(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
18 October 2012 (18.10.2012)

WIPO | PCT

(10) International Publication Number
WO 2012/139192 A3

(51) International Patent Classification:
H04N 7/50 (2006.01) *H03M 7/30* (2006.01)

(21) International Application Number:
PCT/CA2011/050200

(22) International Filing Date:
15 April 2011 (15.04.2011)

(25) Filing Language: English

(26) Publication Language: English

(71) Applicant *(for all designated States except US)*: **RESEARCH IN MOTION LIMITED** [CA/CA]; 295 Phillip Street, Waterloo, Ontario N2L 3W8 (CA).

(72) Inventors; and
(75) Inventors/Applicants *(for US only)*: **HE, Dake** [CA/CA]; 295 Phillip Street, Ext. 78760, Waterloo, Ontario N2L 3W8 (CA). **WANG, Jing** [CA/CA]; 295 Phillip Street, Ext. 75923, Waterloo, Ontario N2L 3W8 (CA).

(74) Agent: **ROWAND INTELLECTUAL PROPERTY LAW**; 2nd Floor, 8 Wellington Street East, Toronto, Ontario M5E 1C5 (CA).

(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, LV, 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).

[Continued on next page]

(54) Title: METHODS AND DEVICES FOR CODING AND DECODING THE POSITION OF THE LAST SIGNIFICANT COEFFICIENT

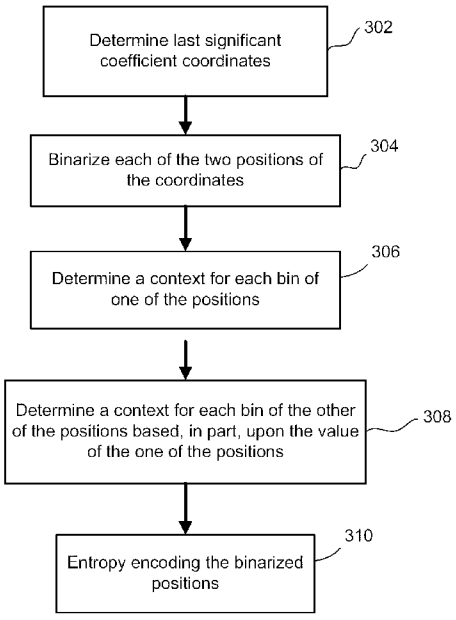

FIG. 8

(57) Abstract: Methods and devices are described for entropy coding data using an entropy coder to encode quantized transform domain coefficient data. Last significant coefficient information is signaled in the bitstream using two-dimensional coordinates for the last significant coefficient. The context for bins of one of the coordinates is based, in part, upon the value of the other of the coordinates. In one case, instead of signaling last significant coefficient information, the number of non-zero coefficients is binarized and entropy encoded.

WO 2012/139192 A3

WO 2012/139192 A3

Published:

— *with international search report (Art. 21(3))*

(88) Date of publication of the international search report:
13 December 2012

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CA2011/050200

A. CLASSIFICATION OF SUBJECT MATTER
IPC: ***H04N 7/50*** (2006.01) , ***H03M 7/30*** (2006.01)
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 7/50 (2006.01) , ***H03M 7/30*** (2006.01) in combination with keywords below

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic database(s) consulted during the international search (name of database(s) and, where practicable, search terms used)
Databases: EPOQUE (EPODOC), Canadian Patent Database, IEEE Xplore, Google scholar
Keywords: binarization, adaptive context, transform coefficient, last significant coefficient, significance map, context processing

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	SOLE et al., "Parallel Context Processing for the significance map in high coding efficiency", Input document to the JCT-VC (JCTVC-D262), Joint Collaborative Team on Video Coding (JCT-VC) of ITU-T SG16 WP3 and ISO/IEC JTC1/SC29/WG11, 20 - 28 January, 2011, Daegu, KR. See abstract, section 1, 2.1.	1 - 2, 4, 7 - 11, 13, 17 - 18
Y	EP 2,007,147 A2 (KARCZEWICZ et al.) 24 December 2008 (24-12-2008) See abstract, paragraph [0130].	1 - 2, 4, 7 - 11, 13, 17 - 18
A	US 7,702,013 B2 (SCHWARZ et al.) 20 April 2010 (20-04-2010) See whole document.	1 - 18
A	HEO et al., "Improved Context-Based Adaptive Binary Arithmetic Coding over H.264/AVC for Lossless Depth Map Coding", IEEE Signal Processing Letters, Vol, 17, No. 10, 10 October 2010. See whole document.	1 - 18

[ ] Further documents are listed in the continuation of Box C.

