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 2D patch is rotated based on an exhaustive orientation mode when the limited rotation flag has a first value and/or the 2D patch is rotated based on a simple orientation mode when the limited rotation flag has a second value.~~

2~~3~~. The method of claim ~~2~~1, ~~wherein the exhaustive orientation mode is indicated by a patch orientation index,~~ wherein the value of the first patch orientation index is in the range of 0 to 7.

4~~3~~. The method of claim ~~2~~1, wherein the exhaustive orientation mode is one of eight exhaustive orientation modes.

5~~4~~. The method of claim ~~4~~3, wherein the eight exhaustive orientation modes ~~corresponds~~correspond to eight patch orientations.

6~~5~~. The method of claim ~~5~~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.

~~7~~6. The method of claim ~~2~~1, ~~wherein the simple orientation mode is indicated by a patch orientation index,~~ wherein the value of the second patch orientation index is in the range of 0 to 1.

~~8~~7. The method of claim ~~2~~1, wherein the simple orientation mode is one of two simple orientation modes.

~~9~~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.

~~10~~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 ~~a~~the first value.

~~11~~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 ~~a~~ the second value.

~~12~~11. The method of claim ~~9~~8, further comprising rotating the 2D patch according to a preferred patch rotation when the patch rotation enabled flag has ~~a~~ the second value, a limited rotation enabled flag has the second value, and a patch rotation present flag has the second value.

~~13~~12. The method of claim ~~9~~8, further comprising rotating the 2D patch according to a default patch rotation when the patch rotation enabled flag has ~~a~~ the second value, a limited rotation enabled flag has the second value, and ~~the~~ a patch rotation present flag has the first value.

~~14~~13. The method of claim ~~9~~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 ~~the~~a patch rotation present flag has the first value.

~~15~~14. The method of claim ~~9~~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 ~~the~~ a patch rotation present flag has the second value.

~~16~~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.

~~17~~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.

~~18~~17. The method of claim ~~17~~16, wherein a three bit flag in the bitstream identifies the one of the plurality of available patch rotations.

~~19~~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.

~~20~~19. The method of claim ~~19~~18, wherein the plurality of flags includes at least one of a patch rotation enabled flag~~, a limited rotation enabled flag~~, and a patch rotation present flag.

~~21~~20. The method of claim ~~19~~18, wherein at least one of the plurality of flags is set to signal the decoder to use a default patch rotation.

~~22~~21. The method of claim ~~19~~18, wherein at least one of the plurality of flags is set to signal the decoder to use a preferred patch rotation.

~~23~~22. The method of claim ~~19~~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.

~~24~~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.

~~25~~24. The decoding device of claim ~~24~~23, further comprising a display configured to display the 3D image.

~~26~~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.

~~27~~26. The encoding device of claim ~~26~~25, further comprising a transmitter coupled to the processor, the transmitter configured to transmit the bitstream toward the decoder.

~~28~~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 ~~23~~22.

~~29~~28. The coding apparatus of claim ~~28~~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 ~~24~~ 23 to ~~29~~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 ~~23~~22.