CLAIMS

What is claimed is:

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

receiving, by the decoder, a bitstream containing a limited rotation enabled flag for a two dimensional (2D) patch;

determining, by the decoder, a rotation mode of the 2D patch based on the limited rotation enabled flag, wherein the rotation mode is an exhaustive orientation mode indicated by a first patch orientation index when the limited rotation flag has a first value, the rotation mode is a simple orientation mode indicated by a second patch orientation index when the limited rotation flag has a second value;

rotating, by the decoder, the 2D patch based on the rotation mode; and

reconstructing, by the decoder, a three dimensional (3D) image using the 2D patch as rotated.

2. The method of claim 1, wherein the value of the first patch orientation index is in the range of 0 to 7.

3. The method of claim 1, wherein the exhaustive orientation mode is one of eight exhaustive orientation modes.

4. The method of claim 3, wherein the eight exhaustive orientation modes correspond to eight patch orientations.

5. The method of claim 4, wherein the eight patch orientations are indicated by the first patch orientation index, wherein the value of the first patch orientation index is in the range of 0 to 7.

6. The method of claim 1, wherein the value of the second patch orientation index is in the range of 0 to 1.

7. The method of claim 1, wherein the simple orientation mode is one of two simple orientation modes.

8. The method of claim 1, wherein the bitstream further contains a patch rotation enabled flag,
wherein the method further comprises: determining, by the decoder, the 2D patch is capable of being rotated based on the patch rotation enabled flag.

9. The method of claim 1, wherein the bitstream further contains a patch rotation present flag, and wherein the 2D patch is rotated according to a default patch rotation when the patch rotation present flag has the first value.

10. The method of claim 1, wherein the bitstream further contains a patch rotation present flag, and wherein the 2D patch is rotated according to a preferred patch rotation or one of a plurality of available patch rotations when the patch rotation present flag has the second value.

11. The method of claim 8, further comprising rotating the 2D patch according to a preferred patch rotation when the patch rotation enabled flag has the second value, a limited rotation enabled flag has the second value, and a patch rotation present flag has the second value.

12. The method of claim 8, further comprising rotating the 2D patch according to a default patch rotation when the patch rotation enabled flag has the second value, a limited rotation enabled flag has the second value, and a patch rotation present flag has the first value.

13. The method of claim 8, further comprising rotating the 2D patch according to the default patch rotation when the patch rotation enabled flag has a second value, the limited rotation enabled flag has a first value, and a patch rotation present flag has the first value.

14. The method of claim 8, further comprising rotating the 2D patch according to one of a plurality of available patch rotations when the patch rotation enabled flag has a second value, the limited rotation enabled flag has a first value, and a patch rotation present flag has the second value.

15. The method of claim 1, wherein the bitstream further contains a default patch rotation and a preferred patch rotation, and wherein the 2D patch is rotated according to the default patch rotation or the preferred patch rotation.

16. The method of claim 1, wherein the bitstream contains one of a plurality of available patch rotations, and wherein the 2D patch is rotated according to the one of the plurality of available patch rotations.

17. The method of claim 16, wherein a three bit flag in the bitstream identifies the one of the plurality of available patch rotations.

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

obtaining, by the encoder, a three dimensional (3D) image;

determining, by the encoder, a plurality of two dimensional (2D) projections for the 3D image using a plurality of available patch rotations;

selecting, by the encoder, one of the plurality of 2D projections;

setting, by the encoder, a plurality of flags for a 2D patch according to the one of the plurality of 2D projections that was selected;

generating, by the encoder, a bitstream containing the plurality of flags and atlas information to reconstruct the 3D image, wherein the plurality of flags include a limited rotation enabled flag, wherein the limited rotation flag is set to a first value when a 2D rotation mode is an exhaustive orientation mode indicated by a first patch orientation index, or the limited rotation flag is set to a second value when the 2D rotation mode is a simple orientation mode indicated by a second patch orientation index; and

storing, by the encoder, the bitstream for transmission toward a decoder.

19. The method of claim 18, wherein the plurality of flags includes at least one of a patch rotation enabled flag, and a patch rotation present flag.

20. The method of claim 18, wherein at least one of the plurality of flags is set to signal the decoder to use a default patch rotation.

21. The method of claim 18, wherein at least one of the plurality of flags is set to signal the decoder to use a preferred patch rotation.

22. The method of claim 18, wherein at least one of the plurality of flags is set to signal the decoder to use one of a plurality of available patch rotations.

23. A decoding device, comprising:

a receiver configured to receive a coded video bitstream containing a limited rotation enabled flag for a two dimensional (2D) patch;

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:

determine a rotation mode of the 2D patch based on the limited rotation enabled flag, wherein the rotation mode is an exhaustive orientation mode indicated by a first patch orientation index when the limited rotation flag has a first value, the rotation mode is a simple orientation mode indicated by a second patch orientation index when the limited rotation flag has a second value;

rotate the 2D patch based on the rotation mode; and

reconstruct a three dimensional (3D) image using the 2D patch as rotated.

24. The decoding device of claim 23, further comprising a display configured to display the 3D image.

25. 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:

determine a plurality of two dimensional (2D) projections for the 3D image using a plurality of available patch rotations;

select one of the plurality of 2D projections;

set a plurality of flags according to the one of the plurality of 2D projections that was selected;

generate a bitstream containing the plurality of flags and atlas information to reconstruct the 3D image, wherein the plurality of flags include a limited rotation enabled flag, wherein the limited rotation flag is set to a first value when a 2D rotation

mode is an exhaustive orientation mode indicated by a first patch orientation index, or the limited rotation flag is set to a second value when the 2D rotation mode is a simple orientation mode indicated by a second patch orientation index; and

store the bitstream in the memory for transmission toward a decoder.

26. The encoding device of claim 25, further comprising a transmitter coupled to the processor, the transmitter configured to transmit the bitstream toward the decoder.

27. A coding apparatus, comprising:

a receiver configured to receive a volumetric 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 volumetric image to a reconstruction device configured to reconstruct the decoded volumetric picture;

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 22.

28. The coding apparatus of claim 27, further comprising a display configured to display a projected image based on the decoded volumetric picture.

30. A system, comprising:

an encoder; and

a decoder in communication with the encoder, wherein the encoder or the decoder includes the encoding device, the decoding device, or the coding apparatus of any of claims 23 to 28.

31. A means for coding, comprising:

receiving means configured to receive a volumetric picture to encode or to receive a bitstream to decode, reconstruct, and project;

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 22.