depth values along projection lines, one is added to all delta_depth values to be coded;

- if the occupancy information is embedded into DepthImg1, when DepthImg1 stores the maximum depth values along projection lines, the depth patch generation step is modified to make sure that all depth values, and more particularly depth D1, to be coded are larger than 0.

According to a first aspect of the present disclosure, there is provided a method including: obtaining an occupancy information indicating whether or not a pixel obtained from a projection of a first point of a point cloud onto a projection plane along a projection line is occupied; storing said occupancy information in an image with a codeword concatenating bits indicating for positions between a first depth value of the first point and a second depth value of a second point of the point cloud projected onto the projection plane along the projection line, whether or not the position is occupied; and encoding said image.

According to a second aspect of the present disclosure, there is provided a device including means for: obtaining an occupancy information indicating whether or not a pixel obtained from a projection of a first point of a point cloud onto a projection plane along a projection line is occupied; storing said occupancy information in an image with a codeword concatenating bits indicating for positions between a first depth value of the first point and a second depth value of a second point of the point cloud projected onto the projection plane along the projection line, whether or not the position is occupied; and encoding said image.

In an embodiment of the above method or the device, storing said occupancy information with said codeword includes shifting the codeword to be stored.

In an embodiment of the above method or the device, the method further includes transmitting information to indicate that the codeword has been shifted.

According to a third aspect of the present disclosure, there is provided a method including: decoding an image storing an occupancy information and a codeword concatenating bits indicating for positions between a first depth value of a first point of a point cloud projected onto a projection plane along a projection line and a second depth value of a second point of the point cloud projected onto the projection plane along the projection line, whether or not the position is occupied; deriving the occupancy information from the decoded image, said occupancy information indicating whether or not a pixel obtained from the projection onto the projection plane of the first point is occupied.

According to a fourth aspect of the present disclosure, there is provided a device including means for: decoding an image storing an occupancy information and a codeword concatenating bits indicating for positions between a first depth value of a first point of a point cloud projected onto a projection plane along a projection line and a second depth value of a second point of the point cloud projected onto the projection plane along the projection line, whether or not the position is occupied; and deriving the occupancy information from the decoded image, said occupancy information indicating whether or not a pixel obtained from the projection onto the projection plane of the first point is occupied.

In an embodiment of the above method or the device, the method further includes a step of or the device further includes means for receiving an information indicating if the codeword has to be shifted, and shifting the decoded codeword according to said received information.

According to a fifth aspect of the present disclosure, there is provided a signal carrying a bitstream including an image storing an occupancy information and a codeword concatenating bits indicating for positions between a first depth value of a first point of a point cloud projected onto a projection plane along a projection line and a second depth value of a second point of the point cloud projected onto the projection plane along the projection line, whether or not the position is occupied, the occupancy information indicating whether or not a pixel obtained from the projection onto the projection plane of the first point is occupied.

In an embodiment, the bitstream includes an information indicating if the codeword has to be shifted.

According to a sixth aspect of the present disclosure, there is provided a non-transitory processor-readable medium including instructions for causing one or more processors to perform the above methods.

According to a seventh aspect of the present disclosure, there is provided a non-transitory computer-readable medium including an image storing an occupancy information and a codeword concatenating bits indicating for positions between a first depth value of a first point of a point cloud projected onto a projection plane along a projection line and a second depth value of a second point of the point cloud projected onto the projection plane along the projection line, whether or not the position is occupied, the occupancy information indicating whether or not a pixel obtained from the projection onto the projection plane of the first point is occupied.

