



- (51) **International Patent Classification:**
H04N 19/159 (2014.01) *H04N 19/573* (2014.01)
- (21) **International Application Number:**
PCT/CN2015/083991
- (22) **International Filing Date:**
14 July 2015 (14.07.2015)
- (25) **Filing Language:** English
- (26) **Publication Language:** English
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- (81) **Designated States** (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.
- (84) **Designated States** (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:
— with international search report (Art. 21(3))

(54) **Title:** ADVANCED INTRA PREDICTION MODE SIGNALING IN VIDEO CODING

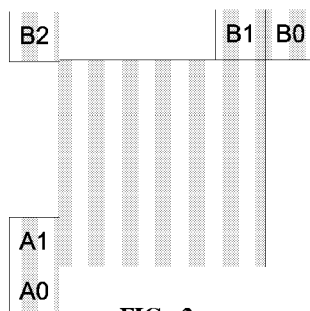


FIG. 2

(57) **Abstract:** An advanced intra mode prediction coding method is proposed. In the proposed method, a candidate intra prediction mode list is constructed. And two new intra prediction modes are proposed.

ADVANCED INTRA PREDICTION MODE SIGNALING IN **VIDEO CODING**

TECHNICAL FIELD

The invention relates generally to video coding. In particular, the presented
5 invention relates to intra mode signaling.

BACKGROUND

In video coding standard H.265/HEVC, several intra prediction modes are available. In an intra coding unit (CU), the used intra prediction mode is signalled.

10 For the luma component, there are 35 possible intra prediction modes. Intra prediction mode *MA* in the neighbouring block *A* and intra prediction mode *MB* in the neighbouring block *B* as shown in Fig. 1 are referred as predictors to code the intra prediction mode of the current block. *MA* and *MB* are named as *candIntraPredModeA* and *candIntraPredModeB* in the HEVC specification. As described in the HEVC
15 specification, the candidate mode list denoted as *candModeList* and the intra prediction mode denoted as *IntraPredMode[xB][yB]* is derived as follows.

1. The *candModeList[x]* with $x = 0..2$ is derived as follows:

– If *candIntraPredModeB* is equal to *candIntraPredModeA*, the following applies:

20 – If *candIntraPredModeA* is less than 2 (either *Intra_Planar* or *Intra_DC*), *candModeList[x]* with $x = 0..2$ is derived as:

$$\text{candModeList}[0] = \text{Intra_Planar} \quad (8-15)$$

$$\text{candModeList}[1] = \text{Intra_DC} \quad (8-16)$$

$$\text{candModeList}[2] = \text{Intra_Angular} (26) \quad (8-17)$$

25 – Otherwise, *candModeList[x]* with $x = 0..2$ is derived as:

$$\text{candModeList}[0] = \text{candIntraPredModeA} \quad (8-18)$$

$$\text{candModeList}[1] = 2 + ((\text{candIntraPredModeA} + 29) \% 32) \quad (8-19)$$

$$\text{candModeList}[2] = 2 + ((\text{candIntraPredModeA} - 2 + 1) \% 32) \quad (8-20)$$

– Otherwise (*candIntraPredModeB* is not equal to *candIntraPredModeA*),

the following applies:

- candModeList[0] and candModeList[1] are derived as follows:

$$\text{candModeList}[0] = \text{candIntraPredModeA} \quad (8-21)$$

$$\text{candModeList}[1] = \text{candIntraPredModeB} \quad (8-22)$$

- 5 – If none of candModeList[0] and candModeList[1] is equal to Intra_Planar, candModeList[2] is set equal to Intra_Planar,
- Otherwise, if none of candModeList[0] and candModeList[1] is equal to Intra_DC, candModeList[2] is set equal to Intra_DC,
- Otherwise, candModeList[2] is set equal to Intra_Angular (26).

10 2. IntraPredMode[xB][yB] is derived by applying the following procedure:

- If prev_intra_luma_pred_flag[xB][yB] is equal to 1, the IntraPredMode[xB][yB] is set equal to candModeList[mpm_idx].
- Otherwise IntraPredMode[xB][yB] is derived by applying the following ordered steps:

15 1) The array candModeList[x], x = 0..2 is modified as the following ordered steps:

- i. When candModeList[0] is greater than candModeList[1], both values are swapped as follows.

$$(\text{candModeList}[0], \text{candModeList}[1]) = \text{Swap}(\text{candModeList}[0], \text{candModeList}[1]) \quad (8-23)$$

- ii. When candModeList[0] is greater than candModeList[2], both values are swapped as follows.

$$(\text{candModeList}[0], \text{candModeList}[2]) = \text{Swap}(\text{candModeList}[0], \text{candModeList}[2]) \quad (8-24)$$

- 25 iii. When candModeList[1] is greater than candModeList[2], both values are swapped as follows.

$$(\text{candModeList}[1], \text{candModeList}[2]) = \text{Swap}(\text{candModeList}[1], \text{candModeList}[2]) \quad (8-25)$$

2) IntraPredMode[xB][yB] is derived as the following ordered steps:

- 30 i. IntraPredMode[xB][yB] = rem_intra_luma_pred_mode[xB][yB]
- ii. For i equal to 0 to 2, inclusive, when IntraPredMode[xB][yB] is greater than or equal to candModeList[i], the value of IntraPredMode[xB][yB] is incremented by one

For the chroma component, 5 possible intra prediction modes are available. As

described in the HEVC specification, the chroma intra prediction mode IntraPredModeC is derived using $\text{intra_chroma_pred_mode}[x_B][y_B]$ and $\text{IntraPredMode}[x_B][y_B]$ as specified in the table below.

$\text{intra_chroma_pred_mode}[x_B][y_B]$	$\text{IntraPredMode}[x_B][y_B]$				
	0	26	10	1	X ($0 \leq X \leq 34$)
0	34	0	0	0	0
1	26	34	26	26	26
2	10	10	34	10	10
3	1	1	1	34	1
4	0	26	10	1	X

- 5 A planar mode is used in HEVC. With this mode, the prediction block is generated as described in sub-clause 8.4.4.2.4 in the HEVC spec. as follows.

8.4.4.2.4 Specification of Intra_Planar prediction mode

Inputs to this process are:

- neighbouring samples $p[x][y]$, with $x, y = -1..2 \cdot n_T - 1$,
- 10 – a variable n_T specifying the transform block size.

