High-Level Syntax Designs for Point Cloud Coding

~~CROSS-REFERENCE TO RELATED APPLICATIONS~~

[0001] ~~This patent application claims the benefit of U.S. Provisional Patent Application No. 62/690,132, filed June 26, 2018, by Ye-Kui Wang, et al., and titled "High-Level Syntax Designs for Point Cloud Coding," which is hereby incorporated by reference.~~

TECHNICAL FIELD

[0002] The present disclosure is generally related to point cloud coding, and is specifically related to the high-level syntax for point cloud coding.

BACKGROUND

[0003] The point cloud is employed in a wide variety of applications including entertainment industry, intelligent automobile navigation, geospatial inspection, three dimensional (3D) modeling of real world objects, visualization etc. Considering the non-uniform sampling geometry of the point cloud, compact representations for storage and transmission of such data is useful. Compared with the other 3D presentations, the irregular point cloud is more general and applicable for a wider range of sensors and data acquisition strategies. For example, when performing a 3D presentation in a virtual reality world or remote renderings in a tele-presence environment, the rendering of virtual figures and real-time instructions are processed as dense point cloud data set.

SUMMARY

[0004] A first aspect relates to a method of point cloud coding (PCC) implemented by a video decoder. The method includes receiving an encoded bitstream including a group of frames header, the group of frames header specifying a profile and a level of the encoded bitstream; and decoding the encoded bitstream.

[0005] A second aspect relates to a method of point cloud coding (PCC) implemented by a video encoder. The method includes generating an encoded bitstream including a group of frames header, the group of frames header specifying a profile and a level of the encoded bitstream; and transmitting the encoded bitstream toward a decoder.

CLAIMS

What is claimed is:

1. A method of point cloud coding (PCC) implemented by a video decoder, comprising:

receiving an encoded bitstream including a group of frames header, the group of frames header specifying a profile and a level of the encoded bitstream; and

decoding the encoded bitstream.

2. A method of point cloud coding (PCC) implemented by a video encoder, comprising:

generating an encoded bitstream including a group of frames header, the group of frames header specifying a profile and a level of the encoded bitstream; and

transmitting the encoded bitstream toward a decoder.

3. The method of any of claims 1 to 2, wherein the group of frames header is a group of frames network abstraction layer (NAL) unit.

4. The method of any of claims 1 to 3, wherein the group of frames header is configured to carry group of frames header parameters.

5. The method of any of claims 1 to 4, wherein at least one of occupancy information, geometry information, and attribute information are included in the group of frames header parameters.

6. The method of any of claims 1 to 5, wherein the group of frames header specifies the profile and the level for decoding auxiliary information for an occupancy map.

7. The method of any of claims 1 to 6, wherein the group of frames header specifies a point cloud reconstruction process that utilizes decoding results of geometry, texture, auxiliary information, and occupancy map.

8. The method of any of claims 1 to 6, wherein the profile or the level indicates capabilities for decoding of auxiliary information and occupancy map components.

9. The method of any of claims 1 to 6, wherein the profile or the level indicates the capabilities for point cloud reconstruction.

10. The method of any of claims 1 to 6, wherein the profile is a specified subset of syntax.

11. The method of any of claims 1 to 6, wherein the profile is a specified subset of coding tools.

12. The method of any of claims 1 to 6, wherein the level is a defined set of constraints on values that may be taken by syntax elements and variables.

13. The method of any of claims 1 to 6, wherein a combination of the profile and the level for the encoded bitstream represents a particular decoding capability required for decoding of the encoded bitstream.

14. A coding apparatus, comprising:

a receiver configured to receive a picture to encode or to receive a bitstream to decode;

a transmitter coupled to the receiver, the transmitter configured to transmit the bitstream to a decoder or to transmit a decoded image to a display;

a memory coupled to at least one of the receiver or the transmitter, the memory configured to store instructions; and

a processor coupled to the memory, the processor configured to execute the instructions stored in the memory to perform the method in any of claims 1 to 13.

15. The coding apparatus of claim 8, further comprising a display configured to display an image.

16. A system, comprising:

an encoder; and

a decoder in communication with the encoder, wherein the encoder or the decoder includes the coding apparatus of any of claims 14 to 15.

