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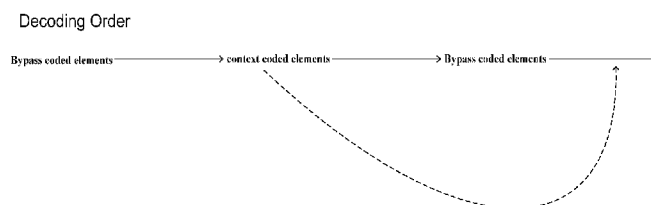


Fig.1

(57) Abstract: Methods are proposed to code the palette syntax in high throughput.



HIGH-THROUGHPUT CODING METHOD FOR PALETTE CODING

TECHNICAL FIELD

[0001] The invention relates generally to video/image coding/processing.
5 Particularly, it is related palette coding.

BACKGROUND

[0002] Palette coding is described in JCTVC-T1005-v2. Table 1. Demonstrates its syntax table.

[0003] First, a reused map is signalled to indict which entries of a prediction palette
10 are reused in the current palette.

[0004] Second, palette entries which cannot be inferred from the prediction palette are signalled directly.

[0005] Third, a flag is signalled to indicate whether escape values are used.

[0006] Forth, a rotation flag is signalled to indicate whether pixels in the block are
15 scanned vertically or horizontally.

[0007] Fifth, the number of coded indices and the indices are signalled.

[0008] Sixth, the last run type is signalled.

[0009] Seventh, run types and runs are signalled.

[0010] Eighth, escape values are coded.

20 [0011] In the palette syntax, the palette_transpose_flag which indicates whether pixels in the block are scanned vertically or horizontally is coded by CABAC bypass.

[0012] The previous one syntax element palette_escape_val_present_flag and afterward one syntax element num_palette_indices_idc of palette_transpose_flag are coded by CABAC context.

25 [0013] CABAC Bypass coding can achieve higher data throughput than CABAC context mode by exploiting hardware or ISA level parallelism. Such benefit grows if a bunch of bypass bins can be processed together.

[0014] Low throughput is observed in the current palette mode due to not grouping elements coded by CABAC bypass.

Table 1. Palette syntax

palette_coding(x0, y0, nCbS) {	Descriptor
palettePredictionFinished = 0	
NumPredictedPaletteEntries = 0	
for(i = 0; i < PredictorPaletteSize && !palettePredictionFinished && NumPredictedPaletteEntries < palette_max_size; i++) {	
palette_predictor_run	ue(v)
if(palette_predictor_run != 1) {	
if(palette_predictor_run > 1)	
i += palette_predictor_run - 1	
PalettePredictorEntryReuseFlag[i] = 1	
NumPredictedPaletteEntries++	
} else	
palettePredictionFinished = 1	
}	
if(NumPredictedPaletteEntries < palette_max_size)	
num_signalled_palette_entries	ue(v)
numComps = (ChromaArrayType == 0) ? 1 : 3	
for(cIdx = 0; cIdx < numComps; cIdx++)	
for(i = 0; i < num_signalled_palette_entries; i++)	
palette_entry	ae(v)
if(CurrentPaletteSize != 0)	
palette_escape_val_present_flag	ae(v)
if(MaxPaletteIndex > 0) {	
palette_transpose_flag	ae(v)
num_palette_indices_idc	ae(v)
for(i=0; i < NumPaletteIndices; i++) {	
palette_index_idc	ae(v)
PaletteIndexIdc[i] = palette_index_idc	
}	
last_palette_run_type_flag	ae(v)
}	
CurrNumIndices = 0	
PaletteScanPos = 0	
while(PaletteScanPos < nCbS * nCbS) {	
xC = x0 + travScan[PaletteScanPos][0]	
yC = y0 + travScan[PaletteScanPos][1]	
if(PaletteScanPos > 0) {	
xcPrev = x0 + travScan[PaletteScanPos - 1][0]	
ycPrev = y0 + travScan[PaletteScanPos - 1][1]	
}	
PaletteRun = nCbS * nCbS - PaletteScanPos - 1	
if(MaxPaletteIndex > 0 && CurrNumIndices < NumPaletteIndices) {	
if(PaletteScanPos >= nCbS && palette_run_type_flag[xcPrev][ycPrev] != COPY_ABOVE_MODE && PaletteScanPos < nCbS * nCbS - 1) {	

