



(51) International Patent Classification:
H04N 7/36 (2006.01)

5775 Morehouse Drive, San Diego, California
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(21) International Application Number:
PCT/US2010/040475

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(22) International Filing Date:
29 June 2010 (29.06.2010)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
61/222,836 2 July 2009 (02.07.2009) US
12/756,661 8 April 2010 (08.04.2010) US

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(81) Designated States (unless otherwise indicated, for every
kind of national protection available): AE, AG, AL, AM,
AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ,
CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO,
DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT,
HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP,
KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD,
ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI,
NO, NZ, OM, PE, PG, PH, PL, PT, RO, RS, RU, SC, SD,
SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR,
TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every
kind of regional protection available): ARIPO (BW, GH,
GM, KE, LR, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG,
ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ,
TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK,
EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU,

[Continued on next page]

(54) Title: **TEMPLATE MATCHING FOR VIDEO CODING**

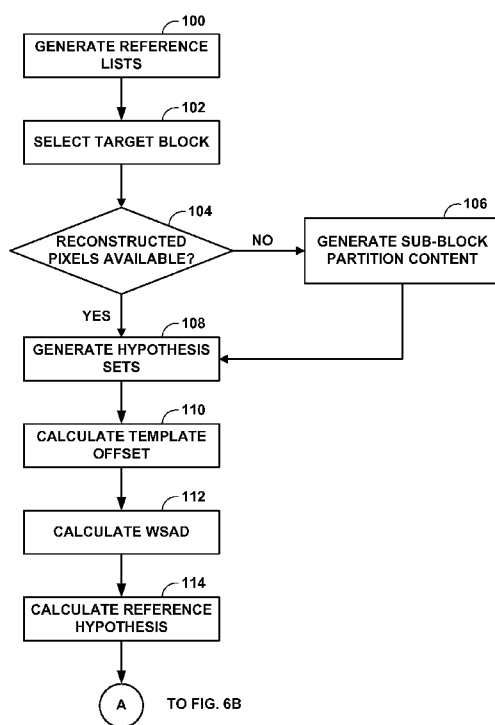


FIG. 6A

(57) Abstract: In one aspect of this disclosure, template matching motion prediction is applied to B frames. In another aspect of this disclosure, template matching motion prediction as applied to video block coding may include generating a template offset, generating a weighted sum of absolute differences, selecting a number of hypotheses used to encode video blocks based on the cost associated with the number of hypotheses and signaling, with a new syntax, to a decoder, the number of hypotheses used in encoding, rejecting hypotheses if the difference in value between a hypothesis and a reference hypothesis is greater than a threshold value, and/or generating the content of a sub-block that does not have reconstructed data available by combining motion-compensated prediction and luma residuals.



LV, MC, MK, MT, NL, NO, PL, PT, RO, SE, SI, SK,
SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ,
GW, ML, MR, NE, SN, TD, TG).

Published:

- *with international search report (Art. 21(3))*
- *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

Declarations under Rule 4.17:

- *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*
- *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*

(88) Date of publication of the international search report:

23 June 2011

INTERNATIONAL SEARCH REPORT

International application No

PCT/US2010/040475

A. CLASSIFICATION OF SUBJECT MATTER

INV. H04N7/36

ADD.

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 G06T

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, INSPEC, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	KAMP S ET AL: "Multihypothesis prediction using decoder side-motion vector derivation in inter-frame video coding", VISUAL COMMUNICATIONS AND IMAGE PROCESSING; 20-1-2009 - 22-1-2009; SAN JOSE,, 20 January 2009 (2009-01-20), XP030081712, abstract	1,3,7-9, 11, 15-19, 21,25, 26,28,32
Y	sections 2.2, 3.2 ----- -/--	2,5,6, 10,13, 14,20, 23,24, 27,30,31



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 document 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)

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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

