

CLAIMS

1. A method for processing point cloud data, comprising:

obtaining point cloud data in a target scene and weight vectors of a first discrete convolution kernel;

performing interpolation processing on the point cloud data based on the point cloud data and the weight vectors of the first discrete convolution kernel to obtain first weight data, the first weight data representing weights of allocation of the point cloud data to positions corresponding to the weight vectors of the first discrete convolution kernel;

performing first discrete convolution processing on the point cloud data based on the first weight data and the weight vectors of the first discrete convolution kernel to obtain a first discrete convolution result; and

obtaining a spatial structure feature of at least part of point cloud data in the point cloud data based on the first discrete convolution result.

2. The method of claim 1, wherein performing the interpolation processing on the point cloud data based on the point cloud data and the weight vectors of the first discrete convolution kernel to obtain the first weight data comprises:

obtaining the first weight data through a preset interpolation processing manner based on the point cloud data and the weight vectors of the first discrete convolution kernel, the first weight data representing the weights of allocation of the point cloud data to the positions corresponding to the weight vectors of the first discrete convolution kernel that meet a preset condition, wherein the point cloud data is in a specific geometrically shaped region enclosed by the weight vectors of the first discrete convolution kernel that meet the preset condition.

3. The method of claim 2, after obtaining the first discrete convolution result, further comprising: performing normalization processing on the first discrete convolution result

based on a normalization parameter, the normalization parameter being determined according to an amount of the point cloud data in the specific geometrically shaped region where the point cloud data is located,

wherein obtaining the spatial structure feature of at least part of point cloud data in the point cloud data based on the first discrete convolution result comprises: obtaining the spatial structure feature of at least part of point cloud data in the point cloud data based on a normalization processing result.

4. The method of any one of claims 1-3, wherein the weight vectors of the first discrete convolution kernel comprise n groups of weight vectors, and the first weight data comprises n groups of first weight data, where n is an integer more than or equal to 2,

wherein performing the first discrete convolution processing on the point cloud data based on the first weight data and the weight vectors of the first discrete convolution kernel to obtain the first discrete convolution result comprises: performing k th first discrete convolution processing on a k th group of weight vectors of the first discrete convolution kernel and the point cloud data based on a k th group of first weight data and a k th group of first convolution parameters to obtain a k th first discrete convolution result, the k th group of first convolution parameters corresponding to a size range of the k th first discrete convolution processing, where k is an integer more than or equal to 1 and less than or equal to n ; and

wherein obtaining the spatial structure feature of at least part of point cloud data in the point cloud data based on the first discrete convolution result comprises: determining the spatial structure feature of the point cloud data based on n first discrete convolution results.

5. The method of claim 4, wherein determining the spatial structure feature of the point cloud data based on the n first discrete convolution results comprises:

performing interpolation processing on first processing data based on the first processing data and weight vectors of a second discrete convolution kernel to obtain second weight data, the second weight data representing weights of allocation of the first processing data to positions corresponding to the weight vectors of the second discrete convolution

kernel, wherein the first processing data is determined according to a previous discrete convolution processing result, and the first processing data is determined according to the n first discrete convolution results in the case of the previous discrete convolution processing result comprising the n first discrete convolution results;

performing second discrete convolution processing on the first processing data based on the second weight data and the weight vectors of the second discrete convolution kernel to obtain a second discrete convolution result; and

obtaining the spatial structure feature of the point cloud data based on the second discrete convolution result.

6. The method of claim 5, wherein the weight vectors of the second discrete convolution kernel comprise l groups of weight vectors, and the second weight data comprise l groups of second weight data, where l is an integer more than or equal to 2,

wherein performing the discrete convolution processing on the first processing data based on the second weight data and the weight vectors of the second discrete convolution kernel comprises: performing m th second discrete convolution processing on an m th group of weight vectors of the second discrete convolution kernel and the first processing data based on an m th group of second weight data and an m th group of second convolution parameters to obtain an m th second discrete convolution result, the m th group of second convolution parameters corresponding to a size range of the m th second discrete convolution processing, where m is an integer more than or equal to 1 and less than or equal to l ; and

wherein obtaining the spatial structure feature of the point cloud data based on the second discrete convolution result comprises:

determining the spatial structure feature of the point cloud data based on l second discrete convolution results.

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

determining a category of an object in the target scene based on the spatial structure

feature of the point cloud data.

8. The method of any one of claims 1-3, wherein obtaining the spatial structure feature of at least part of point cloud data in the point cloud data based on the first discrete convolution result comprises:

performing a first upsampling processing on the first discrete convolution result to obtain a first upsampling processing result; and

obtaining a spatial structure feature of at least one point in the point cloud data based on the first upsampling processing result.

