

CLAIMS

What is claimed is:

1. An image stitching method, comprising:

acquiring brightness compensation information of each of a plurality of input images to be
5 stitched, the plurality of input images being correspondingly captured by a plurality of cameras
arranged on different parts of an apparatus respectively;

performing a brightness compensation on the input images respectively based on the
brightness compensation information of each input image; and

10 stitching the input images subjected to the brightness compensation to obtain a stitched
image.

2. The method according to claim 1, wherein at least two adjacent images in the plurality
of input images have an overlapping area; or

wherein every two adjacent images in the plurality of input images have an overlapping
area

15 3. The method according to claim 1, wherein the plurality of cameras include: at least one
camera arranged at a head position of the vehicle, at least one camera arranged at a rear
position of the vehicle, at least one camera arranged at a middle section of one side of a vehicle
body, and at least one camera arranged in the middle section of the other side of the vehicle
body; or

20 the plurality of cameras include: at least one camera arranged at the head position of the
vehicle, at least one camera arranged at the rear position of the vehicle, at least two cameras
arranged respectively in a front half section and a rear half section of one side of the vehicle
body, and at least two cameras respectively arranged in the front half section and the rear half
section of the other side of the vehicle body.

25 4. The method according to any one of claims 1 to 3, wherein acquiring the brightness
compensation information of each of the plurality of input images to be stitched comprises:

determining the brightness compensation information of each of the plurality of input
images based an overlapping area in the plurality of input images.

30 5. The method according to claim 4, wherein the brightness compensation information of
each input image is used such that brightness difference between the input images subjected to
the brightness compensation falls within a preset brightness tolerance range; or

wherein the brightness compensation information of each input image is used such that
the sum of the differences in pixel values between every two input images in the overlapping
area subjected to the brightness compensation is minimum or less than a preset error value.

35 6. The method according to any one of claims 1 to 5, wherein performing the brightness

compensation on input images respectively based on the brightness compensation information of each input image comprises:

acquiring, for each output sub-block respectively, an input image block in an input image corresponding to the output sub-block; and

performing, based on the brightness compensation information of the input image where the input image block is located, the brightness compensation on the input image block.

7. The method according to claim 6, wherein when the input image block corresponding to the output sub-block belongs to an overlapping area of adjacent input images, acquiring the input image block in the input image corresponding to the output sub-block comprises:

acquiring input image blocks in all input images that correspond to the output sub-blocks and have the overlapping area; or

wherein acquiring the input image block in the input image corresponding to the output sub-block comprises:

acquiring position information of the input image block in the input image corresponding to coordinate information of the output sub-block, and

acquiring, based on the position information of the input image block, the input image block from the corresponding input image; or

wherein performing, based on the brightness compensation information of the input image where the input image block is located, the brightness compensation on the input image block comprises:

performing, for each channel of the input image block respectively, multiplication processing on pixel values of each pixel in the input image block in the channel by brightness compensation information of the input image in the channel.

8. The method according to claim 6 or 7, wherein after performing, based on the brightness compensation information of the input image where the input image block is located, the brightness compensation on the input image block, the method further comprises: performing, based on a coordinate of each pixel in the output sub-block and a coordinate in corresponding input image block, interpolation on the input image block to obtain the output image block on the output sub-block, and

stitching the input images subjected to the brightness compensation to obtain the stitched image comprises: stitching the output image blocks to obtain the stitched image.

9. The method according to claim 8, wherein when the input image block corresponding to the output sub-block belongs to an overlapping area of adjacent input images, performing the interpolation on the input image block to obtain the output image block comprises:

performing the interpolation respectively on each of the input image blocks corresponding

to the output sub-blocks, and superimposing all the interpolated input image blocks corresponding to the output sub-blocks, to obtain the output image blocks.

10. The method according to claim 9, wherein superimposing all the interpolated input image blocks corresponding to the output sub-blocks comprises:

5 acquiring, for each channel of each of the interpolated input image blocks respectively, an average, a weighted value, or a weighted average of pixel values of each pixel in at least two different resolutions, the at least two different resolutions including resolution of the interpolated input image block and at least one resolution lower than the resolution of the interpolated input image block; and

10 performing, for each channel of all the interpolated input image blocks corresponding to the output sub-blocks respectively, a weighted superposition in accordance with the average value, the weighted value, or the weighted average of the pixel values of each pixel.

11. The method according to any one of claims 8 to 10, further comprising:

15 acquiring, based on fusion transformation information from the plurality of images correspondingly captured by the plurality of cameras to the stitched image, a coordinate of a pixel in an input sub-block of the captured image corresponding to a coordinate of each pixel in the output sub-block;

20 acquiring position information of the input sub-block and overlapping attribute information indicating whether the input sub-block belongs to an overlapping area of any two captured images; and

 recording, in a stitching information table, relevant information of each output sub-block through an information table sub-block in an order of the output sub-blocks,

25 wherein acquiring the input image block in the input image corresponding to the output sub-block comprises: reading in sequence an information table sub-block from the stitching information table, and acquiring, based on the relevant information of the output sub-block recorded in the read information table sub-block, the input image block corresponding to the recorded output sub-block.

