

CLAIMS

1. A picture processing method, comprising:

obtaining a motion vector 2-tuple of a current picture block, wherein the motion vector 2-tuple comprises motion vectors of two pixel samples in a video frame to which the current picture block belongs; and

obtaining a motion vector of any pixel sample in the current picture block through computation by using an affine motion model and the motion vector 2-tuple; wherein the affine motion model is in the following form:

$$\begin{cases} vx = ax + by \\ vy = -bx + ay \end{cases}, \text{ wherein}$$

(x, y) are coordinates of the any pixel sample, vx is a horizontal component of the motion vector of the any pixel sample, and vy is a vertical component of the motion vector of the any pixel sample; and

in the equation $vx = ax + by$, a is a horizontal coordinate coefficient of the horizontal component of the affine motion model, and b is a vertical coordinate coefficient of the horizontal component of the affine motion model; and in the equation

$vy = -bx + ay$, a is a vertical coordinate coefficient of the vertical component of the affine motion model, and -b is a horizontal coordinate coefficient of the vertical component of the affine motion model, and wherein the obtaining a motion vector of any pixel sample in the current picture block through computation by using an affine motion model and the motion vector 2-tuple comprises:

obtaining values of the coefficients of the affine motion model by using the motion vectors of the two pixel samples and locations of the two pixel samples; and

obtaining the motion vector of the any pixel sample in the current picture block by using the affine motion model and the values of the coefficients of the affine motion model.

2. The method according to claim 1, wherein the affine motion model further comprises a horizontal displacement coefficient c of the horizontal component of the affine motion model and a vertical displacement coefficient d of the vertical component of the affine motion model, and therefore, the affine motion model is in the following form:

$$\begin{cases} vx = ax + by + c \\ vy = -bx + ay + d \end{cases}$$

3. The method according to claim 1 or 2, wherein the obtaining a motion vector of any pixel sample in the current picture block through computation by using an affine motion model and the motion vector 2-tuple comprises:

obtaining the values of the coefficients of the affine motion model by using a ratio of a difference between horizontal components of the motion vectors of the two pixel samples to a distance between the two pixel samples and a ratio of a difference between vertical components of the motion vectors of the two pixel samples to the distance between the two pixel samples; and

obtaining the motion vector of the any pixel sample in the current picture block by using the affine motion model and the values of the coefficients of the affine motion model.

4. The method according to claim 1 or 2, wherein the obtaining a motion vector of any pixel sample in the current picture block through computation by using an affine motion model and the motion vector 2-tuple comprises:

obtaining the values of the coefficients of the affine motion model by using a ratio of a weighted sum of components of the motion vectors of the two pixel samples to a distance between the two pixel samples or to a square of a distance between the two pixel samples; and

obtaining the motion vector of the any pixel sample in the current picture block by using the affine motion model and the values of the coefficients of the affine motion model.

5. The method according to any one of claims 1 to 3, wherein when the two pixel samples comprise an upper left pixel sample of the current picture block and a pixel sample in a right region on a right side of the upper left pixel sample, the affine motion model is specifically:

$$\begin{cases} vx = \frac{vx_1 - vx_0}{w} x - \frac{vy_1 - vy_0}{w} y + vx_0 \\ vy = \frac{vy_1 - vy_0}{w} x + \frac{vx_1 - vx_0}{w} y + vy_0 \end{cases}, \text{ wherein}$$

(vx_0, vy_0) are a motion vector of the upper left pixel sample, (vx_1, vy_1) are a motion vector of the pixel sample in the right region, and w is a distance between the two pixel samples.

6. The method according to any one of claims 1 to 3, wherein when the two pixel samples comprise an upper left pixel sample of the current picture block and a pixel sample in a lower region below the upper left pixel sample, the affine motion model is specifically:

$$\begin{cases} vx = \frac{vy_2 - vy_0}{h}x + \frac{vx_2 - vx_0}{h}y + vx_0 \\ vy = -\frac{vx_2 - vx_0}{h}x + \frac{vy_2 - vy_0}{h}y + vy_0 \end{cases}, \text{ wherein}$$

(vx_0, vy_0) are a motion vector of the upper left pixel sample, (vx_2, vy_2) are a motion vector of the pixel sample in the lower region, and h is a distance between the two pixel samples.