9. The method of claim 8, wherein obtaining the spatial structure feature of at least one point in the point cloud data based on the first upsampling processing result comprises:

performing interpolation processing on a previous upsampling processing result based on the previous upsampling processing result and weight vectors of a third discrete convolution kernel to obtain third weight data, the third weight data representing weights of allocation of the previous upsampling processing result to positions corresponding to the weight vectors of the third discrete convolution kernel, wherein the previous upsampling processing result is the first upsampling result in the case of the previous upsampling processing being the first upsampling processing performed on the first discrete convolution result;

performing third discrete convolution processing on the previous upsampling processing result based on the third weight data and the weight vectors of the third discrete convolution kernel to obtain a third discrete convolution result;

performing a second upsampling processing on the third discrete convolution result to obtain a second upsampling processing result; and

obtaining the spatial structure feature of the at least one point in the point cloud data based on the second upsampling processing result.

10. The method of any one of claims 1-3, 8 and 9, further comprising:

determining semantic information of the at least one point based on the spatial structure diagram of the at least one point in the point cloud data.

11. A device for processing point cloud data, comprising an acquisition unit, an interpolation processing unit and a feature acquisition unit, wherein

the acquisition unit is configured to obtain point cloud data in a target scene and weight vectors of a first discrete convolution kernel;

the interpolation processing unit is configured to perform interpolation processing on the point cloud data based on the point cloud data and the weight vectors of the first discrete convolution kernel to obtain first weight data, the first weight data representing weights of allocation of the point cloud data to positions corresponding to the weight vectors of the first discrete convolution kernel; and

the feature acquisition unit is configured to perform first discrete convolution processing on the point cloud data based on the first weight data and the weight vectors of the first discrete convolution kernel to obtain a first discrete convolution result and obtain a spatial structure feature of at least part of point cloud data in the point cloud data based on the first discrete convolution result.

12. The device of claim 11, wherein the interpolation processing unit is configured to obtain the first weight data through a preset interpolation processing manner based on the point cloud data and the weight vectors of the first discrete convolution kernel, the first weight data representing the weights of allocation of the point cloud data to the positions corresponding to the weight vectors of the first discrete convolution kernel that meet a preset condition, wherein the point cloud data is in a specific geometrically shaped region enclosed by the weight vectors of the first discrete convolution kernel that meet the preset condition.

13. The device of claim 12, wherein the feature acquisition unit is configured to perform first discrete convolution processing on the point cloud data based on the first weight data and the weight vectors of the first discrete convolution kernel to obtain the first discrete convolution result, perform normalization processing on the first discrete convolution result based on a normalization parameter, the normalization parameter being determined according to an amount of the point cloud data in the specific geometrically shaped region where the point cloud data is located, and obtain the spatial structure feature of at least part of point cloud data in the point cloud data based on a normalization processing result.

14. The device of any one of claims 11-13, wherein there are n groups of weight vectors of the first discrete convolution kernel and n groups of first weight data, where n is an integer more than or equal to 2; and the feature acquisition unit is configured to: perform k th first discrete convolution processing on the k th group of weight vectors of the first discrete convolution kernel and the point cloud data based on the k th group of first weight data and a k th group of first convolution parameters to obtain a k th first discrete convolution result, the k th group of first convolution parameters corresponding to a size range of k th first discrete convolution processing, where k is an integer more than or equal to 1 and less than or equal to n ; and determine the spatial structure feature of the point cloud data based on n first discrete convolution results.

15. The device of claim 14, wherein the interpolation processing unit is further configured to perform interpolation processing on first processing data based on the first processing data and weight vectors of a second discrete convolution kernel to obtain second weight data, the second weight data representing weights of allocation of the first processing data to positions corresponding to the weight vectors of the second discrete convolution kernel, the first processing data being determined according to a previous discrete convolution processing result and the first processing data being determined according to the n first discrete convolution results in the case of the previous discrete convolution processing result comprising the n first discrete convolution results; and

the feature acquisition unit is further configured to perform second discrete

convolution processing on the first processing data based on the second weight data and the weight vectors of the second discrete convolution kernel to obtain a second discrete convolution result and obtain the spatial structure feature of the point cloud data based on the second discrete convolution result.

16. The device of claim 15, wherein there are l groups of weight vectors of the second discrete convolution kernel and l groups of second weight data, where l is an integer more than or equal to 2; and

the feature acquisition unit is configured to: perform m th second discrete convolution processing on the m th group of weight vectors of the second discrete convolution kernel and the first processing data based on the m th group of second weight data and an m th group of second convolution parameters to obtain an m th second discrete convolution result, the m th group of second convolution parameters corresponding to a size range of m th discrete convolution processing, where m is an integer more than or equal to 1 and less than or equal to l ; and determine the spatial structure feature of the point cloud data based on l second discrete convolution results.

17. The device of any one of claims 11-16, further comprising a first determination unit, configured to determine a category of an object in the target scene based on the spatial structure feature of the point cloud data.

18. The device of any one of claims 11-13, further comprising a second determination unit, configured to determine semantic information of the at least one point based on the spatial structure feature of the at least one point in the point cloud data.

19. A computer-readable storage medium having stored thereon a computer program that, when executed by a processor, causes operations of the method of any one of claims 1-10 to be implemented.

20. An electronic device, comprising a memory, a processor and a computer program stored in the memory and capable of running on the processor, the processor executing the program to implement operations of the method of any one of claims 1-10.