

CLAIMS

1. An image lighting method, comprising:

5 determining a convolutional neural network corresponding to a lighting operation type of an initial image;

obtaining local feature information and global feature information of the initial image by means of the convolutional neural network;

obtaining, based on the local feature information and the global feature information, fusion feature information of the initial image by means of the convolutional neural network;

10 obtaining, based on a luminance component map of the initial image, a maximum pooling result map and a minimum pooling result map by means of the convolutional neural network;

15 obtaining, based on the fusion feature information, the maximum pooling result map, and the minimum pooling result map, a bilateral grid matrix of the initial image, wherein the bilateral grid matrix is sampling two dimensions, which are a space domain and a range domain, of the initial image; and

performing affine transformation on the initial image according to the bilateral grid matrix to obtain a target image, the target image being an image obtained after lighting the initial image according to the lighting operation type.

20 2. The method according to claim 1, wherein the performing affine transformation on the initial image according to the bilateral grid matrix to obtain a target image comprises:

slicing the luminance component map of the initial image according to the bilateral grid matrix, the maximum pooling result map, and the minimum pooling result map to obtain an affine transformation matrix; and

25 performing affine transformation on the initial image according to the affine transformation matrix to obtain the target image.

3. The method according to claim 1, wherein the obtaining local feature information and global feature information of the initial image by means of the convolutional neural network comprises:

inputting the luminance component map of the initial image to the convolutional neural network to obtain the local feature information and the global feature information of the initial image;

wherein the performing affine transformation on the initial image according to the bilateral grid matrix to obtain a target image comprises:

slicing the luminance component map of the initial image according to the bilateral grid matrix, the maximum pooling result map, and the minimum pooling result map to obtain a residual matrix; and

obtaining the target image according to the residual matrix and the initial image,

wherein the obtaining the target image according to the residual matrix and the initial image comprises: adding values of pixel points at a same position of the residual matrix and the luminance component map of the initial image to obtain the target image.

4. The method according to any one of claims 1 to 3, wherein the obtaining local feature information and global feature information of the initial image by means of the convolutional neural network comprises:

inputting the initial image and a face mask map of the initial image to the convolutional neural network;

obtaining the local feature information and the global feature information of the initial image.

5. The method according to any one of claims 1 to 3, wherein the obtaining local feature information and global feature information of the initial image by means of the convolutional neural network comprises:

inputting the initial image to a low hierarchy feature extraction layer of the convolutional neural network;

obtaining low hierarchy feature information of the initial image;

inputting the low hierarchy feature information of the initial image to a local feature extraction layer of the convolutional neural network;

obtaining the local feature information of the initial image;

5 inputting the low hierarchy feature information of the initial image to a global feature extraction layer of the convolutional neural network; and

obtaining the global feature information of the initial image.

6. The method according to any one of claims 1 to 3, wherein before the obtaining local feature
10 information and global feature information of the initial image by means of the convolutional neural network, the method further comprises:

performing face correction on the luminance component map of the initial image according to the face mask map of the initial image;

obtaining a corrected image; and

15 the obtaining local feature information and global feature information of the initial image by means of the convolutional neural network comprises:

obtaining, based on the corrected image, the local feature information and the global feature information of the initial image by means of the convolutional neural network.

7. The method according to any one of claims 1 to 3, wherein before the obtaining local feature
20 information and global feature information of the initial image by means of the convolutional neural network, the method further comprises:

shrinking the initial image.

8. The method according to claim 7, wherein after the performing affine transformation on the
25 initial image according to the bilateral grid matrix to obtain a target image, the method further comprises:

amplifying the target image;

obtaining a target image having the same size as the initial image.

9. The method according to any one of claims 1 to 3, wherein after the performing affine
5 transformation on the initial image according to the bilateral grid matrix to obtain a target image,
the method further comprises:

obtaining a portrait division map of the target image;

performing rapid guide filtering on the portrait division map by using the target image as
a guide;

10 obtaining an initial weight map;

obtaining an initial spotlight luminous effect weight map according to a face mask map of
the initial image;

obtaining a portrait spotlight luminous effect weight map according to the initial spotlight
luminous effect weight map and the initial weight map; and

15 obtaining an image with added spotlight luminous effect according to the portrait
spotlight luminous effect weight map and the target image.

