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(54) Title: SEPARATE CODING SECONDARY TRANSFORM SYNTAX ELEMENTS FOR DIFFERENT COLOR COMPONENTS

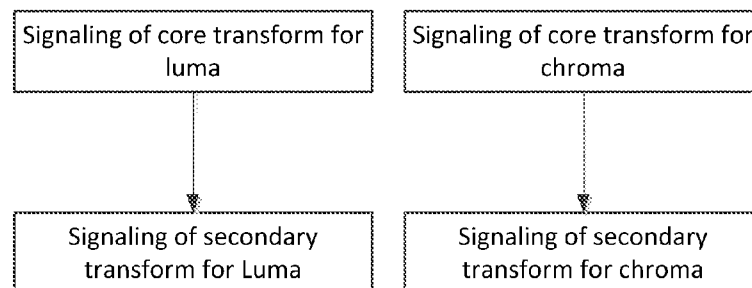


Fig. 3

(57) Abstract: Method of separate coding of secondary transform syntax elements for different color components are proposed.

TITLE

SEPARATE CODING SECONDARY TRANSFORM SYNTAX ELEMENTS FOR DIFFERENT COLOR COMPONENTS

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] The invention relates generally to video coding. In particular, the present invention relates to methods and apparatuses for coding secondary transform syntax elements for luma and chroma components.

Acronym

CU: Coding Unit

CTB (LCU): Coded tree block (largest coding unit)

HEVC: High Efficiency Video Coding

SPS: Sequence Parameter Set

VPS: Video Parameter Set

Description of the Related Art

[0002] A mode-dependent non-separable secondary transform (NSST) is proposed in [1]. It's applied between core transform and quantization, as shown in Fig. 1. In NSST, given the intra prediction mode, a CU-level index (namely NSST index), valued from 0 to 3, is further explicitly signaled to identify which secondary transform is applied. If the NSST index is zero, secondary transform is not used, otherwise, one of the three pre-defined 4×4 non-separable transforms, which are identified by the intra prediction mode and the CU-level index, is applied. For each TU, the same 4x4 non-separable transform is applied to each of its 4x4 coefficient sub-block. In the case of YCbCr video, the 3 color

components in one CU share the same syntax elements.

[0003] In [2], a quadtree plus binary tree (QTBT) structure was proposed for next generation video coding. As opposed to the block structure in HEVC, the proposed QTBT allows separated coding tree block (CTB) for luma and chroma components in I slice. For I slice, the luma CTB is partitioned into CBs by a QTBT structure, and two chroma CTBs are partitioned into chroma CBs by another QTBT structure. In this method, the luma and chroma component do not share the same CU, therefore different block structure, the syntax elements can't be shared as well or is not efficient.

BRIEF SUMMARY OF THE INVENTION

[0004] In light of the previously described problems, separate coding of secondary transform syntax elements is proposed.

BRIEF DESCRIPTION OF THE DRAWINGS

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

[0001] Fig. 1 is a flowchart illustrating the concept of secondary transform.

[0002] Fig. 2 is a flowchart illustrating an example of separate coding of secondary transform syntax elements.

[0003] Fig. 3 is a flowchart illustrating another example of separate coding of secondary transform syntax elements.

DETAILED DESCRIPTION OF THE INVENTION

[0004] 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.

[0005] It is proposed that luma and chroma components use separate secondary transform syntax elements. The syntax elements can be on/off flag or NSST index. The secondary transform can be NSST or other types of secondary transform applied between core transform and quantization.

[0006] In one embodiment, luma component use a 1st set of secondary transform syntax elements, and chroma components (Cb and Cr) share a 2nd set of secondary transform syntax elements.

[0007] In another embodiment, luma component use a 1st set of secondary transform syntax elements, Cb component use a 2nd set of secondary transform syntax elements, and Cr component use a 3rd set of secondary transform syntax elements.

[0008] In still another embodiment, whether some components share the same secondary transform syntax elements depends on whether these components share the same block structure.

