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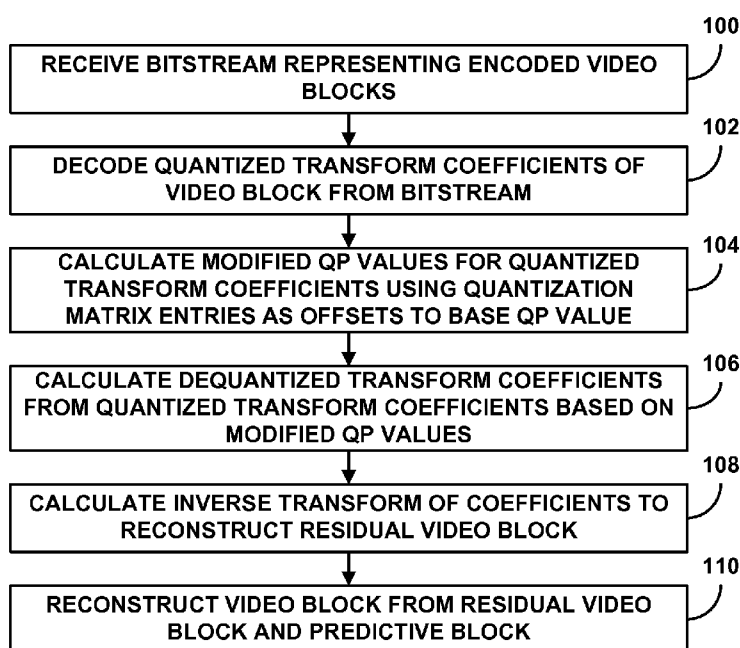
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13/863,197 15 April 2013 (15.04.2013) US(71) Applicant: **QUALCOMM INCORPORATED** [US/US];
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TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW,
ML, MR, NE, SN, TD, TG).**Declarations under Rule 4.17:**— as to applicant's entitlement to apply for and be granted a
patent (Rule 4.17(ii))

[Continued on next page]

(54) Title: UNIFORM GRANULARITY FOR QUANTIZATION MATRIX IN VIDEO CODING



(57) Abstract: The techniques of this disclosure are directed toward the use of modified quantization parameter (QP) values to calculate quantized and dequantized transform coefficients of a video block with uniform QP granularity. Conventionally, when a quantization matrix is used during quantization and dequantization of transform coefficients, the quantization matrix entries act as scale factors of a quantizer step-step corresponding to a base QP value, which results in non-uniform QP granularity. To provide uniform QP granularity across all quantization matrix entries, the techniques include calculating modified QP values for transform coefficients based on associated quantization matrix entries used as offsets to a base QP value. At a video decoder, the techniques include calculating dequantized transform coefficients from quantized transform coefficients based on the modified QP values. At a video encoder, the techniques include calculating quantized transform coefficients from transform coefficients based on the modified QP values.



- *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))* — *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

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A. CLASSIFICATION OF SUBJECT MATTER

INV. H04N7/26

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JUNICHI TANAKA ET AL: "Quantization matrix for HEVC", 96. MPEG MEETING; 21-3-2011 - 25-3-2011; GENEVA; (MOTION PICTURE EXPERT GROUP OR ISO/IEC JTC1/SC29/WG11), no. m19583, 22 March 2011 (2011-03-22), XP030048150,	1-4,9, 11-14, 20-23, 28, 30-33, 39-42, 44-47
Y	sections 2.2 - 2.3.1 ----- -/--	5-8, 15-18, 24-27, 34-37, 43,48



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

22 July 2013

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Name and mailing address of the ISA/

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INTERNATIONAL SEARCH REPORT

International application No

PCT/US2013/036799

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	TOURAPIS ET AL: "Quantization Offset Matrices for Fidelity Range Extensions", 12. JVT MEETING; 69. MPEG MEETING; 17-07-2004 - 23-07-2004; REDMOND,US; (JOINT VIDEO TEAM OF ISO/IEC JTC1/SC29/WG11 AND ITU-T SG.16), no. JVT-L032r4, 23 July 2004 (2004-07-23), XP030005886, ISSN: 0000-0420	1-4,9, 11-14, 20-23, 28, 30-33, 39-42, 44-47
A	sections 1 - 2	5-8, 15-18, 24-27, 34-37, 43,48
X	----- LI X ET AL: "Non CE4: Fine granularity QP offset", 7. JCT-VC MEETING; 98. MPEG MEETING; 21-11-2011 - 30-11-2011; GENEVA; (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-G850, 9 November 2011 (2011-11-09), XP030110834, sections 1 - 2.1	1-4,9, 11-14, 20-23, 28, 30-33, 39-42, 44-47
A		5-8, 15-18, 24-27, 34-37, 43,48
Y	----- LEE T ET AL: "CE4 Subtest 1.2.c: Higher granularity of quantization parameter scaling", 7. JCT-VC MEETING; 98. MPEG MEETING; 21-11-2011 - 30-11-2011; GENEVA; (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-G773, 9 November 2011 (2011-11-09), XP030110757, cited in the application section 1	5-8, 15-18, 24-27, 34-37, 43,48
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INTERNATIONAL SEARCH REPORT

International application No
PCT/US2013/036799

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	JOSHI R ET AL: "Quantization matrix entries as QP offsets", 9. JCT-VC MEETING; 100. MPEG MEETING; 27-4-2012 - 7-5-2012; GENEVA; (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-I0284, 17 April 2012 (2012-04-17), XP030112047, the whole document -----	1-48
A	BROSS B ET AL: "High Efficiency Video Coding (HEVC) text specification draft 6", 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-H1003, 10 February 2012 (2012-02-10), XP030111769, cited in the application section 8.5.3 -----	9,28

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2013/036799

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.:

1-9, 11-18, 20-28, 30-37, 39-48

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: 1-9, 11-18, 20-28, 30-37, 39-48

Adjust basic granularity of quantization parameter

2. claims: 10, 19, 29, 38

Avoid clipping of quantized coefficients during decoding