19 April 2011

Date of mailing of the international search report

28/04/2011

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INTERNATIONAL SEARCH REPORT

International application No

PCT/US2010/040475

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X,P	KAMP S; WIEN M;: "Decoder-side motion vector derivation for hybrid video inter coding", 2010 IEEE INTERNATIONAL CONFERENCE ON MULTIMEDIA AND EXPO (ICME) 19-23 JULY 2010 SUNTEC CITY, SINGAPORE, 19 July 2010 (2010-07-19), - 23 July 2010 (2010-07-23), pages 1277-1280, XP002613773, 2010 IEEE International Conference on Multimedia and Expo (ICME) IEEE Piscataway, NJ, USA DOI: 10.1109/ICME.2010.5583097 ISBN: 978-1-4244-7491-2 abstract section 2.	1,7-9, 15-19, 25,26,32
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X	----- YOSHINORI SUZUKI ET AL: "Inter Frame Coding with Template Matching Averaging", IMAGE PROCESSING, 2007. ICIP 2007. IEEE INTERNATIONAL CONFERENCE ON, IEEE, PI, 1 September 2007 (2007-09-01), pages III-409, XP031158091, ISBN: 978-1-4244-1436-9 abstract sections 1.-3.	1,7,9, 15,19, 25,26,32
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INTERNATIONAL SEARCH REPORT

International application No

PCT/US2010/040475

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	KAMP S ET AL: "Multi-Hypothesis Prediction with Decoder Side Motion Vector Derivation", 27. JVT MEETING; 6-4-2008 - 10-4-2008; GENEVA, ; (JOINT VIDEO TEAM OF ISO/IEC JTC1/SC29/WG11 AND ITU-T SG.16), 24 April 2008 (2008-04-24), XP030007383, page 2 - page 6 -----	1,7-9, 15-19, 25,26,32
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INTERNATIONAL SEARCH REPORT

International application No

PCT/US2010/040475

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 2007/093629 A1 (THOMSON LICENSING [FR]; THOREAU DOMINIQUE [FR]; LE MEUR OLIVIER [FR];) 23 August 2007 (2007-08-23) page 9, line 15 - page 10, line 14 claim 6 figure 16	5,13,23, 30
Y	----- PENG YIN ET AL: "Localized Weighted Prediction for Video Coding", CONFERENCE PROCEEDINGS / IEEE INTERNATIONAL SYMPOSIUM ON CIRCUITS AND SYSTEMS (ISCAS) : MAY 23 - 26, 2005, INTERNATIONAL CONFERENCE CENTER, KOBE, JAPAN, IEEE SERVICE CENTER, PISCATAWAY, NJ, 23 May 2005 (2005-05-23), pages 4365-4368, XP010816640, DOI: 10.1109/ISCAS.2005.1465598 ISBN: 978-0-7803-8834-5 abstract section III.A	6,14,24, 31
A	----- YUNFEI ZHENG ET AL: "Intra prediction using template matching with adaptive illumination compensation", IMAGE PROCESSING, 2008. ICIP 2008. 15TH IEEE INTERNATIONAL CONFERENCE, IEEE, PISCATAWAY, NJ, USA, 12 October 2008 (2008-10-12), pages 125-128, XP031373954, DOI: 10.1109/ICIP.2008.4711707 ISBN: 978-1-4244-1765-0 abstract page 126, left-hand column, line 1 - line 11 section 3.2	6,14,24, 31
A	----- YAMAMOTO T ET AL: "Weighted prediction using neighboring pixels", 33. VCEG MEETING; 83. MPEG MEETING; 12-1-2008 - 13-1-2008; ANTALYA; (VIDEO CODING EXPERTS GROUP OF ITU-T SG.16), no. VCEG-AH19, 13 January 2008 (2008-01-13), XP030003557, sections 1 and 2 -----	6,14,24, 31

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2010/040475

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: 1-3, 7-11, 15-21, 25-28, 32

Multi-hypothesis motion compensation with template matching, where the number of hypotheses is subjected to rate-distortion optimization.

2. claims: 4, 12, 22, 29

Multi-hypothesis motion compensation with template matching, where a hypothesis is rejected when its difference to a reference hypothesis is higher than a threshold value.

3. claims: 5, 13, 23, 30

Multi-hypothesis motion compensation with template matching, where the prediction error is calculated using a weighted sum of differences, with the weights favouring the pixels that are closer to the target block.

4. claims: 6, 14, 24, 31

Multi-hypothesis motion compensation with template matching, where a template offset is used for improving the precision of template matching.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2010/040475

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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