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(72) Inventors; and

(75) Inventors/Applicants (for US only): **SHI, Xiaojin** [CN/US]; 4376 Planetree Cmn, Fremont, CA 94536 (US). **WU, Hsi-jung** [US/US]; 4634 Catalina Drive, San Jose, CA 95129 (US).(74) Agents: **HAILS, Robert** et al.; 1500 K Street, N.w., Suite 700, Washington, DC 20005-1257 (US).

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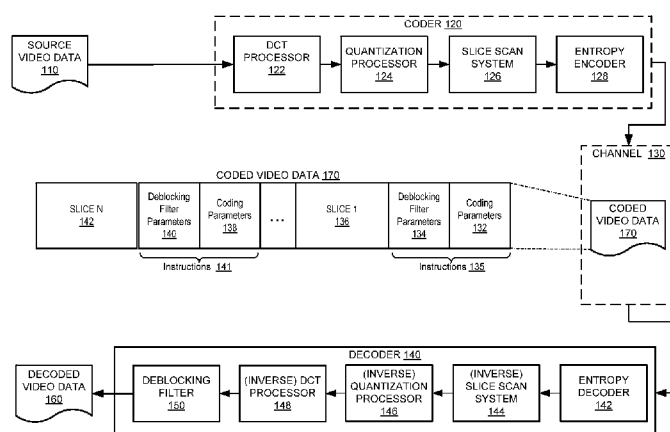
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(54) Title: METHOD AND SYSTEM FOR VIDEO CODER AND DECODER JOINT OPTIMIZATION

FIG. 1



(57) **Abstract:** Embodiments of the present invention provide apparatuses and methods of coding video. The apparatuses and methods may further provide coding a source video sequence according to a block-based coding process, estimating processing capabilities of a target decoder, determining if the estimated processing capabilities are sufficient to perform deblocking filtering. If not sufficient, the apparatuses and methods may provide computing deblocking filter strengths for pixel blocks of the source video sequence to be used at decoding, and transmitting the deblocking filter strengths in a coded video data signal with the coded video data. Moreover, if not sufficient, the apparatuses and methods may provide changing coding parameters including, but not limited to, block sizes, transform sizes, and Qmatrix.

INTERNATIONAL SEARCH REPORT

International application No

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A. CLASSIFICATION OF SUBJECT MATTER
 INV. H04N7/26 H04N7/50

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 practical, search terms used)

EPO-Internal, COMPENDEX, INSPEC, IBM-TDB, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 2006/080261 A2 (MATSUSHITA ELECTRIC IND CO LTD [JP]; INOUE AKIHIKO [JP]) 3 August 2006 (2006-08-03) page 9, line 20 - page 12, line 11; figures 1,5c page 13, line 9 - page 14, line 9; figure 4	1-11, 22-23
Y	US 6 226 410 B1 (O'ROURKE THOMAS P [US]) 1 May 2001 (2001-05-01) column 1, lines 9-14 column 4, line 2 - line 39; figure 2A	1-11, 22-23
A	EP 0 910 219 A2 (MATSUSHITA ELECTRIC IND CO LTD [JP]) 21 April 1999 (1999-04-21) paragraphs [0006], [0031], [0037], [0053]	1-11, 22-23
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☒ 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

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Date of the actual completion of the international search

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Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2
 NL - 2280 HV Rijswijk
 Tel. (+31-70) 340-2040,
 Fax: (+31-70) 340-3016

