Patch Data Unit Coding and Decoding for Point-Cloud Coding

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This patent application claims the benefit of U.S. Provisional Patent Application No. 62/817,391, filed March 12, 2019, by Vladyslav Zakharchenko, et al., and titled "Patch Data Unit Coding and Decoding 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 a dense point cloud data set.

SUMMARY

[0004] A first aspect relates to a method of point cloud coding (PCC) implemented by a decoder. The method includes receiving, by a receiver of the decoder, encoded patch information data; obtaining, by a processor of the decoder, a patch corresponding to the encoded patch information data, the patch having a patch type (patch_mode); determining, by the processor, whether the patch type for the patch is a last patch type; and terminating, by the processor, a reconstruction process corresponding to the encoded patch information data when the patch type is the last patch type.

[0005] Using this coding method allows for the flexible ordering of the patches in the patch frame data unit. That is, patches having a different patch mode (e.g., inter, intra, PCM, etc.) may be included in the patch frame data unit in any order. In addition, additional

CLAIMS

What is claimed is:

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

receiving, by the decoder, encoded patch information data;

obtaining, by the decoder, a patch corresponding to the encoded patch information data, the patch having a patch type (patch_mode);

determining, by the decoder, whether the patch type for the patch is a last patch type; and

terminating, by the decoder, a reconstruction process corresponding to the encoded patch information data when the patch type is the last patch type.

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

receiving, by the decoder, encoded patch information data;

obtaining, by the decoder, a patch corresponding to the encoded patch information data, the patch having a patch type (patch_mode);

determining, by the decoder, that the patch type for the patch is an inter patch type;

decoding, by the decoder, a second reference patch index (dpdu_patch_index) corresponding to the patch;

determining, by the decoder, a reference index (refIdx) for the patch based on a reference frame index ([refFrmIdx]) corresponding to the patch and the second reference patch index as decoded;

decoding, by the decoder, the patch using two dimensional (2D) components corresponding to the patch and three dimensional (3D) components corresponding to the patch, wherein the two dimensional (2D) components and the three dimensional (3D) components are obtained based on the reference index (refIdx) for the patch; and

reconstructing, by the decoder, the volumetric representation based on the patch as decoded.

3. The method of claim 2, further comprising:

determining that the patch type for the patch is an intra patch type;

determining the reference index (refIdx) for the patch based on a frame index ([frmIdx]) corresponding to the patch and a decremented patch index;

decoding the patch using two dimensional (2D) components corresponding to the patch and three dimensional (3D) components corresponding to the patch; and

reconstructing the volumetric representation based on the patch as decoded.

4. The method of any of claims 2 to 3, further comprising:

determining, by the decoder, that the patch type for the patch is a skip patch type;

decoding, by the decoder, a reference patch index (spdu_patch_index) corresponding to the patch when the patch type is the skip patch type;

determining, by the decoder, the reference index (refIdx) for the patch based on the reference frame index ([refFrmIdx]) corresponding to the patch and the reference patch index as decoded when the patch type is the skip patch type; and

reconstructing, by the processor, a volumetric representation of the patch based on the reference index that was determined when the patch type is the skip patch type.

5. The method of any of claims 2 to 4, further comprising:

determining that the patch type for the patch is a pulse code modulation (PCM) patch type;

determining the reference index (refIdx) for the patch based on a frame index ([frmIdx]) corresponding to the patch and a decremented patch index;

decoding the patch using two dimensional (2D) components for independent points corresponding to the patch and three dimensional (3D) components for the independent points corresponding to the patch; and

reconstructing the volumetric representation based on the patch as decoded.

6. The method of any of claims 2 to 5, further comprising receiving an input corresponding to the encoded patch information data, wherein the input comprises one or more of the patch_mode, a patch index, the reference index, a frame index, and a reference frame index.

7. The method of any of claims 2 to 6, further comprising displaying, on a display of an electronic device, an image generated based on the volumetric representation as reconstructed.

8. The method of any of claims 2 to 6, further comprising

determining, by the decoder, whether a more patches available flag has a first value or a second value;

storing, in a memory of the decoder, the volumetric representation as reconstructed when the more patches available flag has the first value; and

terminating, by the decoder, a reconstruction process of the encoded patch information data when the more patches available flag has the second value.

9. The method of claim 8, further comprising:

determining that the patch type for the patch is an intra patch type;

determining the reference index (refIdx) for the patch based on a frame index ([frmIdx]) corresponding to the patch and a decremented patch index;

decoding the patch using two dimensional (2D) components corresponding to the patch and three dimensional (3D) components corresponding to the patch; and

reconstructing the volumetric representation based on the patch as decoded.

10. A method of point cloud coding (PCC) implemented by an encoder, comprising:

obtaining, by the encoder, a patch frame data unit (pfdu) identifying a patch type (pdfu_patch_mode) for each of a plurality of patches;

determining, by the encoder, whether the patch type for a patch from the plurality of patches is a last patch type;

encoding, by the encoder, patch information data for the patch when the patch type is not the last patch type, the patch information data including the patch type for the patch; and

encoding, by the encoder, the patch information data for the patch when the patch type is set to the last patch type, the patch information data including the last patch type for the patch.

11. The method of claim 10, wherein the patch type is one of a skip patch type, an inter patch type, an intra patch type, and a pulse code modulation (PCM) patch type.

12. The method of any of claims 10 to 11, wherein the patch frame data unit includes a frame index (frmIdx), two dimensional (2D) components corresponding to the patch, and three dimensional (3D) components corresponding to the patch.

13. The method of any of claims 10 to 12, wherein the patch information data includes a frame index, two dimensional (2D) components corresponding to the patch, and three dimensional (3D) components corresponding to the patch.

14. The method of any of claims 10 to 13, further comprising iterating the steps of determining whether the patch type is the last patch type and encoding the patch information data for subsequent patches from the plurality of patches until one of the patches from the plurality of patches is determined to have the last patch type.

15. A decoding device, comprising:

a receiver configured to receive encoded patch information data;

a memory coupled to the receiver, the memory storing instructions; and

a processor coupled to the memory, the processor configured to execute the instructions to cause the decoding device to:

obtain a patch corresponding to the encoded patch information data, the patch having a patch type (patch_mode);

determine whether the patch type for the patch is a last patch type; and

terminate a reconstruction process corresponding to the encoded patch information data when the patch type is the last patch type.

16. A decoding device, comprising:

a receiver configured to receive encoded patch information data;

a memory coupled to the receiver, the memory storing instructions; and

a processor coupled to the memory, the processor configured to execute the instructions to cause the decoding device to carry out the method according to any one of claims 2 to 9.

17. An encoding device, comprising:

a receiver configured to receive a three dimensional (3D) image;

a memory coupled to the receiver, the memory containing instructions;

a processor coupled to the memory, the processor configured to implement the instructions to cause the encoding device to carry out the method according to any one of the claims 10 to 14.