palette_run_type_flag[xC][yC]	ae(v)
}	
readIndex = 0	
if(palette_run_type_flag[xC][yC] == COPY_INDEX_MODE && AdjustedMaxPaletteIndex > 0)	
readIndex = 1	
maxPaletteRun = nCbS * nCbS - PaletteScanPos - 1	
if(AdjustedMaxPaletteIndex > 0 && ((CurrNumIndices + readIndex) < NumPaletteIndices palette_run_type_flag[xC][yC] != last_palette_run_type_flag))	
if(maxPaletteRun > 0) {	
palette_run_msb_id_plus1	ae(v)
if(palette_run_msb_id_plus1 > 1)	
palette_run_refinement_bits	ae(v)
}	
CurrNumIndices += readIndex	
}	
runPos = 0	
while (runPos <= paletteRun) {	
xR = x0 + travScan[PaletteScanPos][0]	
yR = y0 + travScan[PaletteScanPos][1]	
if(palette_run_type_flag[xC][yC] == COPY_INDEX_MODE) {	
PaletteSampleMode[xR][yR] = COPY_INDEX_MODE	
PaletteIndexMap[xR][yR] = CurrPaletteIndex	
} else {	
PaletteSampleMode[xR][yR] = COPY_ABOVE_MODE	
PaletteIndexMap[xR][yR] = PaletteIndexMap[xR][yR - 1]	
}	
runPos++	
PaletteScanPos++	
}	
}	
if(palette_escape_val_present_flag) {	
sPos = 0	
while(sPos < nCbS * nCbS) {	
xC = x0 + travScan[sPos][0]	
yC = y0 + travScan[sPos][1]	
if(PaletteIndexMap[xC][yC] == MaxPaletteIndex) {	
for(cIdx = 0; cIdx < numComps; cIdx++)	
if(cIdx == 0 (xR % 2 == 0 && yR % 2 == 0 && ChromaArrayType == 1) (xR % 2 == 0 && ChromaArrayType == 2) ChromaArrayType == 3) {	
palette_escape_val	ae(v)
PaletteEscapeVal[cIdx][xC][yC] = palette_escape_val	
}	
}	

sPos++	
}	
}	
}	

SUMMARY

[0015] In light of the previously described problems, methods are proposed to code the palette syntax in a more efficient way.

- 5 **[0016]** 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

- 10 **[0017]** The invention can be more fully understood by reading the subsequent detailed description and examples with references made to the accompanying drawings, wherein:

[0018] Fig. 1 is a diagram illustrating the proposed decoding order for the palette mode.

15

DETAILED DESCRIPTION

- [0019]** 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.

[0020] In order to achieve higher throughput, several methods are proposed.

[0021] In One embodiment, the palette coding syntax elements coded as ‘bypass’ are put together; and the palette coding syntax elements coded with coding contexts are put together.

- 25 **[0022]** In one embodiment, a palette coding syntax element coded as ‘bypass’

should not be put between two palette coding syntax elements coded with coding contexts.

[0023] In one embodiment, the **palette_transpose_flag** should not be put between two palette coding syntax elements coded with coding contexts, as indicted in Fig.1.

5 [0024] In one embodiment, the **palette_transpose_flag** can be coded after the **last_palette_run_type_flag**.

[0025] In one embodiment, the **palette_transpose_flag** can be coded after the **palette_run_type_flag**.

10 [0026] In one embodiment, the **palette_transpose_flag** can be coded after the **palette_run_msb_id_plus1**.

[0027] In one embodiment, the **palette_transpose_flag** can be coded after the **palette_run_refinement_bits**.

[0028] In one embodiment, the **palette_transpose_flag** can be coded by the CABAC bypass.

15 [0029] In one embodiment, the **palette_transpose_flag** can be derived by the decoder implicitly.

[0030] In one embodiment, the **last_palette_run_type_flag** can be coded by 'bypass'.

[0031] In one embodiment, the **last_palette_run_type_flag** and **palette_run_type_flag** can share the same coding context.

20 [0032] 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.

[0033] The invention may be embodied in other specific forms without departing
5 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
10 modifications and similar arrangements.