Output of this process are:

- predicted samples $\text{predSamples}[x][y]$, with $x, y = 0..n_T - 1$.

The values of the prediction samples $\text{predSamples}[x][y]$, with $x, y = 0..n_T - 1$, are derived by

$$15 \quad \text{predSamples}[x][y] = ((n_T - 1 - x) * p[-1][y] + (x + 1) * p[n_T][y] + (n_T - 1 - y) * p[x][-1] + (y + 1) * p[x][n_T] + n_T) \gg (\text{Log}_2(n_T) + 1).$$

LM mode is a new intra prediction mode but not adopted in HEVC for chroma components. In LM mode, a chroma pixel $P_C(x,y)$ is predicted by a corresponding luma pixel $P_L(x,y)$. The predictor is calculated as $P'_C(x,y) = a * P_L(x,y) + b$.

- 20 The parameters a and b can be obtained by a linear regression process on left and above neighboring pixels.

There are some other modes developed from LM mode. In LM-L mode, a and b are obtained by a linear regression process only on left neighboring pixels. In LM-A mode, a and b are obtained by a linear regression process only on above neighboring

pixels. In LM-U mode, a V pixel $P_V(x,y)$ is predicted by a corresponding U pixel $P_U(x,y)$. The predictor is calculated as $P'_V(x,y)=a*P_U(x,y)+b$. a and b are obtained by a linear regression process on left and above neighboring pixels.

5

SUMMARY

In light of the previously described problems, an advanced intra prediction mode coding method is proposed. In the proposed method, more neighboring blocks are used to predict the intra prediction mode of the current block. Besides, the chroma intra prediction mode and luma intra prediction mode are coded with a unified method.

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Other aspects and features of the invention will become apparent to those with ordinary skill in the art upon review of the following descriptions of specific embodiments.

BRIEF DESCRIPTION OF DRAWINGS

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The invention can be more fully understood by reading the subsequent detailed description and examples with references made to the accompanying drawings, wherein:

Fig. 1 is a diagram illustrating neighboring blocks used in intra prediction mode coding in HEVC;

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Fig. 2 is a diagram illustrating neighboring blocks used in the proposed intra prediction mode coding method;

Fig. 3 is a diagram illustrating more neighboring blocks used in the proposed intra prediction mode coding method;

Fig. 4 is a diagram illustrating collocated blocks in another component;

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Fig. 5 is a diagram illustrating an example of signaling the intra prediction mode in the proposed method;

Fig. 6 is a diagram illustrating an example of inserting intra prediction modes of neighboring blocks in to the candidate intra prediction mode list orderly. In the example, the order is A1, B1, A0, B0, B2;

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Fig. 7 is a diagram illustrating an example of inserting intra prediction modes of

neighboring blocks in to the candidate intra prediction mode list. Mode 1 appears three times in block B0, B1, and B2. Mode 3 appears twice in block A0 and A1. So Mode 1 is inserted into the list before mode 3;

Fig. 8 is a diagram illustrating an example of inserting modes into the candidate intra prediction mode list for the luma component orderly;

Fig. 9 is a diagram illustrating an example of inserting modes into the candidate intra prediction mode list for the chroma component orderly;

Fig. 10 is a diagram illustrating an example of code tree to code the candidate intra prediction mode list.

DETAILED DESCRIPTION

The following description is of the best-contemplated mode of carrying out the invention. This description is made for the purpose of illustrating the general principles of the invention and should not be taken in a limiting sense. The scope of the invention is best determined by reference to the appended claims.

In the following description, Y component is identical to luma component, U component is identical to Cb component and V component is identical to Cr component

An advanced intra prediction mode coding method is proposed.

In one embodiment, neighbouring blocks A0, A1, B0, B1, and B2 as demonstrated in Fig. 2 are used to predict the intra prediction mode of the current block.

In one embodiment, neighbouring blocks X0, X1, X2, ..., X9, XA as demonstrated in Fig. 3 are used to predict the intra prediction mode of the current block.

In one embodiment, one or more of the luma intra prediction mode in collocated luma blocks X0, X1, X2, ..., X9, XA,...XF of the current chroma block as demonstrated in Fig. 4 are used to predict the chroma intra prediction mode.

In one embodiment, one or more of the luma intra prediction mode in collocated luma blocks X0, X1, X2, ..., X9, XA,...XF of the current U block as demonstrated in Fig. 4 are used to predict the intra prediction mode for the component U.

In one embodiment, one or more of the luma intra prediction mode in collocated

luma blocks X0, X1, X2, ..., X9, XA,...XF of the current V block as demonstrated in Fig. 4 are used to predict the intra prediction mode for the component V.

In one embodiment, one or more of the U intra prediction mode in collocated U blocks X0, X1, X2, ..., X9, XA,...XF of the current V block as demonstrated in Fig. 4 are used to predict the intra prediction mode for the component V.

In one embodiment, one or more of the V intra prediction mode in collocated V blocks X0, X1, X2, ..., X9, XA,...XF of the current U block as demonstrated in Fig. 4 are used to predict intra prediction mode for the component U.

In one embodiment, one or more of the U intra prediction mode in collocated U blocks X0, X1, X2, ..., X9, XA,...XF of the current luma block as demonstrated in Fig. 4 are used to predict the luma intra prediction mode.

In one embodiment, one or more of the V intra prediction mode in collocated V blocks X0, X1, X2, ..., X9, XA,...XF of the current luma block as demonstrated in Fig. 4 are used to predict the luma intra prediction mode.

In one embodiment, a candidate intra prediction mode list is constructed for luma intra prediction mode.

In one embodiment, a candidate intra prediction mode list is constructed for chroma intra prediction mode.

In one embodiment, a candidate intra prediction mode list is constructed for intra prediction mode for component U.

In one embodiment, a candidate intra prediction mode list is constructed for intra prediction mode for component V.

In one embodiment, one or more of the luma intra prediction modes in neighbouring blocks A0, A1, B0, B1, and B2 are inserted into the candidate intra prediction mode list for luma intra prediction mode.

In one embodiment, one or more of the chroma intra prediction modes in neighbouring blocks A0, A1, B0, B1, and B2 are inserted into the candidate intra prediction mode list for chroma intra prediction mode.

