

Claims

1. A method for encoding a point cloud to generate a bitstream of compressed point cloud data, wherein the point cloud's geometry is represented by an octree-based structure with a plurality of nodes having parent-child relationships by recursively splitting a volumetric space containing the point cloud into sub-volumes each associated with a node of the octree-based structure, comprising the steps:

Determining a coding mode, wherein the coding mode includes planar coding mode and angular coding mode;

Obtaining coding context information for a present child node, wherein

if the coding mode is the planar coding mode, coding context information includes planar context information, wherein planar context information of the present child node is determined according to the occupancy pattern of the present parent node and the occupancy pattern of at least one neighboring parent node positioned directly next to the present parent node;

if the coding mode is the angular coding mode, the coding context information of a present child node includes planar information of the present parent node and the occupancy of the vertical neighboring parent node adjacent to the present parent node; and

Entropy encoding the present child node based on the determined coding context information to produce encoded data for the bitstream.

2. A method for decoding a bitstream of compressed point cloud data to generate a reconstructed point cloud, wherein the point cloud's geometry is represented by an octree-based structure with a plurality of nodes having parent-child relationships by recursively splitting a volumetric space containing the point cloud

into sub-volumes each associated with a node of the octree-bases structure, comprising the steps:

Determining a coding mode, wherein the coding mode includes planar coding mode and angular coding mode;

Obtaining coding context information for a present child node, wherein

if the coding mode is the planar coding mode, coding context information includes planar context information, wherein planar context information of the present child node is determined according to the occupancy pattern of the present parent node and the occupancy pattern of at least one neighboring parent node positioned directly next to the present parent node;

if the coding mode is the angular coding mode, the coding context information of a present child node includes planar information of the present parent node and the occupancy of the vertical neighboring parent node adjacent to the present parent node; and

Entropy decoding the bitstream based on the context information of the present child node to reconstruct the point cloud.

3. Method according to claims 1 or 2, characterized in that, if the coding mode is the planar coding mode, the coding context information includes plane position context information, wherein the plane position context information includes one or more of:

The distance d from the closest already node at the same coordinate in the respective parent node and the same depth D in the octree-based structure;

The plane position of the closest already coded node at the same coordinate in the respective parent node and the same depth d in the octree-based structure; and

The plane position of the present child node according to the occupancy pattern of at least one neighboring parent node positioned next to the present parent node.

4. Method according to claim 3, characterized in that, if the closest already coded node at the same coordinate in the respective parent node and the same depth D in the octree-based structure is non-existent then the plane position context information only includes the plane position of the present child node according to the occupancy pattern of at least one neighboring parent node positioned directly next to the present node.
5. Method according to claims 3 and 4, characterized in that, if the coding mode is the angular coding mode and the present child node is not eligible for angular coding mode, the coding context information includes plane position context information, wherein the plane position context information includes one or more of:
 - The distance d from the closest already coded node at the same coordinate in the respective parent node and the same depth D in the octree-based structure;
 - The plane position of the closest already coded node at the same coordinate in the respective parent node and the same depth d in the octree-based structure;
 - and
 - The plane position of the present child node according to the occupancy pattern of at least one neighboring parent node positioned directly next to the present parent node.
6. Method according to any of claims 1 to 5, characterized in that for determining the planar context information and the plane position context information according to the occupancy pattern of at least one neighboring parent node, a present plane position of the present child node relative to the present parent node is determined, wherein the present plane position includes high plane position and low plane position.

7. The method according to claim 6, characterized in that, if the present plane position is low plane position, the planar context information and plane position context information is determined according to an occupancy of a first group of four child nodes of the neighboring parent node that are directly next to the present parent node and the occupancy of a second group of four child nodes of the present parent node directly opposite the first group.