7. The method according to any one of claim 1, 2, or 4, wherein when the two pixel samples comprise an upper left pixel sample of the current picture block and a pixel sample in a lower right region on a lower right side of the upper left pixel sample, the affine motion model is specifically:

$$\begin{cases} vx = \frac{(vx_2w_1 + vy_2h_1) - (vx_0w_1 + vy_0h_1)}{w_1^2 + h_1^2}x + \frac{(vx_2h_1 - vy_2w_1) - (vx_0h_1 - vy_0w_1)}{w_1^2 + h_1^2}y + vx_0 \\ vy = -\frac{(vx_2h_1 - vy_2w_1) - (vx_0h_1 - vy_0w_1)}{w_1^2 + h_1^2}x + \frac{(vx_2w_1 + vy_2h_1) - (vx_0w_1 + vy_0h_1)}{w_1^2 + h_1^2}y + vy_0 \end{cases},$$

wherein

(vx_0, vy_0) are a motion vector of the upper left pixel sample, (vx_3, vy_3) are a motion vector of the pixel sample in the lower right region, h_1 is a distance in a vertical direction between the two pixel samples, w_1 is a distance in a horizontal direction between the two pixel samples, and $w_1^2 + h_1^2$ is a square of the distance between the two pixel samples.

8. The method according to any one of claims 1 to 7, wherein after the obtaining a motion vector of any pixel sample in the current picture block through computation by

using an affine motion model and the motion vector 2-tuple, the method further comprises:
performing motion compensation predictive coding on the any pixel sample in the current picture block by using the motion vector that is of the any pixel sample in the current picture block and is obtained through computation.

9. The method according to any one of claims 1 to 7, wherein after the obtaining a motion vector of any pixel sample in the current picture block through computation by using an affine motion model and the motion vector 2-tuple, the method further comprises:
performing motion compensation decoding on the any pixel sample by using the motion vector that is of the any pixel sample in the current picture block to obtain a pixel reconstruction value of the any pixel sample.

10. A picture processing apparatus, wherein the apparatus comprises:
an obtaining unit, configured to obtain a motion vector 2-tuple of a current picture block, wherein the motion vector 2-tuple comprises motion vectors of two pixel samples in a video frame to which the current picture block belongs; and
a computation unit, configured to obtain a motion vector of any pixel sample in the current picture block through computation by using an affine motion model and the motion vector 2-tuple obtained by the obtaining unit; wherein
the affine motion model is in the following form:

$$\begin{cases} vx = ax + by \\ vy = -bx + ay \end{cases}, \text{ wherein}$$

(x, y) are coordinates of the any pixel sample, vx is a horizontal component of the motion vector of the any pixel sample, and vy is a vertical component of the motion vector of the any pixel sample; and

in the equation $vx = ax + by$, a is a horizontal coordinate coefficient of the horizontal component of the affine motion model, and b is a vertical coordinate coefficient of the horizontal component of the affine motion model; and in the equation $vy = -bx + ay$, a is a vertical coordinate coefficient of the vertical component of the affine motion model, and -b is a horizontal coordinate coefficient of the vertical component of the affine motion model, wherein the computation unit is specifically configured to:

obtain values of the coefficients of the affine motion model by using the motion vectors of the two pixel samples and locations of the two pixel samples; and

obtain the motion vector of the any pixel sample in the current picture block by using the affine motion model and the values of the coefficients of the affine motion model.