In one embodiment, one or more of the intra prediction modes of U component in neighbouring blocks A0, A1, B0, B1, and B2 are inserted into the candidate intra prediction mode list for chroma intra prediction mode for U component.

In one embodiment, one or more of the intra prediction modes of V component in neighbouring blocks A0, A1, B0, B1, and B2 are inserted into the candidate intra prediction mode list for chroma intra prediction mode for V component.

In one embodiment, one or more of the luma intra prediction modes in neighbouring blocks X0, X1, X2, ..., X9, XA as demonstrated in Fig. 3 are inserted into the candidate intra prediction mode list for luma intra prediction mode.

5 In one embodiment, one or more of the chroma intra prediction modes in neighbouring blocks X0, X1, X2, ..., X9, XA as demonstrated in Fig. 3 are inserted into the candidate intra prediction mode list for chroma intra prediction mode.

10 In one embodiment, one or more of the intra prediction modes of U component in neighbouring blocks X0, X1, X2, ..., X9, XA as demonstrated in Fig. 3 are inserted into the candidate intra prediction mode list for chroma intra prediction mode for U component.

In one embodiment, one or more of the intra prediction modes of V component in neighbouring blocks X0, X1, X2, ..., X9, XA as demonstrated in Fig. 3 are inserted into the candidate intra prediction mode list for chroma intra prediction mode for V component.

15 In one embodiment, one or more of the luma intra prediction mode in collocated luma blocks X0, X1, X2, ..., X9, XA,...XF of the current chroma block as demonstrated in Fig. 4 are inserted into the candidate intra prediction mode list for chroma intra prediction mode. The luma intra prediction mode in a collocated luma block can be inserted as the first candidate in the candidate intra prediction mode list
20 for chroma intra prediction mode.

In one embodiment, one or more of the luma intra prediction mode in collocated luma blocks X0, X1, X2, ..., X9, XA,...XF of the current U block as demonstrated in Fig. 4 are inserted into the candidate intra prediction mode list for intra prediction mode for the component U. The luma intra prediction mode in a collocated luma
25 block can be inserted as the first candidate in the candidate intra prediction mode list for intra prediction mode for the component U.

In one embodiment, one or more of the luma intra prediction mode in collocated luma blocks X0, X1, X2, ..., X9, XA,...XF of the current V block as demonstrated in Fig. 4 are inserted into the candidate intra prediction mode list for intra prediction
30 mode for the component V. The luma intra prediction mode in a collocated luma block can be inserted as the first candidate in the candidate intra prediction mode list for intra prediction mode for the component V.

In one embodiment, one or more of the U intra prediction mode in collocated U blocks X0, X1, X2, ..., X9, XA,...XF of the current V block as demonstrated in Fig. 4

are inserted into the candidate intra prediction mode list for intra prediction mode for the component V. The U intra prediction mode in a collocated U block can be inserted as the first candidate in the candidate intra prediction mode list for intra prediction mode for the component V. In another embodiment, the U intra prediction mode in a collocated U block can be inserted as a candidate in the candidate intra prediction mode list for intra prediction mode for the component V after the luma intra prediction mode in a collocated luma block.

In one embodiment, one or more of the V intra prediction mode in collocated V blocks X0, X1, X2, ..., X9, XA,...XF of the current U block as demonstrated in Fig. 4 are inserted into the candidate intra prediction mode list for intra prediction mode for the component U. The V intra prediction mode in a collocated V block can be inserted as the first candidate in the candidate intra prediction mode list for intra prediction mode for the component U. In another embodiment, the V intra prediction mode in a collocated V block can be inserted as a candidate in the candidate intra prediction mode list for intra prediction mode for the component U after the luma intra prediction mode in a collocated luma block.

In one embodiment, one or more of the U intra prediction mode in collocated U blocks X0, X1, X2, ..., X9, XA,...XF of the current luma block as demonstrated in Fig. 4 are inserted into the candidate intra prediction mode list for the luma intra prediction mode. The V intra prediction mode in a collocated V block can be inserted as the first candidate in the candidate intra prediction mode list for intra prediction mode for the component U. In another embodiment, the V intra prediction mode in a collocated V block can be inserted as a candidate in the candidate intra prediction mode list for intra prediction mode for the component U after the luma intra prediction mode in a collocated luma block.

In one embodiment, one or more of the V intra prediction mode in collocated V blocks X0, X1, X2, ..., X9, XA,...XF of the current luma block as demonstrated in Fig. 4 are inserted into the candidate intra prediction mode list for the luma intra prediction mode.

In one embodiment, there are no duplicated modes in entries of the candidate intra prediction mode list.

In one embodiment, the index of the intra prediction mode in the candidate intra prediction mode list of the current block is signalled from the encoder to the decoder. The decoder can reconstruct the intra prediction mode by retrieving the mode in the

candidate intra prediction mode list with the signalled index. Fig. 5 demonstrates the mode signalling and reconstructing process.

In one embodiment, the code length of the signalled index of the intra prediction mode in the candidate intra prediction mode list depends on the value of the index.

5 In one embodiment, an index in the candidate intra prediction mode list with a smaller value is signalled with a shorter code length. An index in the candidate intra prediction mode list with a larger value is signalled with a longer code length.

In one embodiment, the intra prediction modes for luma component and chroma component are coded in the same manner.

10 In one embodiment, the intra prediction modes in neighbouring blocks are inserted into the candidate intra prediction mode list from the head to the tail orderly. Fig. 6 demonstrates an example of inserting intra prediction modes of neighboring blocks in to the candidate intra prediction mode list orderly. In the example, the order is A1, B1, A0, B0, B2.

15 In one embodiment, if an intra prediction mode M1 appears more in neighbouring blocks than another intra prediction mode M2, M1 is inserted before M2 in the candidate intra prediction mode list. Fig. 7 demonstrates an example of inserting intra prediction modes of neighboring blocks in to the candidate intra prediction mode list. Mode 1 appears three times in block B0, B1, and B2. Mode 3
20 appears twice in block A0 and A1. So Mode 1 is inserted into the list before mode 3.

In one embodiment, adjacent modes for intra prediction modes of neighbouring blocks are inserted into the candidate intra prediction mode list. The adjacent modes are inserted only if the mode of a neighbouring block is an angular mode. For example, if mode 10 is a mode in a neighbouring block and it is inserted into the list,
25 then 11 and 9 is inserted into the list.

