Hybrid Geometric Coding of Point Clouds

~~CROSS-REFERENCE TO RELATED APPLICATIONS~~

[0001] ~~This application claims priority to United States provisional patent application number 62/689,666 filed on June 25, 2018 by Futurewei Technologies, Inc. and titled "Method and Apparatus for Point Cloud Coding Using Hybrid Code Tree," which is incorporated by reference.~~

TECHNICAL FIELD

[0002] The disclosed embodiments relate to PCC in general and hybrid geometric coding of point clouds in particular.

BACKGROUND

[0003] Point clouds use a relatively large amount of data, so communication of point clouds uses a relatively large amount of bandwidth. However, many networks operate at or near their bandwidth capacities. In addition, customers demand high point cloud quality, which requires using even more data. There is therefore a desire to both reduce the amount of data point clouds use and improve point cloud quality. One solution is to compress point clouds during an encoding process and decompress the point clouds during a decoding process.

SUMMARY

[0004] A first aspect relates to an apparatus comprising a processor configured to obtain a point cloud, make a choice between octree encoding or quadtree encoding of a parent node, and encode the parent node into a bitstream based on the choice; and a transmitter coupled to the processor and configured to transmit the bitstream.

[0005] In a first implementation form of the apparatus according to the first aspect as such, the octree encoding is 3D.

[0006] In a second implement form of the apparatus according to the first aspect as such or any preceding implementation form of the first aspect, the octree encoding uses eight cube child nodes.

CLAIMS

1. An apparatus (900) comprising:

a processor (930) configured to:

obtain a point cloud,

make a choice between octree encoding or quadtree encoding of a parent node, and

encode the parent node into a bitstream based on the choice; and

a transmitter (940) coupled to the processor and configured to transmit the bitstream;

wherein, the processor is further configured to:

encode in the bitstream a first parameter indicating a depth of point cloud coding information, wherein the depth of point cloud coding information is a depth at which quadtree encoding is used for a first time such that each of a set of first nodes before the depth are encoded using octree encoding; and

encode in the bitstream a second parameter indicating a node encoding mode for each of a second set of nodes at and after the depth according to the first parameter, wherein the node encoding mode is one of the octree encoding or the quadtree encoding.

2. The apparatus of claim 1, wherein the octree encoding is three-dimensional, 3D.

3. The apparatus of claim 2, wherein the octree encoding uses eight cube child nodes.

4. The apparatus of claim 1, wherein the quadtree encoding is two-dimensional, 2D.

5. The apparatus of claim 4, wherein the quadtree encoding uses four square child nodes.

6. The apparatus of claim 1, wherein the processor is further configured to further make the choice based on a flatness parameter.

7. The apparatus of claim 1, wherein the processor is further configured to further make the choice based on a rate distortion.

8. A method (700) comprising:

obtaining (710) a point cloud;

making (720) a choice between octree encoding or quadtree encoding of a parent node;

encoding (730) the parent node into a bitstream based on the choice; and

transmitting (740) the bitstream;

wherein the method further comprises:

encoding in the bitstream a first parameter indicating a depth of point cloud coding information, wherein the depth of point cloud coding information is a depth at which quadtree encoding is used for a first time such that each of a set of first nodes before the depth are encoded using octree encoding; and

encoding in the bitstream a second parameter indicating a node encoding mode for each of a second set of nodes at and after the depth according to the first parameter, wherein the node encoding mode is one of the octree encoding or the quadtree encoding.

9. The method of claim 8, wherein the octree encoding is three-dimensional, 3D.

10. The method of claim 9, wherein the octree encoding uses eight cube child nodes.

11. The method of claim 8, wherein the quadtree encoding is two-dimensional, 2D.

12. The method of claim 11, wherein the quadtree encoding uses four square child nodes.

13. The method of claim 8, further comprising further making the choice based on a flatness parameter; or further making the choice based on a rate distortion.

