CLAIMS

What is claimed is:

1. A network training method, comprising:

inputting an implicit vector into a pre-trained generative network to obtain a first generated image, wherein the generative network being obtained with a discriminative network through adversarial trainings with a plurality of natural images;

performing a degradation process on the first generated image to obtain a first degraded image of the first generated image; and

training the implicit vector and the generative network according to the first degraded image and a second degraded image of a target image, wherein a trained generative network and a trained implicit vector are used to generate a reconstructed image of the target image.

2. The method according to claim 1, wherein training the implicit vector and the generative network according to the first degraded image and the second degraded image of the target image includes:

inputting the first degraded image and the second degraded image of the target image respectively into a pre-trained discriminative network for processing, to obtain a first discriminative feature of the first degraded image and a second discriminative feature of the second degraded image; and

training the implicit vector and the generative network according to the first discriminative feature and the second discriminative feature.

3. The method according to claim 2, wherein the discriminative network includes multiple levels of discriminative network blocks, and

inputting the first degraded image and the second degraded image of the target image respectively into the pre-trained discriminative network for processing to obtain the first discriminative feature of the first degraded image and the second discriminative feature of the second degraded image includes:

inputting the first degraded image into the discriminative network for processing to obtain a plurality of first discriminative features outputted by the multiple levels of discriminative network blocks of the discriminative network; and

inputting the second degraded image into the discriminative network for processing to obtain a plurality of second discriminative features outputted by the multiple levels of discriminative network blocks of the discriminative network.

4. The method according to claim 2 or 3, wherein training the implicit vector and the generative network according to the first discriminative feature and the second discriminative feature includes:

determining a network loss of the generative network according to a distance between the first discriminative feature and the second discriminative feature; and

training the implicit vector and the generative network according to the network loss of the generative network.

5. The method according to claim 4, wherein the generative network includes N levels of generative network blocks, and

training the implicit vector and the generative network according to the network loss of the generative network includes:

training first n levels of generative network blocks of the generative network according to the network loss of the generative network after an $(n-1)^{th}$ round of training, to obtain the generative network after an n^{th} round of training, where $1 \leq n \leq N$, and n and N are integers.

6. The method according to any one of claims 1-5, wherein the method further comprises:

inputting a plurality of initial implicit vectors into the pre-trained generative network to obtain a plurality of second generated images; and

determining the implicit vector from the plurality of initial implicit vectors according to information on difference between the target image and the plurality of second generated images.

7. The method according to any one of claims 1-5, wherein the method further comprises:

inputting the target image into a pre-trained coding network to output the implicit vector.

8. The method according to any one of claims 1-7, wherein the method further comprises:

inputting the trained implicit vector into the trained generative network to obtain the reconstructed image of the target image,

wherein the reconstructed image includes a color image, and the second degraded image of the target image includes a gray level image; or

the reconstructed image includes a complete image, and the second degraded image includes a deficient image; or

a resolution of the reconstructed image is greater than a resolution of the second degraded image.

9. An image generation method, comprising:

performing a disturbance process on a first implicit vector by random jittering information to obtain a disturbed first implicit vector; and

inputting a disturbed first implicit vector into a first generative network for processing to obtain a reconstructed image of a target image, wherein a position of an object in the reconstructed image being different from a position of the object in the target image,

wherein the first implicit vector and the first generative network are obtained from training according to the network training method of any one of claims 1-7.

10. An image generation method, comprising:

inputting a second implicit vector and a category feature of a preset category into a second generative network for processing to obtain a reconstructed image of a target image, wherein the second generative network including a conditional generative network, a category of an object in the reconstructed image including the preset category, and a category of the object in the target image being different from the preset category,

wherein the second implicit vector and the second generative network are obtained from training according to the network training method of any one of claims 1-7.

11. An image generation method, comprising:

performing an interpolation process respectively on a third implicit vector, a fourth implicit vector, parameters of a third generative network and parameters of a fourth generative network, to obtain at least one interpolated implicit vector and parameters of at least one interpolated generative network, wherein the third generative network being configured to generate a reconstructed image of a first target image according to the third implicit vector, the fourth generative network being configured to generate a reconstructed image of a second target image according to the fourth implicit vector; and

inputting each interpolated implicit vector respectively into a corresponding interpolated generative network to obtain at least one morphing image, wherein a posture of an object in the

at least one morphing image being between a posture of the object in the first target image and a posture of the object in the second target image,

wherein the third implicit vector, the third generative network, the fourth implicit vector and the fourth generative network are obtained from training according to the network training method of any one of claims 1-7.

12. A network training apparatus, comprising:

a first generative module, configured to input an implicit vector into a pre-trained generative network to obtain a first generated image, wherein the generative network being obtained with a discriminative network through adversarial trainings with a plurality of natural images;

a degradation module, configured to perform a degradation process on the first generated image to obtain a first degraded image of the first generated image; and

a training module, configured to train the implicit vector and the generative network according to the first degraded image and a second degraded image of the target image, wherein a trained generative network and a trained implicit vector are used to generate a reconstructed image of the target image.