In one embodiment, mode LM, LM-L, and LM-A are inserted into the chroma candidate intra prediction mode list.

In one embodiment, mode LM-U is inserted into the candidate intra prediction mode list for the V component.

30 In one embodiment, all possible intra prediction modes are inserted into the candidate intra prediction mode list in an order.

In one embodiment, a mode is not inserted into the candidate intra prediction mode list if the same mode has already been in the list.

Fig. 8 demonstrates an example of inserting modes into the candidate intra

prediction mode list for the luma component orderly.

Fig. 9 demonstrates an example of inserting modes into the candidate intra prediction mode list for the chroma component orderly.

In one embodiment, an Intra_Planar_Left mode is proposed. The prediction
5 block is generated as follows:

$$\text{predSamples}[x][y] = ((nT - 1 - x) * p[-1][y] + (x + 1) * p[nT][-1] + (nT >> 1)) >> \text{Log2}(nT).$$

In one embodiment, an Intra_Planar_Above mode is proposed. The prediction
block is generated as follows:

$$10 \quad \text{predSamples}[x][y] = ((nT - 1 - y) * p[x][-1] + (y + 1) * p[-1][nT] + (nT >> 1)) >> \text{Log2}(nT).$$

In one embodiment, Intra_Planar_Left mode is inserted into the candidate intra prediction mode list.

In one embodiment, Intra_Planar_Above mode is inserted into the candidate intra
15 prediction mode list.

In one embodiment, the index of the candidate intra prediction mode list is coded with the code tree depicted in Fig. 10.

In one embodiment, the code of the index of the candidate intra prediction mode list can be treated as binarization code in the CABAC process.

20 The methods described above can be used in a video encoder as well as in a video decoder. Embodiments of disparity vector derivation methods according to the present invention as described above may be implemented in various hardware, software codes, or a combination of both. For example, an embodiment of the present invention can be a circuit integrated into a video compression chip or program codes
25 integrated into video compression software to perform the processing described herein. An embodiment of the present invention may also be program codes to be executed on a Digital Signal Processor (DSP) to perform the processing described herein. The invention may also involve a number of functions to be performed by a computer processor, a digital signal processor, a microprocessor, or field programmable gate
30 array (FPGA). These processors can be configured to perform particular tasks according to the invention, by executing machine-readable software code or firmware code that defines the particular methods embodied by the invention. The software code or firmware codes may be developed in different programming languages and different format or style. The software code may also be compiled for different target

platform. However, different code formats, styles and languages of software codes and other means of configuring code to perform the tasks in accordance with the invention will not depart from the spirit and scope of the invention.

5 The invention may be embodied in other specific forms without departing from its spirit or essential characteristics. The described examples are to be considered in all respects only as illustrative and not restrictive. To the contrary, it is intended to cover various modifications and similar arrangements (as would be apparent to those skilled in the art). Therefore, the scope of the appended claims should be accorded the broadest interpretation so as to encompass all such modifications and similar
10 arrangements.

CLAIMS

1. An intra prediction mode coding method, comprising:

Neighbouring blocks except block A and block B in Fig.1 are used to predict the intra prediction mode of the current block;

5 The intra prediction modes for luma component and chroma component are coded in the same manner;

One or more of the intra prediction mode in collocated blocks of a coded component is used to predict the intra prediction mode of the current component in the current block;

10 A candidate intra prediction mode list is constructed;

The index of the intra prediction mode in the candidate intra prediction mode list of the current block is signalled from the encoder to the decoder;

Intra_Planar_Left and Intra_Planar_Left modes.

15 2. The method as claimed in claim 1, wherein neighbouring blocks A0, A1, B0, B1, and B2 as demonstrated in Fig. 2 are used to predict the intra prediction mode of the current block.

3. The method as claimed in claim 1, wherein neighbouring blocks X0, X1, X2, ..., X9, XA as demonstrated in Fig. 3 are used to predict the intra prediction mode of the current block.

20 4. The method as claimed in claim 1, wherein one or more of the luma intra prediction mode in collocated luma blocks X0, X1, X2, ..., X9, XA,...XF of the current chroma block as demonstrated in Fig. 4 are used to predict the chroma intra prediction mode.

25 5. The method as claimed in claim 4, wherein one or more of the luma intra prediction mode in collocated luma blocks X0, X1, X2, ..., X9, XA,...XF of the current U block as demonstrated in Fig. 4 are used to predict the intra prediction mode for the component U.

30 6. The method as claimed in claim 4, wherein one or more of the luma intra prediction mode in collocated luma blocks X0, X1, X2, ..., X9, XA,...XF of the current V block as demonstrated in Fig. 4 are used to predict the intra prediction mode for the component V.

7. The method as claimed in claim 1, wherein one or more of the U intra prediction mode in collocated U blocks X0, X1, X2, ..., X9, XA,...XF of the current

V block as demonstrated in Fig. 4 are used to predict the intra prediction mode for the component V.

8. The method as claimed in claim 1, wherein one or more of the V intra prediction mode in collocated V blocks X0, X1, X2, ..., X9, XA,...XF of the current U block as demonstrated in Fig. 4 are used to predict intra prediction mode for the component U.

9. The method as claimed in claim 1, wherein a candidate intra prediction mode list is constructed for luma intra prediction mode.

10. The method as claimed in claim 1, wherein a candidate intra prediction mode list is constructed for chroma intra prediction mode.

11. The method as claimed in claim 10, wherein a candidate intra prediction mode list is constructed for intra prediction mode for component U.

12. The method as claimed in claim 10, wherein a candidate intra prediction mode list is constructed for intra prediction mode for component V.

13. The method as claimed in claim 1, wherein one or more of the luma intra prediction modes in neighbouring blocks A0, A1, B0, B1, and B2 are inserted into the candidate intra prediction mode list for luma intra prediction mode.

14. The method as claimed in claim 1, wherein one or more of the chroma intra prediction modes in neighbouring blocks A0, A1, B0, B1, and B2 are inserted into the candidate intra prediction mode list for chroma intra prediction mode.