30 12. The method according to claim 11, wherein the relevant information of the output sub-block includes: position information of the output sub-block, overlapping attribute information of the input sub-block corresponding to the output sub-block, an identifier of the input image to which the input sub-block corresponding to the output sub-block belongs, a coordinate of each pixel in the output sub-block corresponding to a coordinate of a pixel in the input sub-block, and position information of the input sub-block; or

 wherein the method further comprises:

35 acquiring fusion transformation information based on various transformation information

from the plurality of images correspondingly captured by the plurality of cameras to the stitched image, wherein the various transformation information includes lens distortion removal information, viewing angle transformation information, and registration information; or

5 wherein the method further comprises:

in response to a change in position and/or direction of one or more of the plurality of cameras, performing following steps again:

acquiring, based on the fusion transformation information from the plurality of images correspondingly captured by the plurality of cameras to the stitched image, the coordinate of the pixel in the input sub-block of the captured image corresponding to the coordinate of each pixel in the output sub-block,

acquiring the position information of the input sub-block and the overlapping attribute information indicating whether the input sub-block belongs to the overlapping area of any two captured images, and

15 recording, in the stitching information table, the relevant information of each output sub-block through the information table sub-block in the order of the output sub-blocks; or

wherein the method further comprises:

reading, after the relevant information of all the output sub-blocks is recorded in the stitching information table, the stitching information table into a memory, and

20 reading, into the memory, the plurality of input images to be stitched that are captured by the plurality of cameras,

wherein reading in sequence the information table sub-block from the stitching information table, and acquiring, based on the relevant information of the output sub-block recorded in the read information table sub-block, the input image block corresponding to the recorded output sub-block comprise: reading out in sequence the information table sub-block from the stitching information table in the memory and reading it into a computation chip; and acquiring from the memory, based on the relevant information of the output sub-block recorded in the read information table sub-block, the input image block corresponding to the recorded output sub-block and reading it into the computation chip, and

30 wherein stitching the output image blocks to obtain the stitched image comprises:

writing the acquired output image blocks in sequence back into the memory, and

obtaining the stitched image, in response to writing all the output image blocks of the stitched image corresponding to the stitching information table back into the memory.

13. The method according to claim 11 or 12, further comprising:

35 acquiring, based on an overlapping area of the plurality of images correspondingly

captured by the plurality of cameras, brightness compensation information of each of the plurality of captured images, and storing it in the stitching information table or the information table sub-blocks of the stitching information table,

wherein acquiring the brightness compensation information of each of the plurality of input images comprises:

acquiring brightness compensation information of images that are captured by the same camera from the stitching information table or the information table sub-block respectively, as the brightness compensation information of corresponding input image.

14. The method according to claim 13, further comprising:

in response to a light change satisfying a predetermined condition, acquiring again, based on the overlapping area of the plurality of images captured by the plurality of cameras, the brightness compensation information of each of the plurality of captured images; and updating the brightness compensation information of each captured image in the stitching information table by the newly acquired brightness compensation information of each captured image.

15. The method according to claim 13 or 14, wherein acquiring, based on the overlapping area of the plurality of images captured by the plurality of cameras, the brightness compensation information of each of the plurality of captured images comprises:

acquiring, for each channel of the captured image respectively, the brightness compensation information of each of the plurality of captured images in the channel in such a way that after the brightness compensation is performed, the sum of differences in pixel values in the channel between every two captured images in the overlapping area of the plurality of captured images is minimized.

16. The method according to claim 15, wherein for each channel of the captured image, the sum of differences in pixel values in the channel between every two captured images in the overlapping area of the plurality of captured images is obtained by:

acquiring, for each channel of the captured image respectively, the sum of absolute values of the weighted differences between pixel values, in an overlapping area, of two captured images each having the same overlapping area, or the sum of the squares of the weighted differences between pixel values, in the overlapping area, of two captured images each having the same overlapping area,

wherein the weighted differences between pixel values, in the overlapping area, of the two captured images include a difference between a first product and a second product; the first product includes a product of the brightness compensation information of a first captured image and the sum of pixel values of at least one pixel in the overlapping area of the first

captured image, and the second product includes a second product of the brightness compensation information of a second captured image and the sum of pixel values of at least one pixel in the overlapping area of the second captured image.

17. An image stitching device, comprising:

- 5 a first acquisition module configured to acquire brightness compensation information of each of a plurality of input images to be stitched, the plurality of input images being correspondingly captured by a plurality of cameras respectively;
- a compensation module configured to perform a brightness compensation on the input images respectively based on the brightness compensation information of each input image;
- 10 and
- a stitching module configured to stitch the input images subjected to the brightness compensation to obtain a stitched image.

18. An electronic apparatus, comprising:

- a memory configured to store a computer program; and
- 15 a processor configured to execute a computer program stored in the memory, and to implement, when the computer program is executed, the method according to any one of claims 1 to 16.

19. A computer-readable storage medium on which a computer program is stored, wherein when the computer program is executed by a processor, the method according to any one of
- 20 claims 1 to 16 is implemented.

20. A computer program, comprising a computer readable code, wherein when the computer readable code is run in an apparatus, a processor in the apparatus executes an instruction used to implement the method according to any one of claims 1 to 16.