13. The apparatus according to claim 12, wherein the training module includes:

a feature acquisition submodule configured to input the first degraded image and the second degraded image of the target image respectively into a pre-trained discriminative network for processing to obtain a first discriminative feature of the first degraded image and a second discriminative feature of the second degraded image; and

a first training submodule configured to train the implicit vector and the generative network according to the first discriminative feature and the second discriminative feature.

14. The apparatus according to claim 13, wherein the discriminative network includes multiple levels of discriminative network blocks, and the feature acquisition submodule includes:

a first acquisition submodule configured to input the first degraded image into the discriminative network for processing to obtain a plurality of first discriminative features outputted by the multiple levels of discriminative network blocks of the discriminative network; and

a second acquisition submodule configured to input the second degraded image into the discriminative network for processing to obtain a plurality of second discriminative features

outputted by the multiple levels of discriminative network blocks of the discriminative network.

~~15. The apparatus according to claim 13 or 14, wherein the first training submodule includes:~~

~~a loss determination submodule configured to determine a network loss of the generative network according to a distance between the first discriminative feature and the second discriminative feature; and~~

~~a second training submodule configured to train the implicit vector and the generative network according to the network loss of the generative network.~~

~~16. The apparatus according to claim 15, wherein the generative network includes N levels of generative network blocks, and the second training submodule is configured to:~~

~~train first n levels of generative network blocks of the generative network according to the network loss of the generative network after an $(n-1)^{th}$ round of training to obtain the generative network after an n^{th} round of training, where $1 \leq n \leq N$, and n and N are integers.~~

~~17. The apparatus according to any one of claims 12-16, wherein the apparatus further comprises:~~

~~a second generative module configured to input a plurality of initial implicit vectors into the pre-trained generative network to obtain a plurality of second generated images;~~

~~a first vector determination module configured to determine the implicit vector from the plurality of initial implicit vectors according to information on difference between the target image and the plurality of second generated images.~~

~~18. The apparatus according to any one of claims 12-16, wherein the apparatus further comprises:~~

~~a second vector determination module configured to input the target image into a pre-trained coding network to output the implicit vector.~~

~~19. The apparatus according to any one of claims 12-18, wherein the apparatus further comprises:~~

~~a first reconstruction module configured to input the trained implicit vector into the trained generative network to obtain the reconstructed image of the target image,~~

~~wherein the reconstructed image includes a color image, and the second degraded image of the target image includes a gray level image; or~~

~~the reconstructed image includes a complete image, and the second degraded image includes a deficient image; or~~

~~a resolution of the reconstructed image is greater than a resolution of the second degraded image.~~

~~20~~15. An image generation apparatus, comprising:

a disturbance module configured to perform a disturbance process on a first implicit vector by random jittering information to obtain a disturbed first implicit vector; and

a second reconstruction module configured to input a disturbed first implicit vector into a first generative network for processing to obtain a reconstructed image of a target image, wherein a position of an object in the reconstructed image being different from a position of the object in the target image,

wherein the first implicit vector and the first generative network are obtained from training according to the network training apparatus of any one of claims 12-~~18~~14.

~~21~~16. An image generation apparatus, comprising:

a third reconstruction module configured to input a second implicit vector and a category feature of a preset category into a second generative network for processing to obtain a reconstructed image of a target image, wherein the second generative network including a conditional generative network, a category of an object in the reconstructed image including the preset category, and a category of the object in the target image being different from the preset category,

wherein the second implicit vector and the second generative network are obtained from training according to the network training apparatus of any one of claims 12-~~18~~14.

~~22~~17. An image generation apparatus, comprising:

an interpolation module, configured to perform an interpolation process respectively on a third implicit vector, a fourth implicit vector, parameters of a third generative network and parameters of a fourth generative network to obtain at least one interpolated implicit vector and parameters of at least one interpolated generative network, wherein the third generative network being configured to generate a reconstructed image of a first target image according to the third implicit vector, and the fourth generative network being configured to generate a reconstructed image of a second target image according to the fourth implicit vector; and

a morphing image acquisition module configured to input each interpolated implicit vector respectively into a corresponding interpolation generative network to obtain at least one morphing image, wherein a posture of an object in the at least one morphing image being between a posture of the object in the first target image and a posture of the object in the second target image,

wherein the third implicit vector, the third generative network, the fourth implicit vector and the fourth generative network are obtained from training according to the network training apparatus of any one of claims 12-~~18~~14.

~~23~~18. An electronic device, comprising:

a processor; and

a memory configured to store processor executable instructions,

wherein the processor is configured to invoke the instructions stored in the memory to execute the method according to any one of claims 1-11.

~~24~~19. A computer readable storage medium having computer program instructions stored thereon, wherein the computer program instructions, when executed by a processor, implement the method according to any one of claims 1-11.

~~25~~20. A computer program, comprising computer readable codes, wherein when the computer readable codes run in an electronic device, a processor in the electronic device executes the method according to any one of claims 1-11.