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(54) Title: A FLEXIBLE DLT SIGNALING METHOD

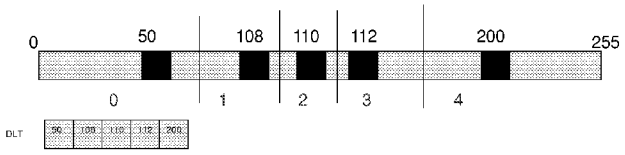

Figure 1

(57) Abstract: In this proposal, a flexible Depth Lookup Table (DLT) signalling method is proposed. By signalling DLT in SPS or in the slice header optionally, DLT can be more robust to scene change without introducing too many overhead bits. Experimental results show that the coding performance is similar to the anchor.

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A FLEXIBLE DLT SIGNALING METHOD

TECHNICAL FIELD

[0001] The invention relates generally to Three-Dimensional (3D) video processing. In particular, the present invention relates to the depth lookup table in the simplified depth coding.

BACKGROUND

[0002] Simplified depth coding (SDC) and a depth lookup table (DLT) are adopted into HTM [1] [2]. For each depth coding unit (CU), if SDC is selected, one of three different prediction modes, DC, Planar and DMM-1 can be selected. After the prediction, the residual is not coded using transform. As the SDC prediction stage always results in one or two depth segments per coded block, a single residual DC depth value is coded for each of these segments. Moreover, the DLT is used to map coded depth values in SDC to valid depth values of the original depth map. Fig.1 demonstrates an example of DLT approach.

[0003] The DLT is constructed based on an initial analysis of the input depth map and is then coded in a sequence parameter set (SPS).

[0004] DLT is an optional coding tool. In the current HTM, the encoder will not use DLT if more than half the values from 0 to MAX_DEPTH_VALUE (*e.g.*, 255 for 8-bit depth samples) appear in the original depth map at the analysis step. Otherwise, DLT will be coded in SPS. In order to code DLT, the number of valid depth values is coded with Exp-Golomb code first. Then each valid depth value is also coded with an exp-Golomb code.

[0005] To make the DLT coding more efficient, it is proposed to code DLT with a range constrained bit map (RCBM) approach in C0142 [3]. It has been shown that RCBM can reduce DLT bits significantly.

[0006] To make the DLT robust to scene change, it is proposed to signal DLT in the intra-slice header instead of the SPS in C0093 [4]. As the Core Experiment (CE) 6 [5] described, it should also be under consideration to signal DLT in all slice headers. Despite of the adaptation to varying scene, signalling DLT in the intra-slice header

results in much more DLT bits compared with in SPS.

SUMMARY

[0007] In light of the previously described problems, this contribution presents a flexible Depth Lookup Table (DLT) signalling method in 3D-HEVC. First, one or more DLTs may be constructed based on an initial analysis, and then these DLTs are coded in SPS. Alternately, there may be no DLT coded in SPS. Second, a flag is signalled in the slice header to indicate whether a DLT coded in SPS is used for this slice, or a new DLT coded in the slice header is used. In the former case, an additional index is signalled to indicate which one is selected if there are more than one DLTs coded in SPS. The proposed method can make the DLT robust to scene change without introducing too many overhead bits. Experimental results show that the coding performance is similar to the anchor.

[0008] 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

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

[0009] Fig. 1 is a diagram illustrating an example of DLT, there are five valid values appears in depth samples at the analysis step, therefore, there are five items in DLT in the order: 50, 108, 110, 112 and 200.

DETAILED DESCRIPTION

[0010] 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.

[0011] A flexible DLT signalling method is proposed, which can keep both the benefits of signalling DLT in the intra-slice header and in SPS. First, one or more DLTs may be constructed based on an initial analysis, and then these DLTs are coded in SPS. Alternately, there may be no DLT coded in SPS. Second, a flag is signalled in the slice header to indicate whether a DLT coded in SPS is used for this slice, or a new DLT coded in the slice header is used. In the former case, an additional index is signalled to indicate which one is selected if there are more than one DLTs coded in SPS. RCBM [3] is used to code DLT.

CLAIMS

1. A method of signalling depth lookup table (DLT) in three-dimensional video coding (3DVC).

2. The method as claimed in claim 1, wherein more than one DLT is signalled for one depth component.

3. The method as claimed in claim 1, wherein the DLT is signalled in more than one syntax structure for one depth component.

4. The method as claimed in claim 3, wherein the DLT is signalled in video, view, sequences, or picture level, comprising view parameter set (VPS), sequence parameter set (SPS) or picture parameter set (PPS).

5. The method as claimed in claim 3, wherein the DLT is signalled in slice level or slice header.

6. The method as claimed in claim 1, wherein different slices use different DLTs.

7. The method as claimed in claim 1, wherein a current slice uses DLT signalled in sequence level and signalled in slice level adaptively.

8. The method as claimed in claim 7, wherein a flag is transmitted from an encoder to a decoder to indicate whether the DLT is signalled in sequence level or slice level for the current slice.

