CLAIMS

1. A method of generating a point cloud completion network, comprising:

acquiring one or more latent space vectors through sampling in latent space;

acquiring first point cloud data generated based on the latent space vectors by inputting the one or more latent space vectors into a first point cloud completion network;

determining a points-distribution feature of the first point cloud data; and

adjusting the first point cloud completion network based on the points-distribution feature to generate a second point cloud completion network for completing second point cloud data, wherein the second point cloud data is point cloud data of at least one object in a three dimensional (3D) space;

wherein adjusting the first point cloud completion network based on the points-distribution feature to generate the second point cloud completion network for completing the second point cloud data comprises:

establishing a third loss function based on the points-distribution feature of the first point cloud data;

establishing a fourth loss function based on a difference between corresponding point cloud data and real point cloud data collected in a physical space, wherein the corresponding point cloud data is acquired from the first point cloud data by performing a preset degradation process; and

optimizing the first point cloud completion network based on the third loss function and the fourth loss function to obtain the second point cloud completion network.

2. The method according to claim 1, wherein determining the points-distribution feature of the first point cloud data comprises:

determining a plurality of point cloud blocks in the first point cloud data; and

calculating a point density variance of the plurality of point cloud blocks as the points-distribution feature of the first point cloud data.

3. The method according to claim 2, wherein determining the plurality of point cloud blocks in the first point cloud data comprises:

sampling, in the first point cloud data, respective points at a plurality of seed positions as seed points; and

for each of the seed points,

determining a plurality of neighboring points of the seed point, and

determining the seed point and the plurality of neighboring points as one point cloud block.

4. The method according to claim 3, wherein a point density of a point cloud block is determined based on a distance between the seed point in the point cloud block and each neighboring point of the seed point.

5. The method according to any one of claims 1-4, wherein adjusting the first point cloud completion network based on the points-distribution feature to generate the second point cloud completion network comprises:

establishing a first loss function based on the points-distribution feature of the first point cloud data, wherein the first loss function represents a distribution evenness of the points in the first point cloud data;

establishing a second loss function based on the first point cloud data and complete point cloud data from a sample point cloud data set, wherein the second loss function

represents a difference between the first point cloud data and the complete point cloud data; and

training the first point cloud completion network based on the first loss function and the second loss function to obtain the second point cloud completion network.

6. The method according to claim 1, wherein performing the preset degradation process comprises:

determining, corresponding to any target point in the real point cloud data, at least one neighboring point in the first point cloud data which is nearest to the target point; and

determining a union of respective neighboring points in the first point cloud data corresponding to various target points in the real point cloud data as the corresponding point cloud data.

7. The method according to any one of claims 1-6, further comprising:

acquiring raw point cloud data collected by a point cloud collecting device in the 3D space;

performing a point cloud segmentation on the raw point cloud data to obtain the second point cloud data of the at least one object; and

completing the second point cloud data by adopting the second point cloud completion network.

8. The method according to claim 7, further comprising:

detecting an association between at least two objects based on the completed second point cloud data of the at least two objects.

9. A method of processing point cloud data, comprising:

acquiring a first to-be-processed point cloud of a game participant and a second to-be-processed point cloud of a game object with a game area;

inputting the first to-be-processed point cloud and the second to-be-processed point cloud into a second point cloud completion network to acquire a first processed point cloud and a second processed point cloud, wherein

the second point cloud completion network has been pre-trained, and

the first processed point cloud and the second processed point cloud are outputted by the second point cloud completion network and correspond to the first to-be-processed point cloud and the second to-be-processed point cloud respectively; and

associating the game participant and the game object based on the first processed point cloud and the second processed point cloud;

wherein the second point cloud completion network is obtained by adjusting a first point cloud completion network based on a points-distribution feature of first point cloud data, and the first point cloud data is generated by the first point cloud completion network based on one or more latent space vectors,

wherein adjusting the first point cloud completion network based on the points-distribution feature of first point cloud data to obtain the second point cloud completion network comprises:

establishing a third loss function based on the points-distribution feature of the first point cloud data;

establishing a fourth loss function based on a difference between corresponding point cloud data and real point cloud data collected in a physical space, wherein the corresponding point cloud data is acquired from the first point cloud data by performing

a preset degradation process; and

optimizing the first point cloud completion network based on the third loss function and the fourth loss function to obtain the second point cloud completion network.

10. The method according to claim 9, wherein the game object comprises a game coin deposited in the game area; and the method further comprises:

determining, based on an association result between the first processed point cloud and the second processed point cloud, the game coin which is deposited by the game participant in the game area.

11. The method according to claim 9 or 10, further comprising:

determining, based on an association result between the first processed point cloud and the second processed point cloud, an action performed on the game object by the game participant.