11. The apparatus according to claim 10, wherein the affine motion model further comprises a horizontal displacement coefficient c of the horizontal component of the affine motion model and a vertical displacement coefficient d of the vertical component of the affine motion model, and therefore, the affine motion model is in the following form:

$$\begin{cases} vx = ax + by + c \\ vy = -bx + ay + d \end{cases}$$

12. The apparatus according to claim 10 or 11, wherein the computation unit is specifically configured to:

obtain the values of the coefficients of the affine motion model by using a ratio of a difference between horizontal components of the motion vectors of the two pixel samples to a distance between the two pixel samples and a ratio of a difference between vertical components of the motion vectors of the two pixel samples to the distance between the two pixel samples; and

obtain the motion vector of the any pixel sample in the current picture block by using the affine motion model and the values of the coefficients of the affine motion model.

13. The apparatus according to any one of claims 10 to 12, wherein the computation unit is specifically configured to:

obtain the values of the coefficients of the affine motion model by using a ratio of a weighted sum of components of the motion vectors of the two pixel samples to a distance between the two pixel samples or to a square of a distance between the two pixel samples; and

obtain the motion vector of the any pixel sample in the current picture block by using the affine motion model and the values of the coefficients of the affine motion model.

14. The apparatus according to any one of claims 10 to 12, wherein when the two pixel samples comprise an upper left pixel sample of the current picture block and a pixel sample in a right region on a right side of the upper left pixel sample, the affine motion

model is specifically:

$$\begin{cases} vx = \frac{vx_1 - vx_0}{w} x - \frac{vy_1 - vy_0}{w} y + vx_0 \\ vy = \frac{vy_1 - vy_0}{w} x + \frac{vx_1 - vx_0}{w} y + vy_0 \end{cases}, \text{ wherein}$$

(vx_0, vy_0) are a motion vector of the upper left pixel sample, (vx_1, vy_1) are a motion vector of the pixel sample in the right region, and w is a distance between the two pixel samples.

15. The apparatus according to any one of claims 10 to 12, wherein when the two pixel samples comprise an upper left pixel sample of the current picture block and a pixel sample in a lower region below the upper left pixel sample, the affine motion model is specifically:

$$\begin{cases} vx = \frac{vy_2 - vy_0}{h} x + \frac{vx_2 - vx_0}{h} y + vx_0 \\ vy = -\frac{vx_2 - vx_0}{h} x + \frac{vy_2 - vy_0}{h} y + vy_0 \end{cases}, \text{ wherein}$$

(vx_0, vy_0) are a motion vector of the upper left pixel sample, (vx_2, vy_2) are a motion vector of the pixel sample in the lower region, and h is a distance between the two pixel samples.

16. The apparatus according to any one of claim 10, 11, or 13, wherein when the two pixel samples comprise an upper left pixel sample of the current picture block and a pixel sample in a lower right region on a lower right side of the upper left pixel sample, the affine motion model is specifically:

$$\begin{cases} vx = \frac{(vx_3w_1 + vy_3h_1) - (vx_0w_1 + vy_0h_1)}{w_1^2 + h_1^2} x + \frac{(vx_3h_1 - vy_3w_1) - (vx_0h_1 - vy_0w_1)}{w_1^2 + h_1^2} y + vx_0 \\ vy = -\frac{(vx_3h_1 - vy_3w_1) - (vx_0h_1 - vy_0w_1)}{w_1^2 + h_1^2} x + \frac{(vx_3w_1 + vy_3h_1) - (vx_0w_1 + vy_0h_1)}{w_1^2 + h_1^2} y + vy_0 \end{cases},$$

wherein

(vx_0, vy_0) are a motion vector of the upper left pixel sample, (vx_3, vy_3) are a motion vector of the pixel sample in the lower right region, h_1 is a distance in a vertical direction between the two pixel samples, w_1 is a distance in a horizontal direction between the two

pixel samples, and $w_1^2 + h_1^2$ is a square of the distance between the two pixel samples.

17. The apparatus according to any one of claims 10 to 16, wherein when the picture processing apparatus is applied to a video coding apparatus, the apparatus further comprises an encoding unit, configured to perform motion compensation predictive coding on the any pixel sample in the current picture block by using the motion vector that is of the any pixel sample in the current picture block and is obtained by the computation unit through computation.