15. The method as claimed in claim 14, wherein one or more of the intra prediction modes of U component in neighbouring blocks A0, A1, B0, B1, and B2 are inserted into the candidate intra prediction mode list for chroma intra prediction mode for U component.

16. The method as claimed in claim 14, wherein one or more of the intra prediction modes of V component in neighbouring blocks A0, A1, B0, B1, and B2 are inserted into the candidate intra prediction mode list for chroma intra prediction mode for V component.

17. The method as claimed in claim 1, wherein one or more of the luma intra prediction mode in collocated luma blocks X0, X1, X2, ..., X9, XA,...XF of the current chroma block as demonstrated in Fig. 4 are inserted into the candidate intra prediction mode list for chroma intra prediction mode; The chroma component can be U or V.

18. The method as claimed in claim 17, wherein the luma intra prediction mode

in a collocated luma block can be inserted as the first candidate in the candidate intra prediction mode list for chroma intra prediction mode.

19. The method as claimed in claim 1, wherein In one embodiment, one or more of the U intra prediction mode in collocated U blocks X0, X1, X2, ..., X9, XA,...XF of the current V block as demonstrated in Fig. 4 are inserted into the candidate intra prediction mode list for intra prediction mode for the component V.

20. The method as claimed in claim 19, wherein the U intra prediction mode in a collocated U block can be inserted as the first candidate in the candidate intra prediction mode list for intra prediction mode for the component V; In another embodiment, the U intra prediction mode in a collocated U block can be inserted as a candidate in the candidate intra prediction mode list for intra prediction mode for the component V after the luma intra prediction mode in a collocated luma block.

21. The method as claimed in claim 1, wherein one or more of the V intra prediction mode in collocated V blocks X0, X1, X2, ..., X9, XA,...XF of the current U block as demonstrated in Fig. 4 are inserted into the candidate intra prediction mode list for intra prediction mode for the component U.

22. The method as claimed in claim 21, wherein the V intra prediction mode in a collocated V block can be inserted as the first candidate in the candidate intra prediction mode list for intra prediction mode for the component U; In another embodiment, the V intra prediction mode in a collocated V block can be inserted as a candidate in the candidate intra prediction mode list for intra prediction mode for the component U after the luma intra prediction mode in a collocated luma block.

23. The method as claimed in claim 1, wherein the code length of the signalled index of the intra prediction mode in the candidate intra prediction mode list depends on the value of the index.

24. The method as claimed in claim 1, wherein an index in the candidate intra prediction mode list with a smaller value is signalled with a shorter code length; An index in the candidate intra prediction mode list with a larger value is signalled with a longer code length.

25. The method as claimed in claim 1, wherein the intra prediction modes in neighbouring blocks are inserted into the candidate intra prediction mode list from the head to the tail orderly.

26. The method as claimed in claim 25, wherein if an intra prediction mode M1 appears more in neighbouring blocks than another intra prediction mode M2, M1 is

inserted before M2 in the candidate intra prediction mode list.

27. The method as claimed in claim 25, wherein adjacent modes for intra prediction modes of neighbouring blocks are inserted into the candidate intra prediction mode list.

5 28. The method as claimed in claim 1, wherein mode LM, LM-L, and LM-A are inserted into the chroma candidate intra prediction mode list.

29. The method as claimed in claim 1, wherein mode LM-U is inserted into the candidate intra prediction mode list for the V component.

10 30. The method as claimed in claim 1, wherein all possible intra prediction modes are inserted into the candidate intra prediction mode list in an order.

31. The method as claimed in claim 1, wherein a mode is not inserted into the candidate intra prediction mode list if the same mode has already been in the list.

32. The method as claimed in claim 1, wherein there are no duplicated modes in entries of the candidate intra prediction mode list.

15 33. The method as claimed in claim 1, wherein an Intra_Planar_Above mode is proposed; The prediction block is generated as follows.

34. The method as claimed in claim 1, wherein an Intra_Planar_Left mode is proposed; The prediction block is generated as follows:

20
$$\text{predSamples}[x][y] = ((nT - 1 - x) * p[-1][y] + (x + 1) * p[nT][-1] + (nT >> 1)) >> \text{Log2}(nT).$$

35. The method as claimed in claim 1, wherein an Intra_Planar_Above mode is proposed; The prediction block is generated as follows:

25
$$\text{predSamples}[x][y] = ((nT - 1 - y) * p[x][-1] + (y + 1) * p[-1][nT] + (nT >> 1)) >> \text{Log2}(nT).$$

36. The method as claimed in claim 1, wherein Intra_Planar_Left mode is inserted into the candidate intra prediction mode list.

37. The method as claimed in claim 1, wherein Intra_Planar_Above mode is inserted into the candidate intra prediction mode list.

30 38. The method as claimed in claim 1, wherein the code of the index of the candidate intra prediction mode list can be treated as binarization code in the CABAC process.

