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(54) Title: METHOD AND APPARATUS FOR VIDEO CODING WITH ADAPTIVE CLIPPING

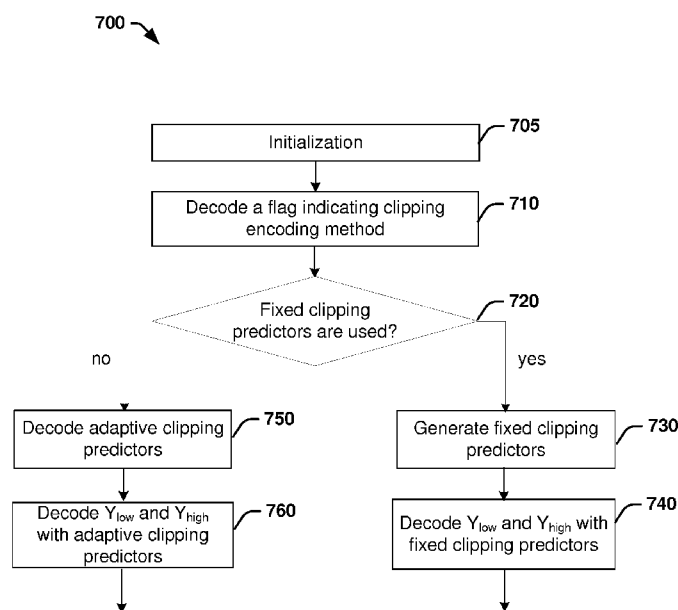


FIG. 7

(57) Abstract: Clipping may be applied during various operations at an encoder or decoder. The lower and upper bounds for clipping can be differentially encoded with respect to predictors. Fixed predictors can be used, for example, 0 and 2^{bitdepth} for the lower and upper bounds, respectively. Adaptive predictors can also be used. Adaptive predictors can be derived from clipping bounds in previously encoded or decoded pictures, or explicitly signaled in a bitstream. Whether to encode the clipping bounds can be determined based on the number of pixels that have values close to the clipping bounds. Additionally, taking advantage of the clipping operation, the prediction residuals can be smoothed, while the distortion for the block may not necessarily increase.



SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR,
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- (84) Designated States** (*unless otherwise indicated, for every kind of regional protection available*): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, 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, KM, 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))*

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- *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))*

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INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2017/059967

<p>A. CLASSIFICATION OF SUBJECT MATTER</p> <p>INV. H04N19/70 H04N19/117 H04N19/463 H04N19/136 H04N19/182 H04N19/82 H04N19/86</p> <p>ADD.</p> <p>According to International Patent Classification (IPC) or to both national classification and IPC</p>														
<p>B. FIELDS SEARCHED</p> <p>Minimum documentation searched (classification system followed by classification symbols) H04N</p> <p>Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched</p> <p>Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) EPO-Internal, INSPEC, WPI Data</p>														
<p>C. DOCUMENTS CONSIDERED TO BE RELEVANT</p> <table border="1"> <thead> <tr> <th>Category*</th> <th>Citation of document, with indication, where appropriate, of the relevant passages</th> <th>Relevant to claim No.</th> </tr> </thead> <tbody> <tr> <td>X</td> <td>Y-L CHANG ET AL: "TE10 substest 3: Controlled clipping", 94. MPEG MEETING; 11-10-2010 - 15-10-2010; GUANGZHOU; (MOTION PICTURE EXPERT GROUP OR ISO/IEC JTC1/SC29/WG11), no. M18172, 2 October 2010 (2010-10-02), XP030046762,</td> <td>1,3,4,6,7,12,14,15,17,18</td> </tr> <tr> <td>A</td> <td>the whole document</td> <td>2,5,8-11,13,16,19-34</td> </tr> <tr> <td></td> <td style="text-align: center;">----- -/--</td> <td></td> </tr> </tbody> </table>			Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.	X	Y-L CHANG ET AL: "TE10 substest 3: Controlled clipping", 94. MPEG MEETING; 11-10-2010 - 15-10-2010; GUANGZHOU; (MOTION PICTURE EXPERT GROUP OR ISO/IEC JTC1/SC29/WG11), no. M18172, 2 October 2010 (2010-10-02), XP030046762,	1,3,4,6,7,12,14,15,17,18	A	the whole document	2,5,8-11,13,16,19-34		----- -/--	
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.												
X	Y-L CHANG ET AL: "TE10 substest 3: Controlled clipping", 94. MPEG MEETING; 11-10-2010 - 15-10-2010; GUANGZHOU; (MOTION PICTURE EXPERT GROUP OR ISO/IEC JTC1/SC29/WG11), no. M18172, 2 October 2010 (2010-10-02), XP030046762,	1,3,4,6,7,12,14,15,17,18												
A	the whole document	2,5,8-11,13,16,19-34												
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<p><input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C.</p> <p><input checked="" type="checkbox"/> See patent family annex.</p>														
<p>* Special categories of cited documents :</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier application or patent but published on or after the international filing date</p> <p>"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)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> <p>"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</p> <p>"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</p> <p>"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</p> <p>"&" document member of the same patent family</p>														
<p>Date of the actual completion of the international search</p> <p>8 November 2017</p>		<p>Date of mailing of the international search report</p> <p>23/11/2017</p>												
<p>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</p>		<p>Authorized officer</p> <p>Cyranka, Oliver</p>												

