

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 of the set of predetermined directional intra-prediction modes being associated with a predetermined direction within a predetermined directional range, the intra-prediction apparatus (100) comprising:
- an aspect ratio determining unit (101) configured to determine a width and a height of the 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, wherein the extension directional intra-prediction mode is within a complementary angle range (α), the complementary angle range (α) being associated with a complementary directional range different from 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.

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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.

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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.

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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).

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

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

wherein s denotes the predetermined angle step.

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

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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 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. 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 11 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.

13. 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 11 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.

14. 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 of the set of predetermined directional intra-prediction modes being associated with a predetermined direction within a predetermined directional range, the
5 intra-prediction method (400) comprising:

determining (401) a width and a height of the video coding block;

10 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, wherein the extension directional intra-prediction mode is within a complementary angle range (α), the complementary
15 angle range (α) being associated with a complementary directional range different from the predetermined directional range; and
intra-predicting (411) pixel values of pixels of the rectangular video coding block on the basis of the extension directional intra-prediction mode.

20 15. The intra-prediction method (400) of claim 14, further comprising:

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
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removing the selected directional intra-prediction mode from the set of predetermined directional intra-prediction modes.

16. A computer program comprising a program code for performing the method (400)
30 of any one of the claims 14 or 15 when executed on a computer.