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(54) **Title:** IMPROVED MERGING CANDIDATE LIST CONSTRUCTION IN 3DVC

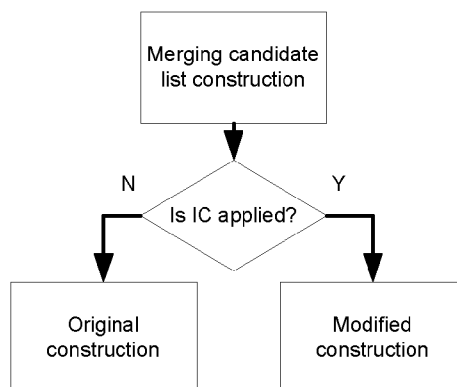


Fig. 1

(57) **Abstract:** An improved merging candidate construction method is proposed. In the proposed method, the syntax redundancy caused by IC can be removed without imposing parsing dependency.



# IMPROVED MERGING CANDIDATE LIST CONSTRUCTION IN 3DVC

## TECHNICAL FIELD

[0001] The invention relates generally to Three-Dimensional (3D) video  
5 processing. In particular, the presented invention relates to illumination compensation  
(IC).

## BACKGROUND

[0002] In the current 3D-HEVC, illumination compensation (IC) only takes  
effects to disparity compensation prediction (DCP). However, ic\_flag is signaled even  
10 if the selected merging candidate does not employ DCP, to avoid the parsing  
dependency in merge blocks. Therefore, there is syntax redundancy for IC in merge  
blocks.

## SUMMARY

[0003] In light of the previously described problems, a method is proposed to  
15 remove such redundancy without imposing parsing dependency by modifying the  
merging candidate construction process.

[0004] 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.

## 20 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:

[0005] Fig. 1 is a diagram illustrating the merging candidate list construction  
25 depending on whether IC is applied;

[0006] Fig. 2 is a diagram illustrating to remove a candidate which does not employ DCP;

[0007] Fig. 3 is a diagram illustrating to insert a dummy candidate into the first position of the merging candidate list when IC is applied;

5 [0008] Fig. 4 is a diagram illustrating to append default candidates to the merging candidate list when IC is applied.

## DETAILED DESCRIPTION

[0009] 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  
10 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.

[0010] It is proposed to remove the syntax redundancy by modify the merging candidate construction process. The merging candidate construction process is conducted in different ways depending on IC is applied or not as depicted in Fig. 1. In  
15 the merging candidate list construction process, a candidate is considered as unavailable if it does not employ DCP, and IC is applied in the current merge block. The redundancy is removed because there are no useless merging candidates taking positions in the merging candidate list when IC is applied. Moreover, there is still no parsing dependency problem because the merging candidate construction process does  
20 not affect the parsing process.

[0011] In one embodiment, a merging candidate is not appended in the merging candidate list if it does not employ DCP and IC is applied in the merging candidate list construction process.

[0012] In another embodiment, the merging candidate list is construed in the  
25 original way firstly if IC is applied. Then candidates in the list which does not employ DCP are removed. If one candidate is removed, the candidates following it will be shifted left orderly to take its position as depicted in Fig.2.

[0013] In still another embodiment, the merging candidate list is construed in the same way as specified in HEVC firstly if IC is applied. Then candidates in the list  
30 which does not employ DCP are removed. If one candidate is removed, the candidates following it will be shifted left orderly to take its position as depicted in Fig.2. Then candidates specified especially for 3DVC are inserted into the list. A candidate is

inserted into the list only if it employs DCP.

[0014] In still another embodiment, a dummy candidate is inserted into the first position of the merging candidate list if IC is applied. The original candidates will be shifted right orderly as depicted in Fig.3. The dummy candidate cannot be selected if  
5 IC is applied.