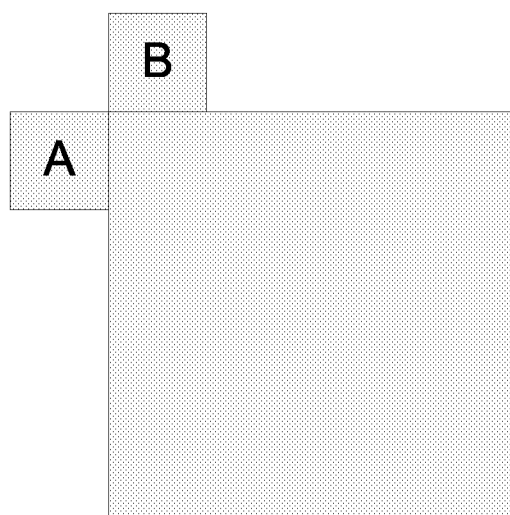


FIG. 1

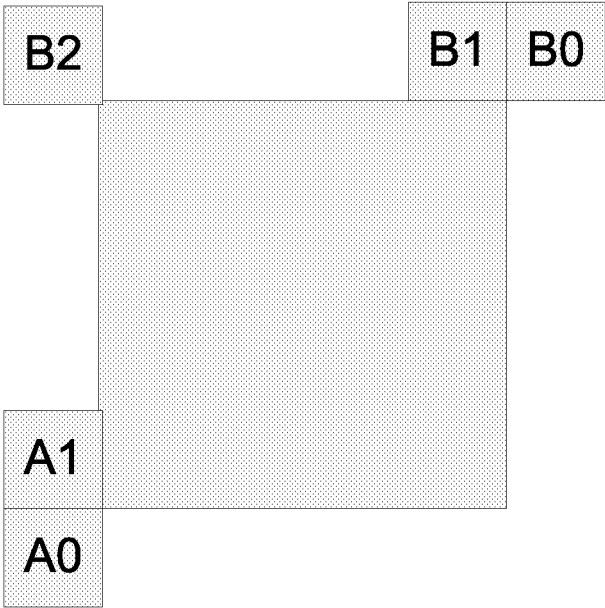


FIG. 2

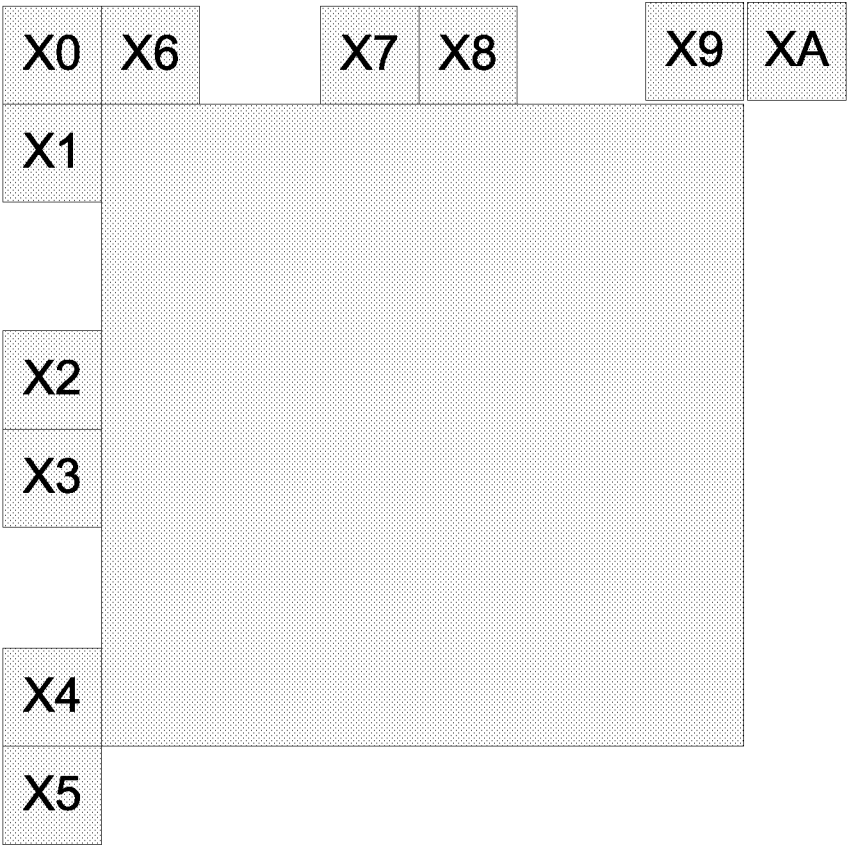


FIG. 3

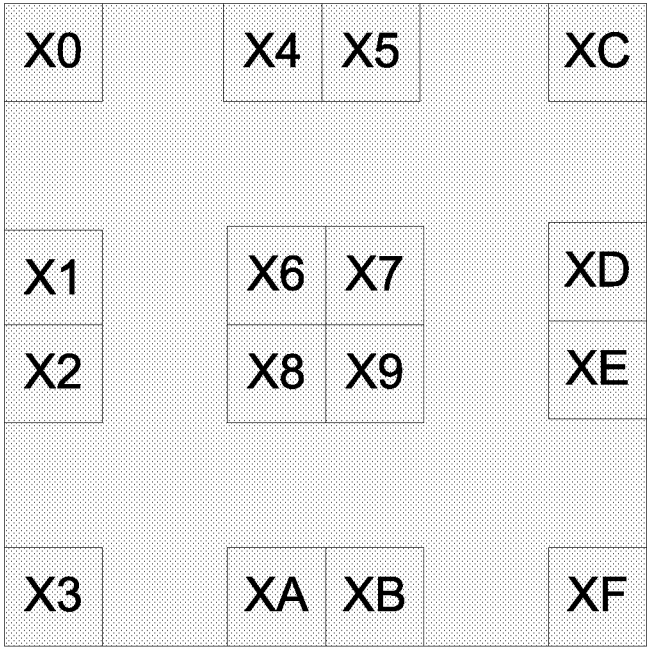


FIG. 4