CLAIMS

1. A method of palette table coding, comprising:
the palette coding syntax elements coded as 'bypass' are put together; and the
5 palette coding syntax elements coded with coding contexts are put together;
a palette coding syntax element coded as 'bypass' should not be put between two
palette coding syntax elements coded with coding contexts; and
more than one palette coding syntax elements share one coding context.
2. The method as claimed in claim 1, wherein the **palette_transpose_flag**
10 should not be put between two palette coding syntax elements coded with coding
contexts.
3. The method as claimed in claim 2, wherein the **palette_transpose_flag** can
be coded after the **last_palette_run_type_flag**.
4. The method as claimed in claim 2, wherein the **palette_transpose_flag** can
15 be coded after the **palette_run_type_flag**.
5. The method as claimed in claim 2, wherein the **palette_transpose_flag** can
be coded after the **palette_run_msb_id_plus1**.
6. The method as claimed in claim 2, wherein the **palette_transpose_flag** can
be coded after the **palette_run_refinement_bits**.
- 20 7. The method as claimed in claim 2, wherein the **palette_transpose_flag** can
be coded by the CABAC bypass.
8. The method as claimed in claim 2, wherein the **palette_transpose_flag** can
be derived by the decoder implicitly.
9. The method as claimed in claim 1, wherein the
25 **last_palette_run_type_flag** can be coded by 'bypass'.
10. The method as claimed in claim 1, wherein **last_palette_run_type_flag** and
palette_run_type_flag can share the same coding context.

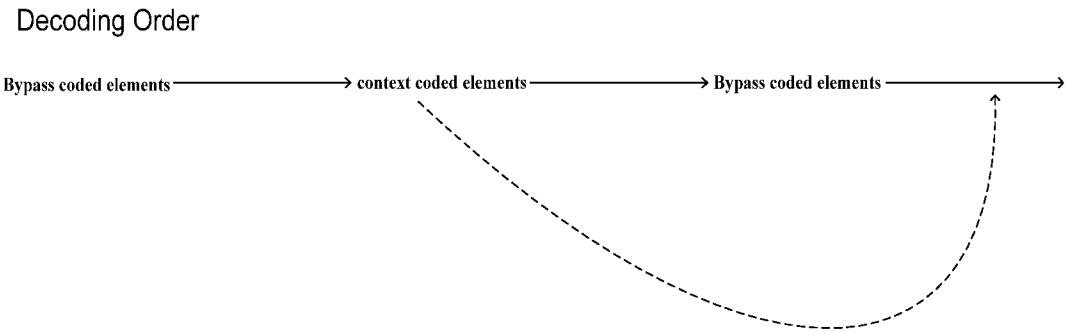


Fig.1

INTERNATIONAL SEARCH REPORT

PORT

International application No.

PCT/CN2015/078269

A. CLASSIFICATION OF SUBJECT MATTER H04N 1/41(2006.01)i 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) WPI, CNPAT, EPODOC, GOOGLE: palette, coding, video, context, bypass, encode, decode, high, throughput				
C. DOCUMENTS CONSIDERED TO BE RELEVANT				
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.		
X	SZE, Vivienne et al., "High Throughput CABAC Entropy Coding in HEVC," <i>IEEE TRANSACTIONS ON CIRCUITS AND SYSTEMS FOR VIDEO TECHNOLOGY</i> , Vol. 22, No. 12, 31 December 2012 (2012-12-31), abstract, pages 1780 and 1781, Section IV	1-10		
A	CN 104301737 A (HUAWEI TECHNOLOGIES CO., LTD.) 21 January 2015 (2015-01-21) the whole document	1-10		
A	WO 2013102014 A1 (UDUEHI, JOSEPH) 04 July 2013 (2013-07-04) the whole document	1-10		
A	US 2010214577 A1 (OWEN, JAMES E.) 26 August 2010 (2010-08-26) the whole document	1-10		
☐ 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 05 January 2016		Date of mailing of the international search report 29 January 2016		
Name and mailing address of the ISA/CN STATE INTELLECTUAL PROPERTY OFFICE OF THE P.R.CHINA 6, Xitucheng Rd., Jimen Bridge, Haidian District, Beijing 100088, China Facsimile No. (86-10)62019451		Authorized officer MA,Lili Telephone No. (86-10)62413996		

INTERNATIONAL SEARCH REPORT
Information on patent family members

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Patent document cited in search report			Publication date (day/month/year)	Patent family member(s)			Publication date (day/month/year)
CN	104301737	A	21 January 2015	WO	2015007207	A1	22 January 2015
WO	2013102014	A1	04 July 2013	US	2015017612	A1	15 January 2015
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				JP	4943523	B2	30 May 2012
				US	8339663	B2	25 December 2012