1. Brief Description of Drawings.

In the drawings, examples of the present principles are illustrated. It shows:

- **Fig. 1** already described shows an encoder;
- **Fig. 2** already described illustrates the depth patch creation process of the encoder of Fig.1;
- **Fig. 3** already described illustrates the image generation process of the encoder of Fig.1;
- **Fig. 4** already described shows examples of sub-blocks traversals used in the encoder of Fig.1;
- **Fig. 5** already described shows a decoder;
- **Fig. 6** already described illustrates the image reconstruction process of the decoder of Fig.5;
- **Fig. 7** shows a lossless encoder in which the present principles may be advantageously implemented;
- **Fig. 8** shows modifications of the lossless encoder of Figure 7 according to an embodiment of the present disclosure;
- **Fig. 9** shows modifications of the decoder of Figure 5 according to an embodiment of the present disclosure;
- **Fig. 10** illustrates the geometry compression block modified according to a first embodiment of the present disclosure;
- **Fig. 11** illustrates the geometry compression block modified according to a second embodiment of the present disclosure;
- **Fig. 12** illustrates the geometry compression block modified according to a third embodiment of the present disclosure;
- **Fig. 13** illustrates an example of enhanced-delta-depth (EDD) codes according to an embodiment of the present disclosure;

CLAIMS

1. A method comprising:
   - obtaining an occupancy information indicating whether or not a pixel obtained from a projection of a first point of a point cloud onto a projection plane along a projection line is occupied;
   - storing said occupancy information in an image with a codeword concatenating bits indicating for positions between a first depth value of the first point and a second depth value of a second point of the point cloud projected onto the projection plane along the projection line, whether or not the position is occupied; and
   - encoding said image.

2. A device comprising means for:
   - obtaining an occupancy information indicating whether or not a pixel obtained from a projection of a first point of a point cloud onto a projection plane along a projection line is occupied;
   - storing said occupancy information in an image with a codeword concatenating bits indicating for positions between a first depth value of the first point and a second depth value of a second point of the point cloud projected onto the projection plane along the projection line, whether or not the position is occupied; and
   - encoding said image.

3. The method of claim 1 or the device of claim 2, wherein storing said occupancy information with said codeword comprises shifting the codeword to be stored.

4. The method or the device of claim 3, wherein the method further comprises transmitting information to indicate that the codeword has been shifted.

5. A method comprising:
   - decoding an image storing an occupancy information and a codeword concatenating bits indicating for positions between a first depth value of

a first point of a point cloud projected onto a projection plane along a projection line and a second depth value of a second point of the point cloud projected onto the projection plane along the projection line, whether or not the position is occupied;

- deriving the occupancy information from the decoded image, said occupancy information indicating whether or not a pixel obtained from the projection onto the projection plane of the first point is occupied.

6. A device comprising means for:

- decoding an image storing an occupancy information and a codeword concatenating bits indicating for positions between a first depth value of a first point of a point cloud projected onto a projection plane along a projection line and a second depth value of a second point of the point cloud projected onto the projection plane along the projection line, whether or not the position is occupied; and
- deriving the occupancy information from the decoded image, said occupancy information indicating whether or not a pixel obtained from the projection onto the projection plane of the first point is occupied.

7. The method of claim 5 or the device of claim 6, wherein the method further comprises a step of or the device further comprises means for receiving an information indicating if the codeword has to be shifted, and shifting the decoded codeword according to said received information.

8. A signal carrying a bitstream comprising an image storing an occupancy information and a codeword concatenating bits indicating for positions between a first depth value of a first point of a point cloud projected onto a projection plane along a projection line and a second depth value of a second point of the point cloud projected onto the projection plane along the projection line, whether or not the position is occupied, the occupancy information indicating whether or not a pixel obtained from the projection onto the projection plane of the first point is occupied.

9. The signal of claim 8, wherein the bitstream comprises an information indicating if the codeword has to be shifted.

10. A non-transitory processor-readable medium including instructions for causing one or more processors to perform the method of any one of claims 1, 3, 4, 5 and 7.

11. A non-transitory computer-readable medium comprising an image storing an occupancy information and a codeword concatenating bits indicating for positions between a first depth value of a first point of a point cloud projected onto a projection plane along a projection line and a second depth value of a second point of the point cloud projected onto the projection plane along the projection line, whether or not the position is occupied, the occupancy information indicating whether or not a pixel obtained from the projection onto the projection plane of the first point is occupied.