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2017/059967

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	Y-L CHANG ET AL: "CE8 Subset3: Controlled Clipping", 4. JCT-VC MEETING; 95. MPEG MEETING; 20-1-2011 - 28-1-2011; DAEGU;(JOINT COLLABORATIVE TEAM ON VIDEO CODING OF ISO/IEC JTC1/SC29/WG11AND ITU-T SG.16); URL: HTTP://WFTP3.ITU.INT/AV-ARCH/JCTVC-SITE/, no. JCTVC-D123, 15 January 2011 (2011-01-15), XP030008163, ISSN: 0000-0015	1,2, 7-13, 18-22
A	the whole document	3-6, 14-17, 23-34
X	----- LI X ET AL: "Non-CE4: Clipping of Transformed Coefficients before De-Quantization", 8. JCT-VC MEETING; 99. MPEG MEETING; 1-2-2012 - 10-2-2012; SAN JOSE; (JOINT COLLABORATIVE TEAM ON VIDEO CODING OF ISO/IEC JTC1/SC29/WG11 AND ITU-T SG.16); URL: HTTP://WFTP3.ITU.INT/AV-ARCH/JCTVC-SITE/, no. JCTVC-H0312, 20 January 2012 (2012-01-20), XP030111339, the whole document	1,5,7, 12,16,18
A	the whole document	2-4,6, 8-11, 13-15, 17,19-34
X,P	----- GALPIN F ET AL: "Adaptive Clipping in JEM2.0", 3. JVET MEETING; 26-5-2016 - 1-6-2016; GENEVA; (THE JOINT VIDEO EXPLORATION TEAM OF ISO/IEC JTC1/SC29/WG11 AND ITU-T SG.16); URL: HTTP://PHENIX.INT-EVRY.FR/JVET/, no. JVET-C0040, 17 May 2016 (2016-05-17), XP030150130, the whole document	23-27, 29-33
A,P	the whole document	1-22,28, 34
X,P	----- GALPIN FRANCK ET AL: "Adaptive Clipping in JEM", 2017 DATA COMPRESSION CONFERENCE (DCC), IEEE, 4 April 2017 (2017-04-04), pages 33-41, XP033095307, DOI: 10.1109/DCC.2017.36 [retrieved on 2017-05-08] the whole document	1-34
A	----- US 2011/305277 A1 (FU CHIH-MING [TW] ET AL) 15 December 2011 (2011-12-15) the whole document	1-34
	----- -/--	

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2017/059967

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	SUDENG HU ET AL: "Adaptive Quantization-Parameter Clip Scheme for Smooth Quality in H.264/AVC", IEEE TRANSACTIONS ON IMAGE PROCESSING, IEEE SERVICE CENTER, PISCATAWAY, NJ, US, vol. 21, no. 4, 1 April 2012 (2012-04-01), pages 1911-1919, XP011492001, ISSN: 1057-7149, DOI: 10.1109/TIP.2011.2176347 the whole document -----	1-34

INTERNATIONAL SEARCH REPORT

International application No.
PCT/EP2017/059967

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: 1-22

Encoding of clipping boundaries.

2. claims: 23-34

Adaptive residual smoothing.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2017/059967

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2011305277 A1	15-12-2011	US 2011305277 A1 US 2016360211 A1	15-12-2011 08-12-2016
