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Published:

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(54) Title: NEIGHBORING-DERIVED PREDICTION OFFSET (NPO)

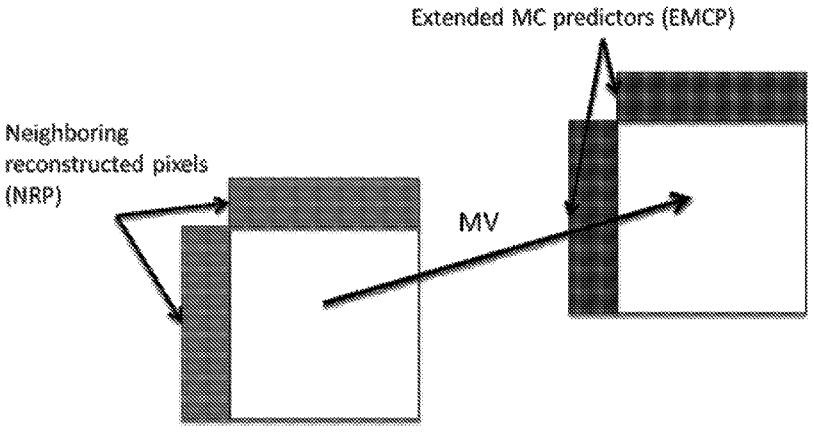

Fig.1

(57) Abstract: Neighboring-derived prediction offset is proposed to improve the motion compensated prediction for inter coding.

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NEIGHBORING-DERIVED PREDICTION OFFSET (NPO)

TECHNICAL FIELD

The invention relates generally to video coding.

BACKGROUND

High-Efficiency Video Coding (HEVC) is a new international video coding standard developed by the Joint Collaborative Team on Video Coding (JCT-VC). HEVC is based on the hybrid block-based motion-compensated DCT-like transform coding architecture. The basic unit for compression, termed coding unit (CU), is a 2Nx2N square block, and each CU can be recursively split into four smaller CUs until the predefined minimum size is reached. Each CU contains one or multiple prediction units (PUs).

To achieve the best coding efficiency of hybrid coding architecture in HEVC, there are two kinds of prediction modes for each PU, which are intra prediction and inter prediction. While intra prediction modes use the spatial neighboring reconstructed pixels to generate the directional predictors, inter prediction modes use the temporal reconstructed reference frames to generate motion compensated predictors. After the prediction is performed and the predictors are subtracted from the source block, the residual blocks will be further transformed and quantized in transform units (TU) and then coded into bitstream. The more accurate predictors can be generated, the smaller residual blocks will be obtained and the higher compression ratio can be achieved.

Inter predictions will explore the correlations of pixels between frames and will be efficient if the scene are stationary and motion estimation can easily find similar blocks with similar pixel values in the temporal neighboring frames. However, in some practical cases, frames will be shot with different lighting conditions. The pixel values between frames will be different even if the content is similar and the scene is stationary.

SUMMARY

Methods of neighboring-derived prediction offset are proposed. The proposed method is to add prediction offset to improve the motion compensated predictors. With this offset, the different lighting conditions between frames can be considered.

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:

Fig. 1 is a diagram illustrating one exemplary implementation to derive the offset. The patterns chosen for NRP and EMCP are N pixels left and N pixels above to the current PU, where N is a predetermined value.

Fig. 2 is a diagram illustrating another exemplary of deriving offset.

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.

The proposed method is to add prediction offset to improve the motion compensated predictors. With this offset, the different lighting conditions between frames can be considered.

In one embodiment, the offset is derived using neighboring reconstructed pixels (NRP) and extended motion compensated predictors (EMCP). Fig. 1 shows one exemplary implementation to derive the offset. The patterns chosen for NRP and EMCP are N pixels left and N pixels above to the current PU, where N is a predetermined value. The patterns can be of any size and shape and can be decided

according to any encoding parameters, such as PU or CU sizes, as long as they are the same for both NRP an EMCP. Then the offset is calculated as the average pixel value of NRP minus the average pixel value of EMCP. And the derived offset will be unique over the PU and applied to the whole PU along with the motion compensated predictors.

