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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, QA, RO, RS, RU, RW, SC, SD,
SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR,
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TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK,
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MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM,
TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW,
ML, MR, NE, SN, TD, TG).

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))

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))

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

24 January 2013

(54) **Title:** PROVIDING CONTENT AWARE VIDEO ADAPTATION

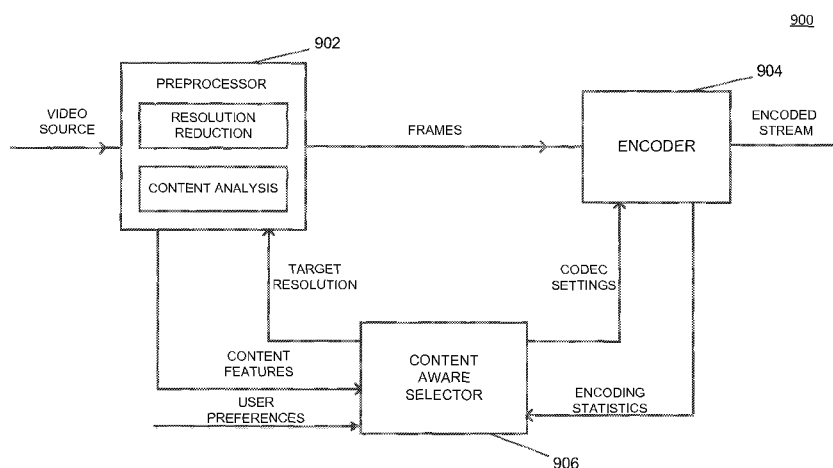


FIG. 9

(57) **Abstract:** A method and system for providing content aware media adaptation are described. Aspects of the invention adaptively down-sample a source video 102 to optimize the encoding process of the source video 102. The system and method extract content characteristics from the source video 102 by sampling the source video 102, and classify the video 102 into one or more content classes based on the extracted characteristics. The content class of the video 102 is used to determine one or more down-sampling settings for the source video. In some aspects, the down-sampling settings are derived by sampling a plurality of videos 102 and determining optimal transitional rates 500 for the plurality of videos. The sampled videos may be used to generate a decision boundary 606 to classify whether a particular video is a good candidate for spatial down-sampling.

INTERNATIONAL SEARCH REPORT

International application No
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A. CLASSIFICATION OF SUBJECT MATTER
INV. H04N7/26 H04N7/46
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

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)

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 1 248 466 A1 (MITSUBISHI ELECTRIC CORP [JP]) 9 October 2002 (2002-10-09) paragraph [0033] paragraph [0037] - paragraph [0046] paragraph [0049] - paragraph [0055] paragraph [0057] - paragraph [0062] paragraph [0068] paragraph [0100] paragraph [0118] - paragraph [0133] figures 3,4,5,6,13 ----- -/-	1,2,5, 12,19, 29,30

☒ 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

10 August 2012

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10/12/2012

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INTERNATIONAL SEARCH REPORT

International application No
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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	TOMIC M ET AL: "Implementation and analysis of mpeg-4 dynamic resolution conversion", IMAGE AND SIGNAL PROCESSING AND ANALYSIS, 2003. ISPA 2003. PROCEEDINGS OF THE 3RD INTERNATIONAL SYMPOSIUM ON ROME, ITALY SEPT. 18-20, 2003, PISCATAWAY, NJ, USA, IEEE, ZAGREB, CROATIA, vol. 1, 18 September 2003 (2003-09-18), pages 317-322, XP010703154, DOI: 10.1109/ISPA.2003.1296915 ISBN: 978-953-184-061-3 * section 3 *	1,2,5, 12,19, 29,30
X	----- YONGQING LIANG ET AL: "A new content-based hybrid video transcoding method", PROCEEDINGS 2001 INTERNATIONAL CONFERENCE ON IMAGE PROCESSING. ICIP 2001 - THESSALONIKI, GREECE, OCT. 7 - 10, 2001; [INTERNATIONAL CONFERENCE ON IMAGE PROCESSING], INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS, NEW YORK, NY, vol. 1, 7 October 2001 (2001-10-07), pages 429-432, XP010564888, DOI: 10.1109/ICIP.2001.959045 ISBN: 978-0-7803-6725-8 * sections 2 and 3 *;	1,12,29, 30
A	figure 1	2,5,19
X	----- BARRETO D ET AL: "Region-based super-resolution for compression", MULTIDIMENSIONAL SYSTEMS AND SIGNAL PROCESSING ; AN INTERNATIONAL JOURNAL, KLUWER ACADEMIC PUBLISHERS, BO, vol. 18, no. 2-3, 8 March 2007 (2007-03-08), pages 59-81, XP019506574, ISSN: 1573-0824, DOI: 10.1007/S11045-007-0019-Y	1,29,30
A	abstract * section 4: Model II *;	2,5,12, 19
A	figure 2 ----- WO 2010/033151 A1 (THOMSON LICENSING [FR]; VO DUNG TRUNG [US]; SOLE JOEL [US]; YIN PENG []) 25 March 2010 (2010-03-25) page 2, line 2 - line 4 page 6, line 30 - line 34 page 3, line 9 - line 15 page 10, line 17 - line 34 page 11, line 21 - page 12, line 4 page 12, line 13 - page 13, line 22 figures 1,10,12,13 ----- -/--	1,2,5, 12,19, 29,30

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2012/035426

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2008/133677 A1 (QUALCOMM INC [US]; SHAH DEVARSHI [US]; BHAMIDIPATI PHANIKUMAR [US]; KA) 6 November 2008 (2008-11-06)	1,12,29,30
A	paragraph [0037] - paragraph [0039] paragraph [0057] paragraph [0058]	2,5,19

X	US 2003/169933 A1 (SONG BYUNG-CHEOL [KR] ET AL) 11 September 2003 (2003-09-11)	1,12,29,30
A	paragraph [0014] - paragraph [0016] paragraph [0027] paragraph [0030] - paragraph [0034] paragraph [0046] - paragraph [0049] figures 3,5	2,5,19

A	US 6 909 745 B1 (PURI ATUL [US] ET AL) 21 June 2005 (2005-06-21) column 1, line 51 - line 55 figures 3, 10-14 column 5, line 35 - line 50 column 7, line 64 - column 8, line 32 column 8, line 60 - column 9, line 18 column 9, line 38 - line 67 table 1	1,2,5,12,19,29,30

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2012/035426

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.:

1, 2, 5, 12, 19, 29, 30

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.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2012/035426

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
EP 1248466	A1	09-10-2002	AU 3054801 A	23-10-2001
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			WO 2008133677 A1	06-11-2008

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			DE 10303928 A1	23-10-2003
			JP 2003274415 A	26-09-2003
			KR 20030073254 A	19-09-2003
			US 2003169933 A1	11-09-2003
			US 2006210184 A1	21-09-2006

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			US 7715475 B1	11-05-2010

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, 2, 5, 12, 19, 29, 30

How to identify video candidates for spatial down-sampling

2. claims: 3, 4, 31

How to derive fast intermediate parameter/values with a low complexity

3. claims: 6-10

How to select a spatial down sampling ratio

4. claims: 13-16

How to select the frame rate reduction

5. claims: 17, 18

How to extract content characteristics

6. claims: 20-22

How to force down-sampling regardless of the content characteristics

7. claims: 23-28

How to generate classes for content based classification