Authorized officer

Georgiou, Georgia

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2009/046079

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2008/031356 A1 (UCHIDA KOSUKE [JP] ET AL) 7 February 2008 (2008-02-07) paragraphs [0032] - [0040]; figures 2-4 -----	1-11, 22-23
A	WO 2008/011502 A2 (QUALCOMM INC [US]; RAVEENDRAN VIJAYALAKSHMI R [US]) 24 January 2008 (2008-01-24) paragraphs [0025] - [0026] paragraphs [0031] - [0034], [0064]; figures 2,9 -----	1-11, 22-23
A	US 2005/024651 A1 (YU ZHENGHUA [AU] ET AL) 3 February 2005 (2005-02-03) paragraphs [0006], [0020], [0021], [0024], [0026], [0027]; figure 3 paragraph [0035]; figure 5 -----	1-11, 22-23
X	WO 2008/033830 A2 (APPLE INC [US]; NORMILE JIM [US]; PUN THOMAS [US]; SHI XIAOJIN [US]; T) 20 March 2008 (2008-03-20) paragraphs [0019], [0 21], [0023], [0024], [0025], [0026], [0027] -----	12-15, 17-21
A	US 2003/198294 A1 (ZACCARIN ANDRE [CA]) 23 October 2003 (2003-10-23) paragraphs [0012] - [0013], [0026] - [0030]; claims 1-6; figure 2 -----	1-11,16, 22-23
A	US 2003/198294 A1 (ZACCARIN ANDRE [CA]) 23 October 2003 (2003-10-23) paragraphs [0012] - [0013], [0026] - [0030]; claims 1-6; figure 2 -----	1-14, 17-23
A	YU HU ET AL: "Decoder-Friendly Adaptive Deblocking Filter (DF-ADF) Mode Decision in H.264/AVC" CIRCUITS AND SYSTEMS, 2007. ISCAS 2007. IEEE INTERNATIONAL SYMPOSIUM ON, IEEE, PI, 1 May 2007 (2007-05-01), pages 3976-3979, XP031182179 the whole document -----	1-23
A	WO 2005/002233 A1 (KONINKL PHILIPS ELECTRONICS NV [NL]; JUNG JOEL [FR]; BOURGE ARNAUD [FR]) 6 January 2005 (2005-01-06) page 6, lines 20-27; figure 3 page 7, line 17 - page 8, line 29 -----	12-14, 17-21
A	US 2005/201627 A1 (LIANG YI [US] ET AL) 15 September 2005 (2005-09-15) paragraphs [0035], [0037], [0056]; figures 3,5 -----	12-14, 17-21
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INTERNATIONAL SEARCH REPORT

International application No
PCT/US2009/046079

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	THOMAS WARSAW ET AL: "Architecture design of an H.264/AVC decoder for real-time FPGA implementation" APPLICATION-SPECIFIC SYSTEMS, ARCHITECTURES AND PROCESSORS, 2006. ASAP '06. INTERNATIONAL CONFERENCE ON, IEEE, PISCATAWAY, NJ, USA, 1 September 2006 (2006-09-01), pages 253-256, XP031021369 ISBN: 978-0-7695-2682-9 paragraph [04.2] -----	15-16

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2009/046079

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☒ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☒ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-11, 22-23

encoding wherein when the target decoder's capabilities are not sufficient to perform deblocking, the deblocking filter strengths are calculated and transmitted with the encoded signal

2. claims: 12-14, 17-21

encoding wherein when the target decoder's capabilities are not sufficient to perform deblocking the coding policy is adapted to control the quality of the encoded signal

3. claims: 15-16

encoding wherein when the target encoder has parallel processing capabilities the encoding is adapted to allow taking full advantage of the parallel processing when deblocking

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2009/046079

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
WO 2006080261	A2	03-08-2006	CN 101156449 A JP 2008529317 T US 2008144949 A1	02-04-2008 31-07-2008 19-06-2008
US 6226410	B1	01-05-2001	US 6353680 B1	05-03-2002
EP 0910219	A2	21-04-1999	BR 9804444 A CN 1215282 A DE 69829345 D1 DE 69829345 T2 ES 2239375 T3 ID 21114 A JP 11122624 A SG 72874 A1 TW 390090 B US 6389071 B1	03-11-1999 28-04-1999 21-04-2005 06-04-2006 16-09-2005 22-04-1999 30-04-1999 23-05-2000 11-05-2000 14-05-2002
US 2008031356	A1	07-02-2008	JP 2008042566 A	21-02-2008
WO 2008011502	A2	24-01-2008	EP 2052547 A2 JP 2009545212 T KR 20090037939 A US 2008024513 A1	29-04-2009 17-12-2009 16-04-2009 31-01-2008
US 2005024651	A1	03-02-2005	NONE	
WO 2008033830	A2	20-03-2008	EP 2070331 A2 KR 20090075686 A US 2009073005 A1 US 2008062018 A1	17-06-2009 08-07-2009 19-03-2009 13-03-2008
US 2003198294	A1	23-10-2003	NONE	
WO 2005002233	A1	06-01-2005	AT 411705 T CN 1813478 A JP 2007538415 T KR 20060027819 A US 2006209953 A1	15-10-2008 02-08-2006 27-12-2007 28-03-2006 21-09-2006
US 2005201627	A1	15-09-2005	WO 2005088975 A1	22-09-2005