17. A means for coding, comprising:

receiving means configured to receive a picture to encode or to receive a bitstream to decode;

transmission means coupled to the receiving means, the transmission means configured to transmit the bitstream to a decoder or to transmit a decoded image to a display means;

storage means coupled to at least one of the receiving means or the transmission means, the storage means configured to store instructions; and

processing means coupled to the storage means, the processing means configured to execute the instructions stored in the storage means to perform the method in any of claims 1 to 13.

CLAIMS

1. A method (600) of point cloud coding, PCC, implemented by a video encoder, comprising:

generating (602) an encoded bitstream by performing the steps of:

encoding a first sequence of data units, wherein the first sequence of data units represents geometry information of the point cloud, and each data unit is a PCC network abstraction layer, NAL, unit and a corresponding PCC NAL unit header includes data unit type identification information indicating that the data unit represents geometry information;

encoding a second sequence of data units, wherein the second sequence of data units represents texture information of the point cloud, and each data unit is a PCC network abstraction layer, NAL, unit and a corresponding PCC NAL unit header includes data unit type identification information indicating that the data unit represents texture information;

combining the first and the second sequences of data units, wherein data units corresponding to a same time instance in the first and the second sequences are arranged in a contiguous manner; and including a group of frames header, wherein the group of frames header specifies a profile and a level of the first and the second sequence; and

transmitting (604) the encoded bitstream toward a decoder;

wherein the profile is a specified subset of coding tools.

2. A method (500) of point cloud coding, PCC, implemented by a video decoder, comprising:

receiving (502) an encoded bitstream from an encoder,

wherein the encoded bitstream is generated by performing the steps of:

encoding a first sequence of data units, wherein the first sequence of data units represents geometry information of the point cloud, and each data unit is a PCC network abstraction layer, NAL, unit and a corresponding PCC NAL unit header includes data unit type identification information indicating that the data unit represents geometry information;

encoding a second sequence of data units, wherein the second sequence of data units represents texture information of the point cloud, and each data unit is a PCC network abstraction layer, NAL, unit and a corresponding PCC NAL unit header includes data unit type identification information indicating that the data unit represents texture information; and

combining the first and the second sequences of data units, wherein data units corresponding to a same time instance in the first and the second sequences are arranged in a contiguous manner; and including a group of frames header, wherein the group of frames header specifies a profile and a level of the first and the second sequence; and

decoding (504) the encoded bitstream, wherein decoding the encoded bitstream comprises performing the steps of:

extracting and sending data units belonging to the first sequence to a first decoder;

extracting and sending data units belonging to the second sequence to a second decoder; and decoding, respectively by the first and the second decoders, the first and the second sequences;

wherein the profile is a specified subset of coding tools.

3. The method of any of claims 1 to 2, wherein the group of frames header is a group of frames NAL unit.

4. The method of any of claims 1 to 3, wherein the group of frames header is configured to carry group of frames header parameters.

5. The method of any of claims 1 to 4, wherein at least one of occupancy information, geometry information, and attribute information are included in the group of frames header parameters.

6. The method of any of claims 1 to 5, wherein the group of frames header specifies the profile and the level for decoding auxiliary information for an occupancy map.

7. The method of any of claims 1 to 6, wherein the group of frames header specifies a point cloud reconstruction process that utilizes decoding results of geometry, texture, auxiliary information, and occupancy map.

8. The method of any of claims 1 to 6, wherein the profile or the level indicates capabilities for decoding of auxiliary information and occupancy map components.

9. The method of any of claims 1 to 6, wherein the profile or the level indicates the capabilities for point cloud reconstruction.

10. The method of any of claims 1 to 6, wherein the profile is a specified subset of syntax.

11. The method of any of claims 1 to 6, wherein the level is a defined set of constraints on values that may be taken by syntax elements and variables.

12. The method of any of claims 1 to 6, wherein a combination of the profile and the level for the encoded bitstream represents a particular decoding capability required for decoding of the encoded bitstream.

13. A coding apparatus, comprising:

a receiver configured to receive a picture to encode or to receive a bitstream to decode;

a transmitter coupled to the receiver, the transmitter configured to transmit the bitstream to a decoder or to transmit a decoded image to a display;

a memory coupled to at least one of the receiver or the transmitter, the memory configured to store instructions; and

a processor coupled to the memory, the processor configured to execute the instructions stored in the memory to perform the method in any of claims 1 to 12.

14. The coding apparatus of claim 8, further comprising a display configured to display an image.