12. The method according to any one of claims 9-11, wherein acquiring the first to-be-processed point cloud of the game participant and the second to-be-processed point cloud of the game object within the game area comprises:

acquiring raw point cloud data, which is collected by a point cloud collecting device arranged around the game area; and

performing a point cloud segmentation on the raw point cloud data to obtain the first to-be-processed point cloud of the game participant and the second to-be-processed point cloud of the game object.

13. The method according to any one of claims 9-12, wherein

the second point cloud completion network is configured to complete the respective first to-be-processed point clouds of game participants of various categories and/or the respective second to-be-processed point clouds of game objects of various categories; or

the second point cloud completion network comprises a first point cloud completion subnetwork and a second point cloud completion subnetwork, wherein the first point cloud completion subnetwork is configured to complete the first to-be-processed point cloud of the game participant of a first category, and the second point cloud completion subnetwork is configured to complete the second to-be-processed point cloud of the game object of a second category.

14. An apparatus for generating point cloud completion network, comprising:

a sampling module, configured to acquire one or more latent space vectors through sampling in latent space, and acquire first point cloud data generated based on the latent space vectors by inputting the one or more latent space vectors into a first point cloud completion network;

a determining module, configured to determine a points-distribution feature of the first point cloud data; and

a generating module, configured to adjust the first point cloud completion network based on the points-distribution feature to generate a second point cloud completion network for completing second point cloud data, wherein the second point cloud data is point cloud data of at least one object in a three dimensional (3D) space;

wherein the generating module comprises:

a third establishing unit, configured to establish a third loss function based on the points-distribution feature of the first point cloud data;

a fourth establishing unit, configured to establish a fourth loss function based on a difference between corresponding point cloud data and real point cloud data collected in a physical space, where the corresponding point cloud data is acquired from the first point cloud data by performing a preset degradation process; and

an optimizing unit, configured to optimize the first point cloud completion network based on the third loss function and the fourth loss function to obtain the second point cloud completion network.

15. An apparatus for processing point cloud data, comprising:

an acquiring module, configured to acquire a first to-be-processed point cloud of a game participant and a second to-be-processed point cloud of a game object within a game area;

an inputting module, configured to input the first to-be-processed point cloud and the second to-be-processed point cloud into a second point cloud completion network to acquire a first processed point cloud and a second processed point cloud, wherein

the second point cloud completion network has been pre-trained, and

the first processed point cloud and the second processed point cloud are outputted by the second point cloud completion network and correspond to the first to-be-processed point cloud and the second to-be-processed point cloud respectively; and

an associating module, configured to associate the game participant and the game object based on the first processed point cloud and the second processed point cloud;

wherein the second point cloud completion network is obtained by adjusting a first point cloud completion network based on a points-distribution feature of first point cloud data, and the first point cloud data is generated by the first point cloud completion network based on one or more latent space vectors,

wherein adjusting the first point cloud completion network based on the points-distribution feature of first point cloud data to obtain the second point cloud completion network comprises:

establishing a third loss function based on the points-distribution feature of the first point cloud data;

establishing a fourth loss function based on a difference between corresponding point cloud data and real point cloud data collected in a physical space, wherein the corresponding point cloud data is acquired from the first point cloud data by performing a preset degradation process; and

optimizing the first point cloud completion network based on the third loss function and the fourth loss function to obtain the second point cloud completion network.

16. A system for processing point cloud data, comprising:

a point cloud collecting device, arranged around a game area, configured to collect a first to-be-processed point cloud of a game participant and a second to-be-processed point cloud of a game object within the game area; and

a processing unit, connected to and communicated with the point cloud collecting device, configured to input the first to-be-processed point cloud and the second to-be-processed point cloud into a second point cloud completion network to acquire a first processed point cloud and a second processed point cloud, and associate the game participant and the game object based on the first processed point cloud and the second processed point cloud,

wherein the second point cloud completion network has been pre-trained;

wherein the first processed point cloud and the second processed point cloud are outputted by the second point cloud completion network and correspond to the first to-

be-processed point cloud and the second to-be-processed point cloud respectively; and

wherein the second point cloud completion network is obtained by adjusting a first point cloud completion network based on a points-distribution feature of first point cloud data, and the first point cloud data is generated by the first point cloud completion network based on one or more latent space vectors,

wherein adjusting the first point cloud completion network based on the points-distribution feature of first point cloud data to obtain the second point cloud completion network comprises:

establishing a third loss function based on the points-distribution feature of the first point cloud data;

establishing a fourth loss function based on a difference between corresponding point cloud data and real point cloud data collected in a physical space, wherein the corresponding point cloud data is acquired from the first point cloud data by performing a preset degradation process; and

optimizing the first point cloud completion network based on the third loss function and the fourth loss function to obtain the second point cloud completion network.

17. A computer readable storage medium storing a computer program thereon, wherein the program is executed by a processor to implement the method according to any one of claims 1-13.

18. A computer device, comprising a memory, a processor, and a computer program stored in the memory and executable on the processor, wherein the processor executes the program to implement the method according to any one of claims 1-13.