CLAIMS

1. An information processing method, comprising:

obtaining three-dimensional (3D) point information of a 3D point cloud;

generating, based on the 3D point information, a two-dimensional (2D) point cloud image from projection of the 3D point cloud on a horizontal plane; and

determining projection coordinates of 3D points comprised in the 3D point cloud in a reference coordinate system of a reference plane graph based on a consistency degree that the 2D point cloud image has with the reference plane graph, wherein the reference plane graph is used for representing a projection graph with reference coordinates that is obtained through the projection of a target object on the horizontal plane, and the 3D point cloud is used for representing 3D space information of the target object,

wherein generating, based on the 3D point information, the 2D point cloud image from the projection of the 3D point cloud on the horizontal plane comprises:

determining at least one plane comprised in the 3D point cloud according to the 3D point information of the 3D point cloud;

determining to-be-filtered-out 3D points according to a number of the 3D points comprised in each of the at least one plane and a normal direction of each of the at least one plane;

deleting the to-be-filtered-out 3D points from the 3D point cloud to obtain remaining 3D points of the 3D point cloud; and

projecting the remaining 3D points on the horizontal plane according to the 3D point information of the remaining 3D points to generate the 2D point image resulting from the projection of the 3D point cloud on the horizontal plane.

2. The method of claim 1, further comprising: before generating, based on the 3D point information, the 2D point cloud image from the projection of the 3D point cloud on the horizontal plane,

obtaining at least two pieces of pose information of an image acquiring device during

acquisition of image information, wherein the image information is used for constructing the 3D point cloud; and

determining, according to the at least two pieces of pose information of the image acquiring device, the horizontal plane on which the 3D point cloud is projected.

3. The method of claim 2, wherein the pose information comprises orientation information and position information,

wherein determining, according to the at least two pieces of pose information of the image acquiring device, the horizontal plane on which the 3D point cloud is projected comprises:

determining, according to the at least two pieces of pose information of the image acquiring device, a displacement of the image acquiring device between any two positions during the acquisition of the image information; and

determining, according to at least two pieces of orientation information of the image acquiring device and the displacement of the image acquiring device between any two positions, the horizontal plane on which the 3D point cloud is projected.

4. The method of claim 2 or 3, wherein the image acquiring device meets at least one of following preset fundamental conditions:

a horizontal axis of the image acquiring device during the acquisition of the image information is parallel to the horizontal plane on which the 3D point cloud is projected; and

a height of the image acquiring device from a ground during the acquisition of the image information changes in a preset height range.

5. The method of claim 1, wherein determining the to-be-filtered-out 3D points according to the number of the 3D points comprised in each of the at least one plane and the normal direction of each of the at least one plane comprises:

determining, a first plane with a greatest number of 3D points that is greater than a first threshold, from among the at least one plane according to the number of the 3D points

comprised in each of the at least one plane;

determining whether a normal direction of the first plane is perpendicular to the horizontal plane; and

in response to that the normal direction of the first plane is perpendicular to the horizontal plane, determining the 3D points comprised in the first plane as the to-be-filtered-out 3D points.

6. The method of any one of claims 1 to 5, wherein determining the projection coordinates of the 3D points comprised in the 3D point cloud in the reference coordinate system of the reference plane graph based on the consistency degree that the 2D point cloud image has with the reference plane graph comprises:

performing at least one similarity transformation on the 2D point cloud image;

determining a consistency degree that the 2D points in the 2D point cloud image have with reference points in the reference plane graph after the similarity transformation is performed each time;

determining, according to the consistency degree determined after the at least one similarity transformation is performed, a transformation relationship of matching the 3D points in the 3D point cloud with the reference points in the reference plane graph; and

projecting the 3D point cloud on the reference plane graph based on the transformation relationship to obtain the projection coordinates of the 3D point cloud in the reference coordinate system of the reference plane graph.

7. The method of claim 6, wherein performing the at least one similarity transformation on the 2D point cloud image comprises:

determining a transformation range of the similarity transformation performed on the 2D point cloud image; and

performing the at least one similarity transformation on the 2D point cloud image in the transformation range.

8. The method of claim 6, wherein the similarity transformation comprises translation transformation, and determining the consistency degree that the 2D points in the 2D point cloud image have with reference points in the reference plane graph after the similarity transformation is performed each time comprises:

performing down-sampling processing on the 2D point cloud image for a preset number of times after the 2D point cloud image is subjected to the translation transformation each time to obtain a first sampled image subjected to the down-sampling processing each time;

determining a consistency degree that 2D points in the first sampled image subjected to the down-sampling processing each time have with reference points in a second sampled image, wherein the second sampled image is obtained after the reference plane graph is subjected to same down-sampling processing as the down-sampling processing to which the first sampled image is subjected; and

determining, according to the consistency degree which the first sampled image has with the second sampled image and which is determined after down-sampling processing is performed for a first time, the consistency degree that the 2D points in the 2D point cloud image subjected to the translation transformation each time have with reference points in the reference plane graph.

9. The method of claim 6, wherein determining the consistency degree that the 2D points in the 2D point cloud image have with reference points in the reference plane graph after the similarity transformation is performed each time comprises:

traversing first pixel points in the 2D point cloud image after the similarity transformation is performed each time on the 2D point cloud image, wherein the first pixel points are pixel points constituting the 2D points in the 2D point cloud image;

determining a first image region in the reference plane graph that corresponds to each first pixel point;

in response to that one or more second pixel points representing one or more reference points exist in the first image region, determining the first pixel point as a first target pixel

point;

determining a first proportion of a number of the first target pixel points comprised in the 2D point cloud image to a number of the first pixel points comprised in the 2D point cloud image; and

determining, according to the first proportion, the consistency degree that the 2D point cloud image has with the reference plane graph after the similarity transformation is performed each time.

