

CLAIMS:

1. An intra-prediction apparatus (100) for extending a set of predetermined directional intra-prediction modes of a rectangular video coding block, each predetermined directional intra-prediction mode being associated with a predetermined direction within a predetermined directional range, comprising:
- an aspect ratio determining unit (101) configured to determine a width and a height of the rectangular video coding block, and to determine an aspect ratio of the rectangular video coding block on the basis of the width and the height;
- a directional intra-prediction mode extending unit (105) configured to determine an extension directional intra-prediction mode upon the basis of the aspect ratio of the rectangular video coding block from an extended set of directional intra-prediction modes, wherein the extension directional intra-prediction mode is within a complementary angle range (α), and the extended set of directional intra-prediction modes includes extension directional intra-prediction modes within the complementary directional range and the predetermined directional intra-prediction modes within the predetermined directional range; and
- an intra-prediction unit (107) configured to intra-predict pixel values of pixels of the rectangular video coding block on the basis of the extension directional intra-prediction mode.
2. The intra-prediction apparatus (100) of claim 1, wherein a complementary angle range determining unit (103) is configured to determine the complementary angle range (α) upon the basis of the following equation:

$$\alpha = \frac{\pi}{4} - \arctan\left(\frac{L_{\text{shorter}}}{L_{\text{longer}}}\right)$$

wherein α denotes the complementary angle range, and $L_{\text{shorter}} / L_{\text{longer}}$ denotes the aspect ratio of the rectangular video coding block.

3. The intra-prediction apparatus (100) of claim 2, wherein L_{shorter} represents the width of the rectangular video coding block and L_{longer} represents the height of the rectangular video coding block in a vertical orientation of the rectangular video coding block, or wherein L_{shorter} represents the height of the rectangular video coding block and L_{longer} represents the width of the rectangular video coding block in a horizontal orientation of the rectangular video coding block.

4. The intra-prediction apparatus (100) of any one of the preceding claims, the directional intra-prediction mode extending unit (105) further configured to select a complementary direction within the complementary directional range, and to add the extension directional intra-prediction mode being associated with the complementary direction to the set of predetermined directional intra-prediction modes.

5. The intra-prediction apparatus (100) of claim 4, wherein the directional intra-prediction mode extending unit (105) is further configured to select a further complementary direction within the complementary directional range, and to add a further extension directional intra-prediction mode being associated with the further complementary direction to the set of predetermined directional intra-prediction modes.

6. The intra-prediction apparatus (100) of claim 5, wherein the complementary direction of the extension directional intra-prediction mode and the further complementary direction of the further extension directional intra-prediction mode differ by a predetermined angle step (s).

7. The intra-prediction apparatus (100) of claim 6, wherein the predetermined angle step (s) is given by the following equation:

$$s = \frac{\pi}{64}$$

wherein s denotes the predetermined angle step.

8. The intra-prediction apparatus (100) of any one of the preceding claims, further comprising:

a directional intra-prediction mode removing unit configured to select a directional intra-prediction mode within the set of predetermined directional intra-prediction modes, the selected directional intra-prediction mode being associated with a direction opposite to the complementary directional range, and to remove the selected directional intra-prediction mode from the set of predetermined directional intra-prediction modes.

9. The intra-prediction apparatus (100) of any one of the preceding claims, wherein the complementary directional range and the predetermined directional range are adjacent.

10. The intra-prediction apparatus (100) of any one of the preceding claims, wherein the rectangular video coding block is a coding unit (CU), a prediction unit (PU), or a transform unit (TU).

11. The intra-prediction apparatus (100) of any one of the preceding claims, wherein the directional intra-prediction mode extending unit (105) configured to determine the extension directional intra-prediction mode within the complementary angle range (α), wherein the complementary angle range is determined based on the aspect ratio of the rectangular video coding block.
12. The intra-prediction apparatus (100) of any one of the preceding claims, wherein the complementary angle range (α) is different from a predetermined directional range, and wherein the extension directional intra-prediction mode is different from a predetermined directional intra-prediction mode being associated with a predetermined direction within the predetermined directional range.
13. An encoding apparatus (200) for encoding a rectangular video coding block, the encoding apparatus (200) comprising:
an intra-prediction apparatus (100) of any one of the claims 1 to 12 for providing a predicted rectangular video coding block; and
an encoding unit (201) configured to encode the rectangular video coding block on the basis of the predicted rectangular video coding block.
14. A decoding apparatus (300) for decoding an encoded rectangular video coding block, the decoding apparatus (300) comprising:
an intra-prediction apparatus (100) of any one of the claims 1 to 12 for providing a predicted rectangular video coding block; and
a restoration unit (301) configured to restore a rectangular video coding block on the basis of the encoded rectangular video coding block and the predicted rectangular video coding block.
15. An intra-prediction method (400) for extending a set of predetermined directional intra-prediction modes of a rectangular video coding block, each predetermined directional intra-prediction mode being associated with a predetermined direction within a predetermined directional range, comprising:
determining (401) a width and a height of the rectangular video coding block;
determining (403) an aspect ratio of the rectangular video coding block on the basis of the width and the height;
determining (405, 407, 409) an extension directional intra-prediction mode upon the basis of the aspect ratio of the rectangular video coding block from an extended set of directional intra-prediction modes, wherein the extension directional intra-prediction mode is within a

complementary angle range (α), and the extended set of directional intra-prediction modes includes extension directional intra-prediction modes within the complementary directional range and the predetermined directional intra-prediction modes within the predetermined directional range; and

- 5 intra-predicting (411) pixel values of pixels of the rectangular video coding block on the basis of the extension directional intra-prediction mode.

16. The intra-prediction method (400) of claim 15, further comprising:

- 10 selecting a directional intra-prediction mode within the set of predetermined directional intra-prediction modes, the selected directional intra-prediction mode being associated with a direction opposite to the complementary directional range; and
removing the selected directional intra-prediction mode from the set of predetermined directional intra-prediction modes.

- 15 17. The intra-prediction method (400) of claim 15, wherein the complementary angle range (α) is different from a predetermined directional range, and wherein the extension directional intra-prediction mode is different from a predetermined directional intra-prediction mode being associated with a predetermined direction within the predetermined directional range.

- 20 18. A computer program comprising a program code for performing the method (400) of any one of the claims 15-17 when executed on a computer.