18. The apparatus according to any one of claims 10 to 16, wherein when the picture processing apparatus is applied to a video decoding apparatus, the apparatus further comprises a decoding unit, configured to perform motion compensation decoding on the any pixel sample by using the motion vector that is of the any pixel sample in the current picture block and is obtained by the computation unit through computation to obtain a pixel reconstruction value of the any pixel sample.

19. A picture processing method, comprising:

obtaining coefficients of an affine motion model, and obtaining a motion vector of any pixel sample in a current picture block through computation by using the coefficients of the affine motion model and the affine motion model, wherein the obtaining a motion vector of any pixel sample in the current picture block through computation by using the coefficients of the affine motion model and the affine motion model comprises:

obtaining values of the coefficients of the affine motion model by using the motion vectors of the two pixel samples and locations of the two pixel samples; and

obtaining the motion vector of the any pixel sample in the current picture block by using the affine motion model and the values of the coefficients of the affine motion model; and

determining a predicted pixel value of a pixel of the any pixel sample by using the motion vector that is of the any pixel sample and is obtained through computation; wherein

the affine motion model is in the following form:

$$\begin{cases} vx = ax + by \\ vy = -bx + ay \end{cases}, \text{ wherein}$$

(x, y) are coordinates of the any pixel sample, vx is a horizontal component of the motion vector of the any pixel sample, and vy is a vertical component of the motion vector of the any pixel sample;

in the equation $vx = ax + by$, a is a horizontal coordinate coefficient of the horizontal component of the affine motion model, and b is a vertical coordinate coefficient of the horizontal component of the affine motion model; and in the equation $vy = -bx + ay$, a is a vertical coordinate coefficient of the vertical component of the affine motion model, -b is a horizontal coordinate coefficient of the vertical component of the affine motion model, and the coefficients of the affine motion model comprise a and b; and

the coefficients of the affine motion model further comprise a horizontal displacement coefficient c of the horizontal component of the affine motion model and a vertical displacement coefficient d of the vertical component of the affine motion model, and therefore, the affine motion model is in the following form:

$$\begin{cases} vx = ax + by + c \\ vy = -bx + ay + d \end{cases}$$

20. A picture processing apparatus, comprising:

an obtaining unit, configured to obtain coefficients of an affine motion model;

a computation unit, configured to obtain a motion vector of any pixel sample in the current picture block through computation by using the coefficients of the affine motion model that are obtained by the obtaining unit and the affine motion model, wherein the computation unit is specifically configured to:

obtain values of the coefficients of the affine motion model by using the motion vectors of the two pixel samples and locations of the two pixel samples; and

obtain the motion vector of the any pixel sample in the current picture block by using the affine motion model and the values of the coefficients of the affine motion model; and

a predicting unit, configured to determine a predicted pixel value of a pixel of the any pixel sample by using the motion vector that is of the any pixel sample and is obtained by the computation unit through computation; wherein

the affine motion model is in the following form:

$$\begin{cases} vx = ax + by \\ vy = -bx + ay \end{cases}, \text{ wherein}$$

(x, y) are coordinates of the any pixel sample, vx is a horizontal component of the motion vector of the any pixel sample, and vy is a vertical component of the motion vector of the any pixel sample;

in the equation $vx = ax + by$, a is a horizontal coordinate coefficient of the horizontal component of the affine motion model, and b is a vertical coordinate coefficient of the horizontal component of the affine motion model; and in the equation

$vy = -bx + ay$, a is a vertical coordinate coefficient of the vertical component of the affine motion model, -b is a horizontal coordinate coefficient of the vertical component of the affine motion model, and the coefficients of the affine motion model comprise a and b; and

the coefficients of the affine motion model further comprise a horizontal displacement coefficient c of the horizontal component of the affine motion model and a vertical displacement coefficient d of the vertical component of the affine motion model, and therefore, the affine motion model is in the following form:

$$\begin{cases} vx = ax + by + c \\ vy = -bx + ay + d \end{cases}$$