In the other embodiment, for each neighboring positions (left and above to the boundaries, shaded in grey), the individual offset is calculated as the corresponding pixel in NRP minus the pixel in EMCP. When all individual offsets are calculated and obtained, the derived offset for each position in the current PU will be the average of the offsets from the left and above positions. An example is shown in Fig. 2, assumed it will generate offset values of 6, 4, 2, -2 for the above and 6, 6, 6, 6 for the left neighboring positions. For the first position in the top left corner in this example, offset of 6 will be generated by averaging the offset from left and above. For the next position, the offset will be equal to (6+4)/2, that is, 5. The offset for each position can be processed and generated in raster scan order sequentially. Since the neighboring pixels are more highly correlated to the boundary pixels, so do the offsets. This method can adapt the offset according to the pixel positions. The derived offsets will be adapted over the PU and applied to each PU position individually along with the motion compensated predictors.

The methods described above can be used in a video encoder as well as in a video decoder. Embodiments of neighboring-derived prediction offset 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.

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 neighboring-derived prediction offset (NPO).

2. The method as claimed in claim 1, wherein the offset is derived as the average value of neighboring reconstructed pixels (NRP) minus the average value of extended motion compensated predictors (EMCP).

3. The method as claimed in claim 2, wherein the patterns chosen for NRP and EMCP can be of any size and shape or can be determined by any other encoding parameters, as long as they are the same for NRP and EMCP.

4. The method as claimed in claim 2, wherein the derived offset will be unique over the PU and applied to the whole PU along with the motion compensated predictors.

5. The method as claimed in claim 1, wherein the offset is derived as the weighting average of the offsets from the left and above to the current position.

6. The method as claimed in claim 5, wherein for each neighboring positions (left and above to the PU boundaries), the individual offset is calculated as the corresponding pixel in NRP minus the pixel in EMCP.

7. The method as claimed in claim 5, wherein the weightings for average can be predetermined values or can depend on coding parameters.

8. The method as claimed in claim 5, wherein the offsets for other positions will be generated using the same method and follow a certain scanning order.

9. The method as claimed in claim 5, wherein the derived offsets will be adapted over the PU and applied to each PU position individually along with the motion compensated predictors.

10. The method as claimed in claim 1, wherein NPO can be always applied or can be turned on or off explicitly, e.g. signaled by a flag or implicitly, e.g. determined by statistics from the neighbors.

11. The method as claimed in claim 1, NPO can be applied according the CU size or PU size or any other coding parameters.

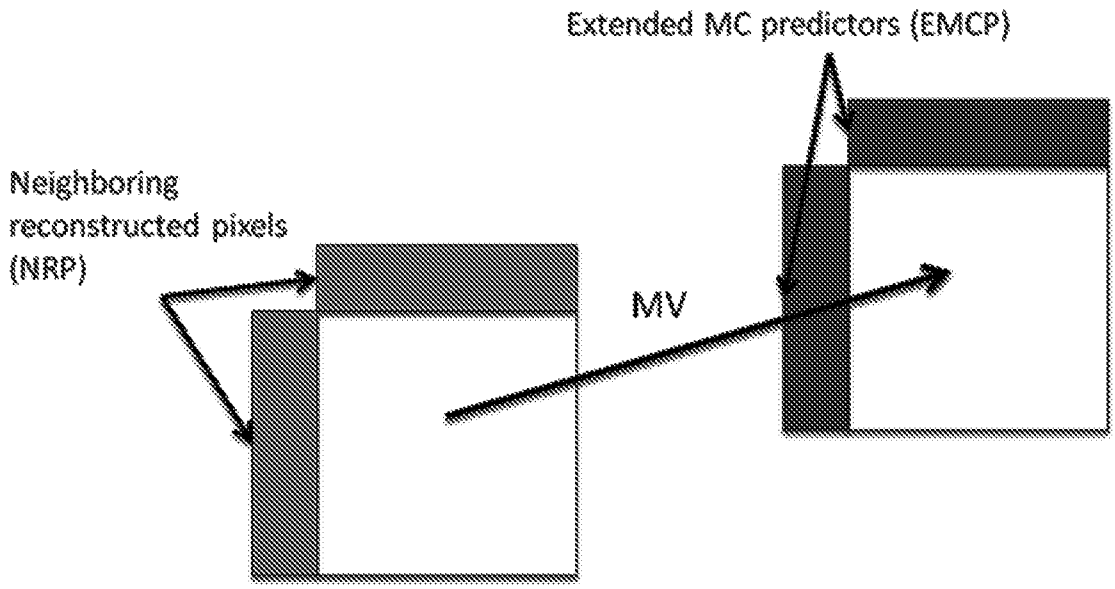
Extended MC predictors (EMCP)
Neighboring
reconstructed pixels
(NRP)
MV

