance and a third vertical distance between the first pixel and the third pixel; and

determining the first horizontal component difference, the first vertical component difference, the second horizontal component difference, and the second vertical component difference according to the motion vector of the first pixel, the motion vector of the second pixel, the motion vector of the third pixel, the second horizontal distance, the second vertical distance, the third horizontal distance, and the third vertical distance.

55. The decoding device according to claim 47, wherein the first control point and the third control point are the same pixel.

56. The decoding device according to claim 47, wherein the first control point, the second control point, the third control point, and the fourth control point are vertices of the affine picture block, and the affine picture block is rectangular.

57. The decoding device according to claim 46, wherein the second determining module comprises instructions for:

determining a third preset value as the motion vector precision of the affine picture block; or

determining the motion vector precision of the affine picture block according to a feature of a picture block adjacent to the affine picture block, wherein the adjacent picture block is a picture block spatially or temporally adjacent to the affine picture block.

58. The decoding device according to claim 46, wherein the decoding module comprises instructions for:

determining a motion vector of each affine motion compensation picture subblock in the affine motion compensation picture subblocks;

determining a motion compensation prediction signal of each affine motion compensation picture subblock according to the motion vector of each affine motion compensation picture subblock;

determining a prediction residual signal of each affine motion compensation picture subblock according to the motion compensation prediction signal of each affine motion compensation picture subblock; and

decode the prediction residual signal of each affine motion compensation picture subblock.

59. The decoding device according to claim 58, wherein the plurality of modules further comprises:

a filtering module, configured to filter signals of boundary pixels of each affine motion compensation picture subblock, wherein the boundary pixels are pixels in one or more rows at a boundary of each affine motion compensation picture subblock.

60. The decoding device according to claim 59, wherein the signal of the boundary pixel comprises a motion compensation prediction signal or a reconstructed signal, and the reconstructed signal is a sum of the motion compensation prediction signal and a reconstructed residual signal.