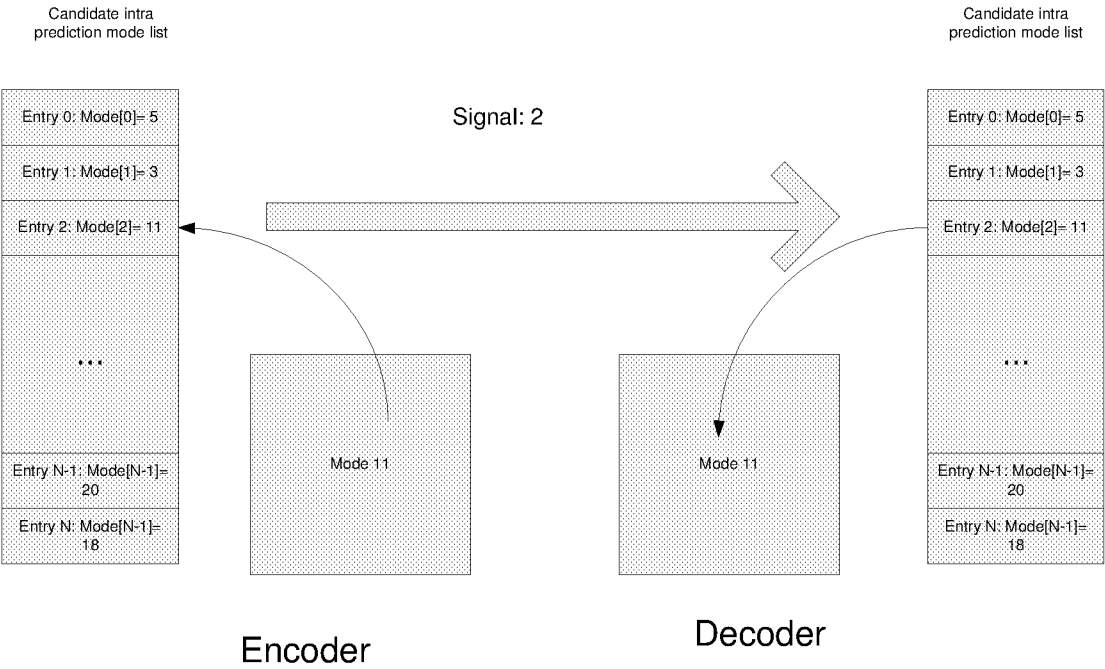


FIG. 5

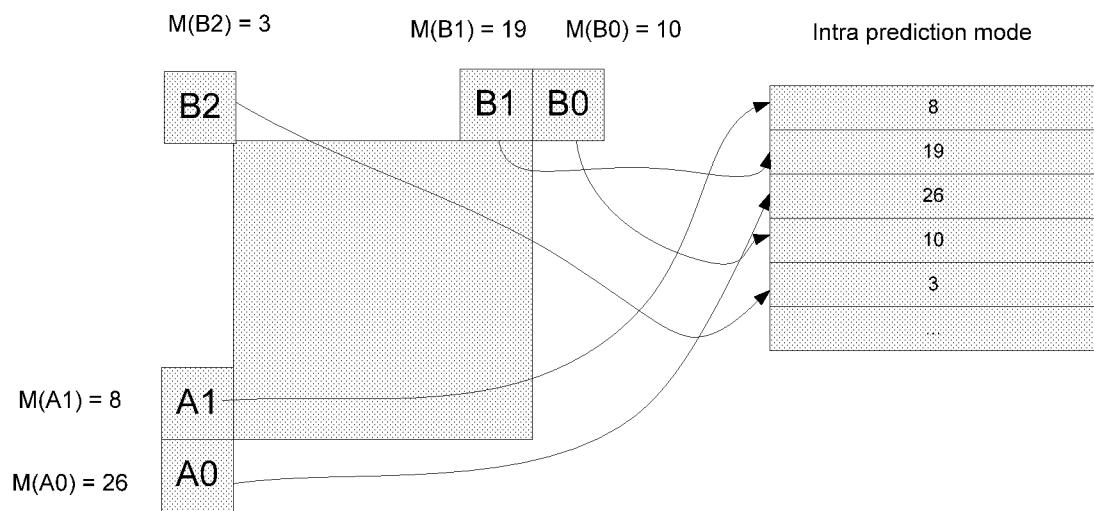


FIG. 6

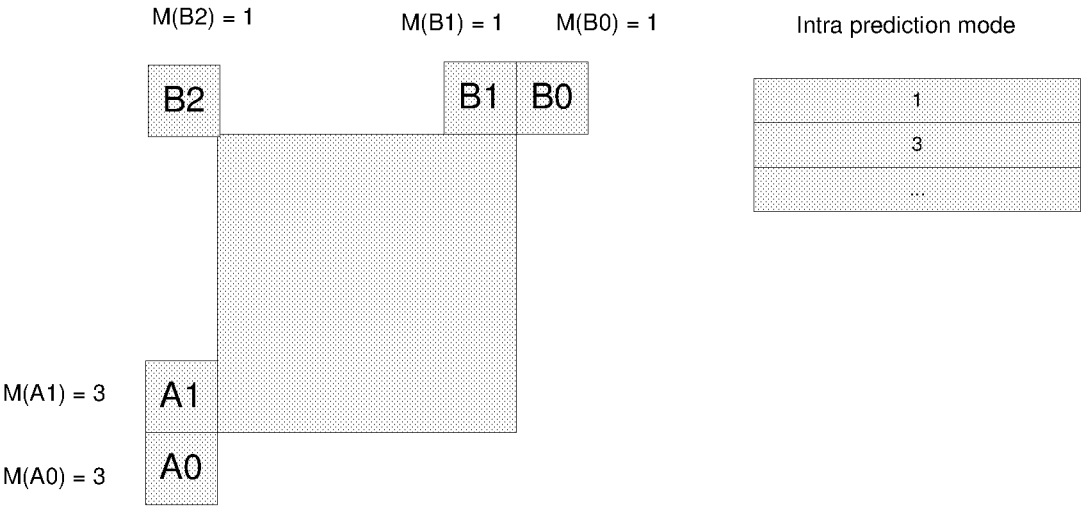
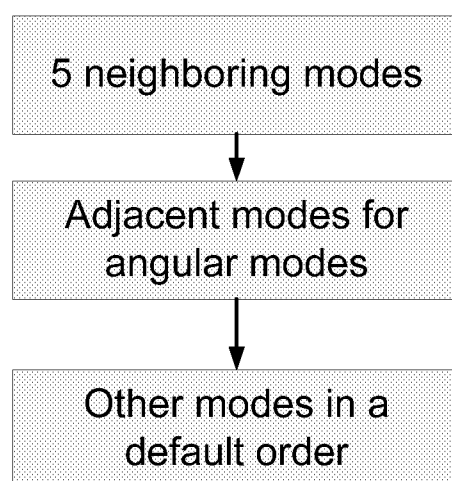
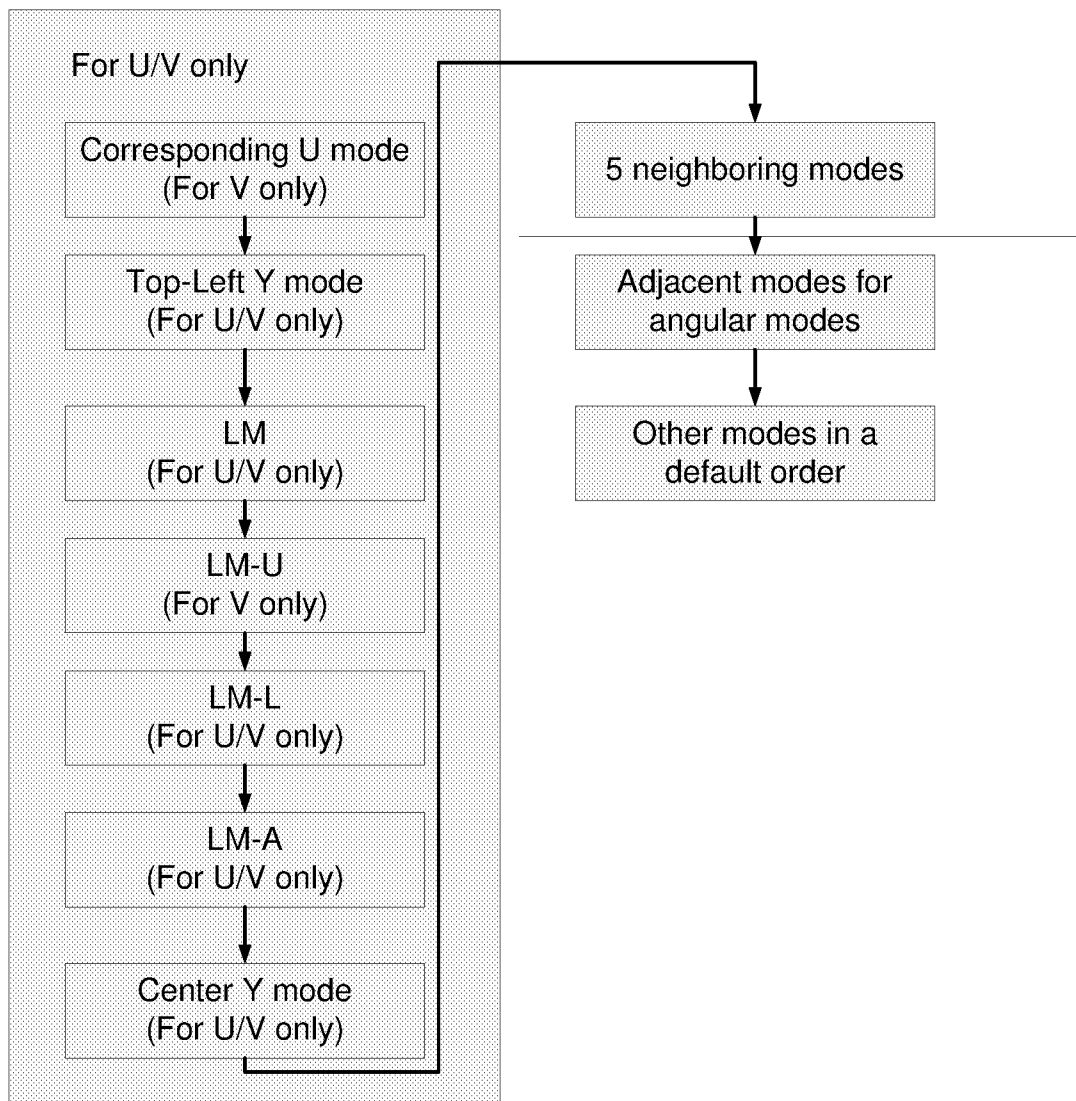