Fig.1

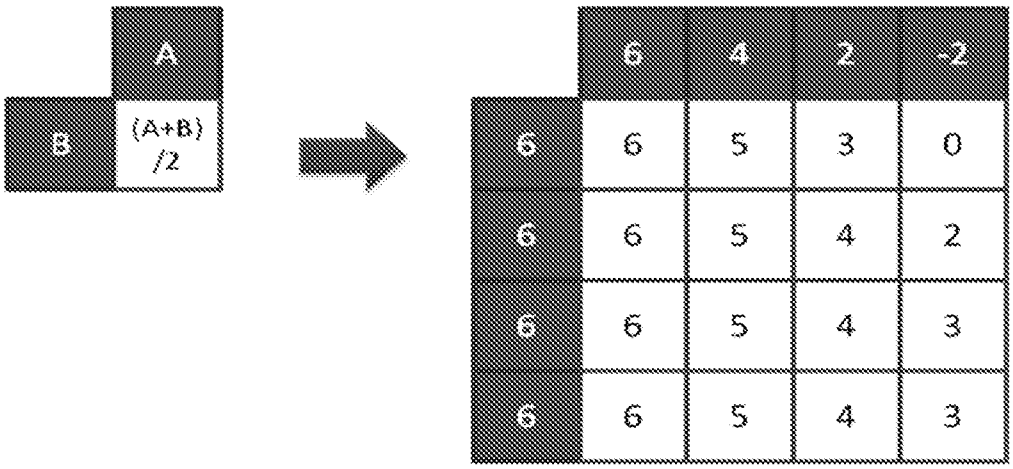
A
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Fig. 2

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2015/088962

A. CLASSIFICATION OF SUBJECT MATTER

H04N 19/503(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)

CNKI,CNPAT,WPI,EPODOC: neighboring derived prediction offset, NPO, neighboring reconstructed pixel?, extended motion compensated predictor?, EMCP, predict+, offset, compensat+, adjust+, correct+, inter, motion vector, motion compensat+, neighbor+, adjacent+.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2015195569 A1 (LG ELECTRONICS INC.) 09 July 2015 (2015-07-09) description, paragraphs [0018]-[0025]	1, 5, 7-11
X	CN 1691130 A (SONY CORPORATION) 02 November 2005 (2005-11-02) description, page 26, line 15-page 28, line 4	1, 5, 7-11
X	CN 101335894 A (MITSUBISHI ELECTRIC CORPORATION) 31 December 2008 (2008-12-31) description, page 4, lines 7-14	1, 5, 7-11
X	CN 101281650 A (BEIJING UNIVERSITY OF AERONAUTICS & ASTRONAUTICS) 08 October 2008 (2008-10-08) description, page 3, lines 1-12	1, 5, 7-11
X	US 2011317766 A1 (GWANGJU INSTITUTE OF SCIENCE AND TECHNOLOGY ET AL.) 29 December 2011 (2011-12-29) description, paragraphs [0025]-[0031]	1, 5, 7-11

☐ 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

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"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
09 May 2016	**27 May 2016**
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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2015/088962

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				WO	2014010935	A1	16 January 2014
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				EP	1589763	A2	26 October 2005
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				US	2009003718	A1	01 January 2009
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