14. An apparatus (900) comprising:

a receiver (920) configured to receive a bitstream; and

a processor (930) coupled to the receiver and configured to:

parse from the bitstream a first parameter indicating a depth of point cloud coding, PCC;

decode first nodes before the depth using octree decoding,

parse from the bitstream a second parameter indicating a node coding mode for second nodes at and after the depth, and

decode the second nodes using the octree decoding or quadtree decoding based on the second parameter.

15. The apparatus of claim 14, wherein the octree decoding is three-dimensional, 3D, and uses eight cube child nodes.

16. The apparatus of claim 14, wherein the quadtree decoding is two-dimensional, 2D, and uses four square child nodes.

17. The apparatus of claim 14, wherein the processor is further configured to further decode the first nodes and the second nodes until reaching a level of detail, LoD.

18. A method (800) comprising:

receiving (810) a bitstream;

parsing (820) from the bitstream a first parameter indicating a depth of point cloud coding, PCC;

decoding (830) first nodes before the depth using octree decoding;

parsing (840) from the bitstream a second parameter indicating a node coding mode for second nodes at and after the depth;

decoding (850) the second nodes using the octree decoding or quadtree decoding based on the second parameter.

~~What is claimed is:~~

~~1. An apparatus comprising:~~

~~a processor configured to:~~

~~obtain a point cloud,~~

~~make a choice between octree encoding or quadtree encoding of a parent node, and~~

~~encode the parent node into a bitstream based on the choice; and~~

~~a transmitter coupled to the processor and configured to transmit the bitstream.~~

~~2. The apparatus of claim 1, wherein the octree encoding is three-dimensional (3D).~~

~~3. The apparatus of claim 2, wherein the octree encoding uses eight cube child nodes.~~

~~4. The apparatus of claim 1, wherein the quadtree encoding is two-dimensional (2D).~~

~~5. The apparatus of claim 4, wherein the quadtree encoding uses four square child nodes.~~

6. The apparatus of claim 1, wherein the processor is further configured to further make the choice based on a flatness parameter.

7. The apparatus of claim 1, wherein the processor is further configured to further make the choice based on a rate distortion.

8. A method comprising:

obtaining a point cloud;

making a choice between octree encoding or quadtree encoding of a parent node;

encoding the parent node into a bitstream based on the choice; and

transmitting the bitstream.

9. The method of claim 8, wherein the octree encoding is three-dimensional (3D).

10. The method of claim 9, wherein the octree encoding uses eight cube child nodes.

11. The method of claim 8, wherein the quadtree encoding is two-dimensional (2D).

12. The method of claim 11, wherein the quadtree encoding uses four square child nodes.

13. The method of claim 8, further comprising further making the choice based on a flatness parameter.

14. The method of claim 8, further comprising further making the choice based on a rate distortion.

15. An apparatus comprising:

a receiver configured to receive a bitstream; and

a processor coupled to the receiver and configured to:

parse from the bitstream a first parameter indicating a depth of point cloud coding (PCC),

decode first nodes before the depth using octree decoding,

parse from the bitstream a second parameter indicating a node coding mode for second nodes at and after the depth, and

decode the second nodes based on the second parameter.

16. The apparatus of claim 15, wherein the octree decoding is three-dimensional (3D) and uses eight cube child nodes.

17. The apparatus of claim 15, wherein the quadtree decoding is two-dimensional (2D) and uses four square child nodes.

18. The apparatus of claim 15, wherein the processor is further configured to further decode the first nodes and the second nodes until reaching a level of detail (LoD).

19. A method comprising:

receiving a bitstream;

parsing from the bitstream a first parameter indicating a depth of point cloud coding (PCC);

decoding first nodes before the depth using octree decoding;

parsing from the bitstream a second parameter indicating a node coding mode for second nodes at and after the depth;

decoding the second nodes based on the second parameter.

20. An apparatus comprising:

a processing means configured to:

obtain a point cloud,

make a choice between octree encoding or quadtree encoding of a parent node, and

encode the parent node into a bitstream based on the choice; and

a transmission means coupled to the processing means and configured to transmit the bitstream.