[0015] In still another embodiment, if the number of candidates in the merging candidate list employing DCP is lower than the maximum number of merging candidates when IC is applied, default candidates employing DCP are appended to the list as depicted in Fig.4. In one example, a default candidate is first set equal to the  
10 first candidate in the list, then its motion vector (MV) is added by a delta MV, such as (4, 0), (-4, 0), (8, 0), (-8, 0) and so on. The default candidate should not be equal to any existing candidate in the list. If there are more than one default candidate, they should be different to each other.

[0016] In still another embodiment, if the number  $N$  of candidates in the merging candidate list employing DCP is lower than the maximum number  $M$  of merging  
15 candidates when IC is applied, the maximum number is set to be  $N$ . Thus the candidate index can be coded with the maximum value  $N-1$  instead of  $M-1$ , which can save bits.

[0017] The methods described above can be used in a video encoder as well as in  
20 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 integrated into video compression software to perform the processing described herein.  
25 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  
30 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.

[0018] 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.

## CLAIMS

1. A method of constructing a merging candidate list, wherein merging construction process is conducted in different ways depending on whether illumination compensation (IC) is applied or not.

5        2. The method as claimed in claim 1, wherein candidates in the merging candidate list employ disparity compensation prediction (DCP) if IC is applied.

3. The method as claimed in claim 2 wherein all candidates except the first one in the merging candidate list employ DCP if IC is applied.

10       4. The method as claimed in claim 2, wherein a merging candidate is not appended in the merging candidate list if it does not employ DCP and IC is applied in the merging candidate list construction process.

15       5. The method as claimed in claim 2, wherein the merging candidate list is construed in an original way firstly if IC is applied; candidates in the merging candidate list which does not employ DCP are removed; if one candidate is removed, candidates following the removed candidate are shifted orderly.

20       6. The method as claimed in claim 2, wherein the merging candidate list is construed in a specified way if IC is applied; candidates in the merging candidate list which does not employ DCP are removed; if one candidate is removed, candidates following the removed candidate will be shifted orderly; candidates specified especially for 3DVC are inserted into the merging candidate list; and a candidate is inserted into the merging candidate list only if the candidate employs DCP.

7. The method as claimed in claim 2, wherein a dummy candidate is inserted into the first position of the merging candidate list if IC is applied; original candidates are shifted right orderly; the dummy candidate cannot be selected if IC is applied.

25       8. The method as claimed in claim 2, wherein default candidates employing DCP are appended to the merging candidate list if a number of candidates in the merging candidate list employing DCP is lower than a maximum number of merging candidates when IC is applied; a default candidate is first set equal to the first candidate in the list, then a motion vector (MV) of the default candidate is added by a  
30       delta MV.

9. The method as claimed in claim 8, wherein the default candidate is not equal to any existing candidate in the merging candidate list; if there are more than one default candidate, the default candidates are different to each other.

10. The method as claimed in claim 8, wherein the maximum number is set to be  $N$  if the number  $N$  of candidates in the merging candidate list employing DCP is lower than the maximum number  $M$  of merging candidates when IC is applied; and a candidate index is coded with the maximum value  $N-1$  instead of  $M-1$ .

5        11. The method as claimed in claim 7, wherein `ic_flag` is not signaled if the first merging candidate is selected and IC is not applied in a current block implicitly.

12. The method as claimed in claim 4, wherein the method does not apply to the first candidate in the merging candidate list.

10        13. The method as claimed in claim 5, wherein the method does not apply to the first candidate in the merging candidate list.

14. The method as claimed in claim 6, wherein the method does not apply to the first candidate in the merging candidate list.