[0009] In still another embodiment, if luma and chroma components share the same block structure, then luma and chroma components shares the same secondary transform syntax elements; if luma and chroma components have different block structure, then luma and chroma components use separate secondary transform syntax elements, the signaling is shown in Fig. 3.

[0010] In still another embodiment, if Cb and Cr components share the same block structure, then Cb and Cr components shares the same secondary transform syntax elements; if Cb and Cr components have different block structure, then luma and chroma components use separate secondary transform syntax elements.

[0011] In still another embodiment, luma and chroma components share the same block structure, but luma and chroma components use separate secondary transform

syntax elements, the signaling is shown in Fig. 2.

[0012] In still another embodiment, Cb and Cr components share the same block structure, but Cb and Cr components use separate secondary transform syntax elements.

[0013] In still another embodiment, a flag is signaled to indicate whether separate secondary transform syntax elements are used for different color components. The flag can be at SPS, VPS, or slice header.

[0014] The methods described above can be used in a video encoder as well as in a video decoder. Embodiments of the 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 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 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.

[0015] 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 arrangements.

What is claimed is

1. A method that the coding of secondary transform syntax elements for different color components are separated.
2. The method as claimed in claim 1, wherein luma and chroma components use separated secondary transform syntax elements.
3. The method as claimed in claim 2, wherein luma component uses a 1st set of secondary transform syntax elements, and chroma components (Cb and Cr) share a 2nd set of secondary transform syntax elements.
4. The method as claimed in claim 2, wherein luma component uses a 1st set of secondary transform syntax elements, Cb component uses a 2nd set of secondary transform syntax elements, and Cr component uses a 3rd set of secondary transform syntax elements.
5. The method as claimed in claim 2, wherein whether some components share the same secondary transform syntax elements depends on whether these components share the same block structure.
6. The method as claimed in claim 5, if luma and chroma components share the same block structure, then luma and chroma components share the same secondary transform syntax elements; if luma and chroma components have different block structures, then luma and chroma components use separated secondary transform syntax elements.
7. The method as claimed in claim 5, if Cb and Cr components share the same block structure, then Cb and Cr components shares the same secondary transform syntax elements; if Cb and Cr components have different block structure, then luma and chroma components use separated secondary transform syntax elements.

8. The method as claimed in claim 2, wherein luma and chroma components share the same block structure, but luma and chroma components use separated secondary transform syntax elements.

9. The method as claimed in claim 2, wherein Cb and Cr components share the same block structure, but Cb and Cr components use separated secondary transform syntax elements.

10. The method as claimed in claim 1, wherein the different color components can also be RGB, YUV, XYZ, et al.

11. The method as claimed in claim 1, wherein a flag is signaled to indicate whether different color components use separated secondary transform syntax elements.

12. The method as claimed in claim 10, wherein the flag can be signaled at video level, sequence level, picture level, slice level or block level.

13. The method as claimed in claim 12, wherein the flag can be signaled in VPS, SPS, PPS, slice header, coding tree unit (CTU) or coding unit (CU).

14. The method as claimed in claim 1, wherein the syntax elements can indicate on/off, NSST index or other types of secondary transform signaling.

15. The method as claimed in claim 1, wherein the secondary transform syntax elements of one component is coded with prediction from the secondary transform syntax elements of another component.