9. The method as claimed in claim 7, wherein the DLT is signalled in a current slice if it is indicated that the DLT signalled in slice level is used; and the DLT is not signalled in the current slice if it is indicated that the DLT signalled in sequence level is used.

10. The method as claimed in claim 9, wherein the DLT is only signalled if the current slice is an I-slice.

11. The method as claimed in claim 7, wherein additional information is transmitted from an encoder to a decoder if it is indicated that a DLT signalled in sequence level is used and more than one DLT are signalled in sequence level; and the additional information indicates which DLT signalled in sequence level is used in the current slice; wherein the additional information is transmitted in slice level or slice header.

12. The method as claimed in claim 7, wherein the DLT is not signalled in the current slice if it is indicated that the DLT signalled in slice level is used, and a DLT used in a reference picture is used in the current slice.

13. The method as claimed in claim 12, wherein only one DLT is used for all slices belonging to a picture.

14. The method as claimed in claim 12, wherein additional information is transmitted from an encoder to decoder to indicate whether DLT is signalled or not in the current slice, if DLT is not signalled in the current slice, a DLT used in a reference picture is used in the current slice; the additional information is transmitted in slice level or slice header.

15. The method as claimed in claim 12, wherein additional information is transmitted from an encoder to a decoder to indicate the DLT used in which reference picture is used in the current slice; and the additional information is transmitted in slice level or slice header.

16. The method as claimed in claim 15, wherein the reference picture is indicated by a reference list and reference index.

17. The method as claimed in claim 1, wherein a set of DLT is transmitted in a SPS level, and a syntax is first transmitted to indicate the number of DLTs to be transmitted in a SPS header; each DLT is coded and transmitted sequentially in the SPS header.

18. The method as claimed in claim 1, wherein a flag is signaled in a slice header to indicate whether a DLT transmitted is SPS is used or not; if none of the DLT transmitted is SPS is used, a second flag is signaled to indicate whether the DLT is inherited from a previous coded picture/slice or a new DLT is coded in the current slice header.

19. The method as claimed in claim 18, wherein when the DLT is inherited from the previous coded picture, the DLT is inherited from the previous coded I-picture/slice with a smallest POC distance.

20. The method as claimed in claim 18, wherein when the DLT is inherited from previous coded picture, a flag is transmitted to indicate which reference picture list is selected and another flag is also transmitted to indicate the DLT is inherited from which reference picture in the selected reference picture list.

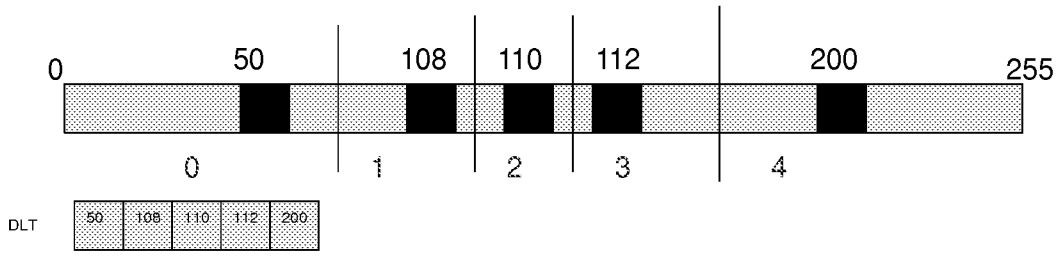

Figure 1

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2013/074125

A. CLASSIFICATION OF SUBJECT MATTER

H04N 7/26 (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)

IPC: 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, WPI, EPODOC: three, dimensional, 3D, video, cod+, signal, depth, lookup, table, DLT, sequence, image, picture, parameter, slice, header, level, encoder, decoder.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2009/0161989 A1 (SAMSUNG ELECTRONICS CO., LTD.) 25 June 2009 (25.06.2009) claims 18-29 and figures 2A-3D	1-8
A	CN 102292993 A (LG ELECTRONICS INC.) 21 December 2011 (21.12.2011) the whole document	1-20
A	US 2009/0002368 A1 (NOKIA CORPORATION) 01 January 2009 (01.01.2009) the whole document	1-20

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

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

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

"L" document which may throw doubts on priority claim (S) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"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	Date of mailing of the international search report
11 December 2013 (11.12.2013)	**16 Jan. 2014 (16.01.2014)**
Name and mailing address of the ISA/CN The State Intellectual Property Office, the P.R.China 6 Xitucheng Rd., Jimen Bridge, Haidian District, Beijing, China 100088 Facsimile No. 86-10-62019451	Authorized officer LI,Peng Telephone No. (86-10)62413234

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INTERNATIONAL SEARCH REPORT
Information on patent family members

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Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
US 2009/0161989 A1	25.06.2009	EP 2076048 A2	01.07.2009
		CN 101465004 A	24.06.2009
		JP 2009151758 A	09.07.2009
		KR 20090067547 A	25.06.2009
CN 102292993 A	21.12.2011	WO 2010085074 A2	29.07.2010
		EP 2389767 A2	30.11.2011
US 2009/0002368 A1	01.01.2009	None	