FIG. 7

**FIG. 8**

**FIG. 9**

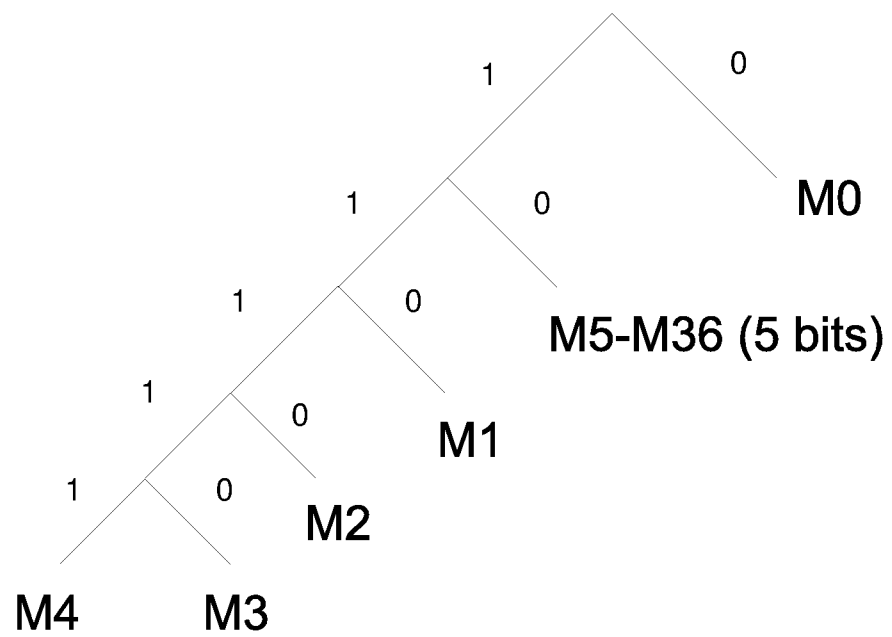


FIG. 10

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2015/083991

A. CLASSIFICATION OF SUBJECT MATTER

H04N 19/159(2014.01)i; H04N 19/573(2014.01)n

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

H04N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

CNKI,CNPAT,EPODOC,WPI:intra, prediction, mode, candidate,list,block,order,luma,chroma,HEVC,planar,inex

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	CN 103314588 A (MEDIATEK INC.) 18 September 2013 (2013-09-18) Description, paragraphs [0004]-[0006] [0031], Figures 2-3	1-3, 9-16, 23-33, 36-38
Y	CHEN, Yiwen et al. "3D-CE2: Single depth intra mode for 3D-HEVC" <Joint Collaborative Team on 3D Video Coding Extensions of ITU-T SG 16 WP 3 and ISO/IEC JTC 1/SC 29/WG 11>, Vol. I, No. I, 09 July 2014 (2014-07-09), ISSN: /, Chapters1-2, Figure 1	1-3, 9-16, 23-33, 36-38
A	CN 103597831 A (MEDIATEK INC.) 19 February 2014 (2014-02-19) The whole document	1-38

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

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Date of the actual completion of the international search

28 September 2015

Date of mailing of the international search report

04 March 2016

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/CN2015/083991

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				US	2012177112	A1	12 July 2012
				WO	2012092763	A1	12 July 2012
				US	2012177113	A1	12 July 2012
				AU	2011354441	A1	02 May 2013
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				EP	2661880	A1	13 November 2013
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IL	229715	A	30 January 2014				