FIGURES

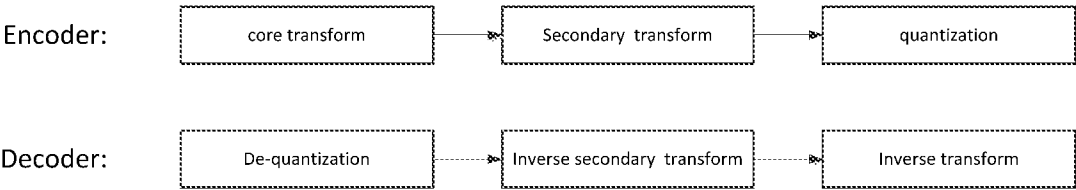


Fig. 1

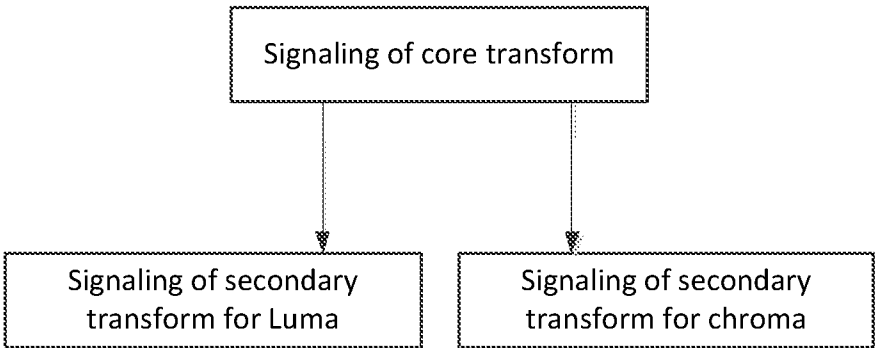


Fig. 2

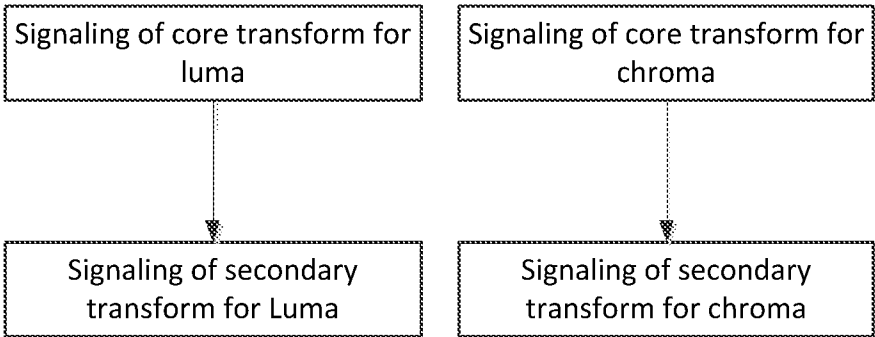


Fig. 3

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2016/078517

A. CLASSIFICATION OF SUBJECT MATTER

H04N 19/12(2014.01)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)

CNABS, CNTXT, CNKI, VEN, USTXT, EPTXT, Internet: secondary, second+, transform+, color, colour, luma, chroma+, luminance, HEVC, H.265, flag, indicat+, cod+

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2013003856 A1 (SAMSUNG ELECTRONICS CO., LTD.) 03 January 2013 (2013-01-03) claims 1-10, description, paragraphs [0233]-[0241]	1-3, 5, 6, 8, 11-15
Y	US 2013003856 A1 (SAMSUNG ELECTRONICS CO., LTD.) 03 January 2013 (2013-01-03) claims 1-10, description, paragraphs [0233]-[0241]	10
Y	ALSHIN, A. et al. "Coding Efficiency Improvements beyond HEVC with Known Tools" <i>Applications of Digital Image Processing XXXVIII, Proc. of SPIE Vol. 9599, 95991C</i> , 22 September 2015 (2015-09-22), parts 1 and 3	10
A	US 2014254661 A1 (SAMSUNG ELECTRONICS CO., LTD.) 11 September 2014 (2014-09-11) the whole document	1-15
A	US 2010322512 A1 (NOVATEK MICROELECTRONICS CORP.) 23 December 2010 (2010-12-23) the whole document	1-15

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

* Special categories of cited documents:

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"E" earlier application or patent but published on or after the international filing date

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"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/CN2016/078517

Patent document cited in search report			Publication date (day/month/year)	Patent family member(s)			Publication date (day/month/year)
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				WO	2013005961	A2	10 January 2013
				KR	20140053155	A	07 May 2014
				CN	103636205	A	12 March 2014
US	2014254661	A1	11 September 2014	KR	20150129715	A	20 November 2015
				WO	2014137159	A1	12 September 2014
US	2010322512	A1	23 December 2010	TW	201101800	A	01 January 2011
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