10. The method of claim 6, wherein determining the consistency degree that the 2D points in the 2D point cloud image have with reference points in the reference plane graph after the similarity transformation is performed each time comprises:

traversing second pixel points in the reference plane graph after the similarity transformation is performed each time on the 2D point cloud image, wherein the second pixel points are pixel points constituting the reference points in the reference plane graph;

determining a second image region in the 2D point cloud image that corresponds to each second pixel point ;

in response to that one or more first pixel points representing one or more 2D points exist in the second image region, determining the second pixel point as a second target pixel point;

determining a second proportion of a number of the second target pixel points comprised in the reference plane graph to a number of the second pixel points comprised in the reference plane graph; and

determining, according to the second proportion, the consistency degree that the 2D point cloud image has with the reference plane graph after the similarity transformation is performed each time, or

wherein determining the consistency degree that the 2D points in the 2D point cloud image have with reference points in the reference plane graph after the similarity transformation is performed each time comprises:

determining one or more first pixel points in a non-enclosed region of the 2D point

cloud image after the similarity transformation is performed each time on the 2D point cloud image, wherein the first pixel points are pixel points constituting the 2D points in the 2D point cloud image;

determining a third proportion of a number of the first pixel points in the non-enclosed region to a number of the first pixel points comprised in the 2D point cloud image; and

determining, according to the third proportion, the consistency degree that the 2D point cloud image has with the reference plane graph after the similarity transformation is performed each time.

11. The method of claim 6, wherein determining the consistency degree that the 2D points in the 2D point cloud image have with reference points in the reference plane graph after the similarity transformation is performed each time comprises:

determining third pixel points obtained through the projection of the image acquiring device in the 2D point cloud image according to the pose information of the image acquiring device during the acquisition of the image information after the similarity transformation is performed each time on the 2D point cloud image, wherein the image information is used for constructing the 3D point cloud;

determining a fourth proportion of a number of the third pixel points in a non-enclosed region to a number of the third pixel points comprised in the 2D point cloud image; and

determining, according to the fourth proportion, the consistency degree that the 2D point cloud image has with the reference plane graph after the similarity transformation is performed each time.

12. The method of claim 6, wherein determining, according to the consistency degree determined after at least one similarity transformation is performed, the transformation relationship of matching the 3D points in the 3D point cloud with the reference points in the reference plane graph comprises:

determining a 2D transformation matrix for matching the 2D points in the 2D point cloud image with the reference points in the reference plane graph according to the consistency degree determined after the at least one similarity transformation is performed; and

determining the transformation relationship of matching the 3D points in the 3D point cloud with the reference points in the reference plane graph based on the 2D transformation matrix.

13. A positioning method, comprising:

obtaining target image information of a target object acquired by an image acquiring device;

comparing acquired target image information with three-dimensional (3D) points in a 3D point cloud, wherein the 3D point cloud is used for representing 3D space information of the target object, each 3D point in the 3D point cloud corresponds to projection coordinates, the projection coordinates are determined based on consistency of a two-dimensional (2D) point cloud image with a reference plane graph, the 2D point cloud image is generated from projection of the 3D point cloud on a horizontal plane, and the reference plane graph is used for representing a projection image with reference coordinates that is obtained through the projection of the target object on the horizontal plane; and

positioning the image acquiring device according to projection coordinates corresponding to one or more 3D points matching the target image information,

wherein the 2D point cloud image is generated by:

determining at least one plane comprised in the 3D point cloud according to 3D point information of the 3D point cloud;

determining to-be-filtered-out 3D points according to a number of the 3D points comprised in each of the at least one plane and a normal direction of each of the at least one plane;

deleting the to-be-filtered-out 3D points from the 3D point cloud to obtain remaining 3D points of the 3D point cloud; and

projecting the remaining 3D points on the horizontal plane according to the 3D point information of the remaining 3D points to generate the 2D point image resulting from the projection of the 3D point cloud on the horizontal plane.

14. An information processing device, comprising:

an obtaining module, configured to obtain three-dimensional (3D) point information of a 3D point cloud;

a generating module, configured to generate, based on the 3D point information, a two-dimensional (2D) point cloud image from projection of the 3D point cloud on a horizontal plane; and

a determining module, configured to determine projection coordinates of 3D points comprised in the 3D point cloud in a reference coordinate system of a reference plane graph based on a consistency degree that the 2D point cloud image has with the reference plane graph, wherein the reference plane graph is used for representing a projection graph with reference coordinates that is obtained through the projection of a target object on the horizontal plane, and the 3D point cloud is used for representing 3D space information of the target object,

wherein the generating module is specifically configured to:

determine at least one plane comprised in the 3D point cloud according to the 3D point information of the 3D point cloud;

determine to-be-filtered-out 3D points according to a number of the 3D points comprised in each of the at least one plane and a normal direction of each of the at least one plane;

delete the to-be-filtered-out 3D points from the 3D point cloud to obtain remaining 3D points of the 3D point cloud; and

project the remaining 3D points on the horizontal plane according to the 3D point information of the remaining 3D points to generate the 2D point image resulting from the projection of the 3D point cloud on the horizontal plane.

15. An electronic device, comprising:

a processor;

a memory, configured to store instructions executable by the processor,

wherein the processor is configured to execute the instructions stored in the memory to perform the method according to any one of claims 1 to 12 or the method according to claim 13.

16. A computer-readable storage medium having stored thereon computer program instructions that, when executed by a processor, cause the method according to any one of claims 1 to 12 or the method according to claim 13 to be performed.

17. A computer program comprising computer-readable code, wherein when the computer-readable code run in an electronic device, a processor in the electronic device performs the method according to any one of claims 1 to 12 or the method according to claim 13.