[X] 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	Date of mailing of the international search report
30 November 2011 (30-11-2011)	21 December 2011 (21-12-2011)

Name and mailing address of the ISA/CA	Authorized officer
Canadian Intellectual Property Office Place du Portage I, C114 - 1st Floor, Box PCT 50 Victoria Street Gatineau, Quebec K1A 0C9 Facsimile No.: 001-819-953-2476	Sanja Denic (819) 994-1712

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CA2011/050200

Patent Document Cited in Search Report	Publication Date	Patent Family Member(s)	Publication Date
EP2007147A2	24 December 2008 (24-12-2008)	AU2002334271B2	07 August 2008 (07-08-2008)
		AU2002334271B9	04 September 2008 (04-09-2008)
		AU2008202981A1	31 July 2008 (31-07-2008)
		AU2008202983A1	31 July 2008 (31-07-2008)
		CN1585958A	23 February 2005 (23-02-2005)
		CN1327395C	18 July 2007 (18-07-2007)
		CN1866297A	22 November 2006 (22-11-2006)
		CN100454339C	21 January 2009 (21-01-2009)
		CN1874509A	06 December 2006 (06-12-2006)
		EP1435063A1	07 July 2004 (07-07-2004)
		EP1435063A4	23 May 2007 (23-05-2007)
		EP1933568A2	18 June 2008 (18-06-2008)
		EP1933568A3	25 June 2008 (25-06-2008)
		JP2005504471A	10 February 2005 (10-02-2005)
		US2003081850A1	01 May 2003 (01-05-2003)
		US6856701B2	15 February 2005 (15-02-2005)
		WO03027940A1	03 April 2003 (03-04-2003)
US7702013B2	20 April 2010 (20-04-2010)	AT343302T	15 November 2006 (15-11-2006)
		AT352826T	15 February 2007 (15-02-2007)
		DE50305419D1	30 November 2006 (30-11-2006)
		DE50306371D1	15 March 2007 (15-03-2007)
		DK1467491T3	19 March 2007 (19-03-2007)
		DK1487113T3	20 November 2006 (20-11-2006)
		EP1467491A2	13 October 2004 (13-10-2004)
		EP1467491A3	02 March 2005 (02-03-2005)
		EP1467491B1	24 January 2007 (24-01-2007)
		EP1487113A2	15 December 2004 (15-12-2004)
		EP1487113A3	16 March 2005 (16-03-2005)
		EP1487113B1	18 October 2006 (18-10-2006)
		EP1500281A2	26 January 2005 (26-01-2005)
		ES2270246T3	01 April 2007 (01-04-2007)
		ES2277174T3	01 July 2007 (01-07-2007)
		HK1070480A1	08 June 2007 (08-06-2007)
		HK1070992A1	05 January 2007 (05-01-2007)
		JP2005237004A	02 September 2005 (02-09-2005)
		JP4057595B2	05 March 2008 (05-03-2008)
		JP4295356B1	15 July 2009 (15-07-2009)
		JP2009165144A	23 July 2009 (23-07-2009)
		JP2005530375A	06 October 2005 (06-10-2005)
		JP4313757B2	12 August 2009 (12-08-2009)
		JP2005229632A	25 August 2005 (25-08-2005)
		JP4313771B2	12 August 2009 (12-08-2009)
		PT1467491E	30 March 2007 (30-03-2007)
		PT1487113E	29 December 2006 (29-12-2006)
		US2005117652A1	02 June 2005 (02-06-2005)
		US7496143B2	24 February 2009 (24-02-2009)
		US2004114683A1	17 June 2004 (17-06-2004)
		US2009201986A1	13 August 2009 (13-08-2009)
		US2009201994A1	13 August 2009 (13-08-2009)
		US2009201995A1	13 August 2009 (13-08-2009)
		US2009201996A1	13 August 2009 (13-08-2009)
		WO03094529A2	13 November 2003 (13-11-2003)
		WO03094529A3	08 April 2004 (08-04-2004)