10. The method according to claim 9, wherein the obtaining an image with added spotlight
luminous effect according to the portrait spotlight luminous effect weight map and the target
20 image comprises:

obtaining, by using the following formulas, the image I_{out} with added spotlight
luminous effect according to the portrait spotlight luminous effect weight map W and the target
image I_{in} ;

$$\begin{aligned} I_{out}[i, j, 1] &= I_{in}[i, j, 1] \times W[i, j]; \\ I_{out}[i, j, 2] &= (I_{in}[i, j, 2] - 0.5) \times \min(1, W[i, j] \times 1.5) + 0.5; \\ I_{out}[i, j, 3] &= (I_{in}[i, j, 3] - 0.5) \times \min(1, W[i, j] \times 1.5) + 0.5; \end{aligned}$$

wherein a value range of i is $[0, N-1]$, a value range of j is $[0, M-1]$, values of M and N

are integers greater than 1, N is a total row number of the target image, and M is a total column number of the target image.

11. The method according to claim 9, wherein the obtaining the portrait division map of the
5 target image comprises:

performing portrait division on the target image;

obtaining a portrait foreground map;

performing key point extraction on the target image;

obtaining a portrait face map; and

10 obtaining a portrait division map according to the portrait foreground map and the portrait face map.

12. The method according to claim 11, wherein the obtaining a portrait division map according to the portrait foreground map and the portrait face map comprises:

15 traversing all pixel points in the portrait foreground map S_w ;

for any one pixel point $S_w(i, j)$ in the portrait foreground map S_w , if a pixel point $S_f(i, j)$ at a same position in the portrait face map S_f belongs to a part of a portrait, determining whether values of the pixel point $S_w(i, j)$ and the pixel point $S_f(i, j)$ are all 1;

if not, amending the value of the pixel point $S_w(i, j)$ in the portrait foreground map S_w
20 to 0; and

obtaining the portrait division map;

wherein a value range of i is $[0, N-1]$, a value range of j is $[0, M-1]$, values of M and N are integers greater than 1, N is a total row number of the target image, and M is a total column number of the target image.

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13. The method according to any one of claim 4, 6, or 9, wherein the face mask map further comprises at least one of nose shadow information of a face, nose wing information of the face, nose tip information of the face, cheek information of the face, temple information of the face, or skin color type information of the face.

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14. The method according to any one of claims 1 to 3, wherein the lighting operation type comprises rimming light, photographic studio light, stage light, monochromatic light, two-color light, or polychromatic light.

10 15. An image lighting apparatus, comprising:

a convolutional neural network obtaining module, configured to determine a convolutional neural network corresponding to a lighting operation type of an initial image;

a feature information obtaining module, configured to obtain local feature information and global feature information of the initial image by means of the convolutional neural network;

15 a fusion feature information obtaining module, configured to obtain, based on the local feature information and the global feature information, fusion feature information of the initial image by means of the convolutional neural network;

20 a pooling result map obtaining module, configured to obtain, based on a luminance component map of the initial image, a maximum pooling result map and a minimum pooling result map by means of the convolutional neural network;

a bilateral grid matrix obtaining module, configured to obtain, based on the fusion feature information, the maximum pooling result map, and the minimum pooling result map, a bilateral grid matrix of the initial image, wherein the bilateral grid matrix is sampling two dimensions, which are a space domain and a range domain, of the initial image; and

25 a target image obtaining module, configured to perform affine transformation on the initial image according to the bilateral grid matrix to obtain a target image, the target image being an image obtained after lighting the initial image according to the lighting operation type.

16. An electronic device, comprising:

a memory, configured to store program instructions; and

5 a processor, configured to invoke and execute the program instructions in the memory to execute the image lighting method according to any one of claims 1 to 14.

17. A readable storage medium having computer programs stored thereon, wherein the computer programs are used for executing the image lighting method according to any one of claims 1 to 14.

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