8. The method according to claim 7, characterized in that

If at least one child node of the first group is occupied and the second group is not occupied, the planar context information includes the likelihood of a plane and the plane position context information includes the likelihood of a low plane position;
or

If the first group is not occupied and at least one child node of the second group is occupied, the planar context information includes the likelihood of a plane and the plane position context information includes the likelihood of a high plane position;
or

If the first group is not occupied and the second group is not occupied, the planar context information includes the likelihood of a plane, wherein the plane position context information includes the likelihood of a low plane, if at least one or more child nodes in the neighboring parent node are occupied which do not belong to the first group; or

If at least one child node of the first group is occupied and at least one child node of the second group is occupied and $\#FirstGroup > \#SecondGroup + 1$, the planar context information includes the likelihood of a plane and the plane position context information includes the likelihood of a low plane position; or

If at least one child node of the first group is occupied and at least one child node of the second group is occupied and $\#FirstGroup < \#SecondGroup + 1$, the planar

context information includes the likelihood of a plane and the plane position context information includes the likelihood of a high plane position; and

Wherein #FirstGroup indicates the number of occupied child nodes in the first group and #SecondGroup indicates the number of occupied child nodes in the second group.

9. The method according to claim 6, characterized in that, if the present plane position is high, the planar context information and plane position context information is determined according to an occupancy of the neighboring parent node that is along the axis under consideration directly after the present parent node, and the occupancy of a group of four child nodes of the present parent node in a plane directly perpendicular to the axis under consideration and next to the present child node.

10. The method according to claim 9, characterized in that

If at least one child node of the group is occupied and the neighboring parent node is not occupied, the planar context information includes the likelihood of a plane and the plane position context information includes the likelihood of a low plane position; or

If the group is not occupied and the neighboring parent node is occupied, the planar context information includes the likelihood of a plane and the plane position context information includes the likelihood of a high plane position; or

If the group is not occupied and the neighboring parent node is not occupied, the planar context information includes the likelihood of a plane, wherein the plane position context information includes the likelihood of a low plane, if at least one or more child nodes in a neighboring parent node along the axis under consideration directly before the present parent node are occupied; or

If at least one child node of the group is occupied and the neighboring parent node is occupied and $\#Group > 2$, the planar context information includes the likelihood of a plane and the plane position context information includes the likelihood of a low plane position; or

If at least one child node of the group is occupied and the neighboring parent node is occupied and $\#Group < 2$, the planar context information includes the likelihood of a plane and the plane position context information includes the likelihood of a high plane position;

If at least one child node of the group is occupied and the neighboring parent node is occupied and $\#Group = 2$, the planar context information includes the likelihood of the absence of a plane and the plane position is inferred to be unknown; and

Wherein $\#Group$ indicates the number of occupied nodes in the group.

11. Method according to any of claims 1 to 10, characterized in that the neighboring parent node is arranged along one of the geometrical axes under consideration.
12. Method according to any of claims 1 to 11, characterized in that the context information is determined along all three geometrical axes.
13. An encoder for encoding a point cloud to generate a bitstream of compressed point cloud data, wherein the point cloud's geometry is represented by an octree-based structure with a plurality of nodes having parent-child relationships by recursively splitting a volumetric space containing the point cloud into sub-volumes each associated with a node of the octree-based structure, the encoder comprising:
a processor and
a memory storage device, wherein in the memory storage device instructions executable by the processor are stored that, when executed, cause the processor to perform the method according to any of claims 1 and 3 to 12 when dependent on claim 1.

14. A decoder for decoding a bitstream of compressed point cloud data to generate a reconstructed point cloud, wherein the point cloud's geometry is represented by an octree-based structure with a plurality of nodes having parent-child relationships by recursively splitting a volumetric space containing the point cloud into sub-volumes each associated with a node of the octree-bases structure, the decoder comprising:
 - a processor and
 - a memory storage device, wherein in the memory storage device instructions executable by the processor are stored that, when executed, cause the processor to perform the method according to any of claims 2 to 12.
15. A non-transitory computer-readable storage medium storing processor-executed instructions that, when executed by a processor, cause the processor to perform the method according to any one of claims 1 to 12.