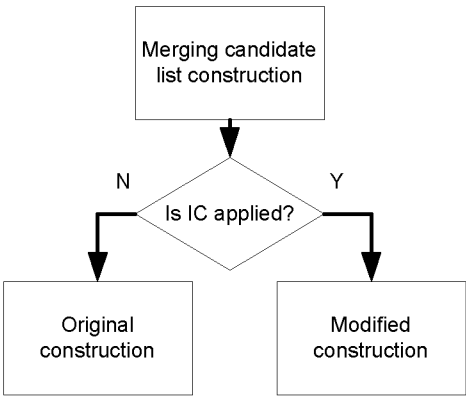


Fig. 1

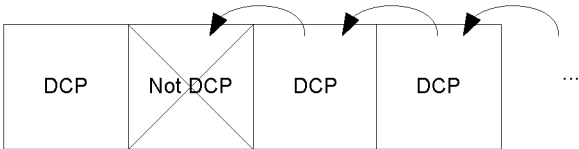


Fig. 2

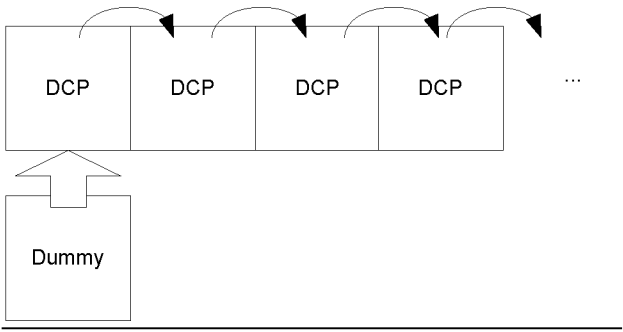


Fig. 3

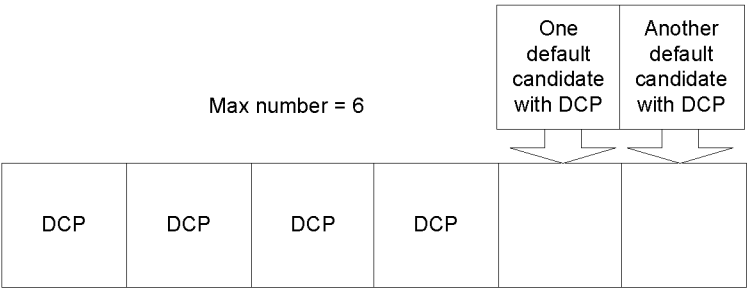


Fig. 4

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2014/070082

**A. CLASSIFICATION OF SUBJECT MATTER**

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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)

CNPAT, WPI, EPODOC, CNKI: merg+, combin+, synthesiz+, candidat+, list, table, illuminat+, luminance, light+, bright+, compensat+, disparity, predict+, DCP, first, primus, remov+, mov+, delet+, shift+, dummy, motion vector, number, amount, max+, supreme, largest

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

| Category* | Citation of document, with indication, where appropriate, of the relevant passages                                                                                          | Relevant to claim No. |
|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|
| X         | CN 103477635 A (FRAUNHOFER-GESELLSCHAFT ZUR FOERDERUNG DER ANGEWANDTEN FORSCHUNG E.V) 25 December 2013 (2013-12-25)<br>description, paragraphs [0033]-[0037], [0051]-[0167] | 1-4, 12               |
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| A         | US 2013235926 A1 (BROADCOM CORP.) 12 September 2013 (2013-09-12)<br>the whole document                                                                                      | 1-14                  |
| A         | US 2013336406 A1 (QUALCOMM INC.) 19 December 2013 (2013-12-19)<br>the whole document                                                                                        | 1-14                  |
| A         | WO 2013001749 A1 (PANASONIC CORP.) 03 January 2013 (2013-01-03)<br>the whole document                                                                                       | 1-14                  |

☐ 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                                                                | “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                                              |
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| “P” | document published prior to the international filing date but later than the priority date claimed                                                                  |     |                                                                                                                                                                                                                                              |

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**INTERNATIONAL SEARCH REPORT**  
**Information on patent family members**

International application No.

**PCT/CN2014/070082**

| Patent document<br>cited in search report |            |    | Publication date<br>(day/month/year) | Patent family member(s) |             |    | Publication date<br>(day/month/year) |
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