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**Datasheet for the decision
of 9 November 2021**

Case Number: T 2698/16 - 3.5.04

Application Number: 12701213.6

Publication Number: 2668781

IPC: H04N7/26, H04N7/46, H04N7/50

Language of the proceedings: EN

Title of invention:

SINGLE REFERENCE PICTURE LIST CONSTRUCTION FOR VIDEO CODING

Applicant:

QUALCOMM INCORPORATED

Headword:

Relevant legal provisions:

EPC Art. 56
RPBA 2020 Art. 13(2)

Keyword:

Third and fourth auxiliary requests - amendment after summons
- exceptional circumstances (yes)
All requests - inventive step - (no)

Decisions cited:

Catchword:



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Chambres de recours

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Case Number: T 2698/16 - 3.5.04

D E C I S I O N
of Technical Board of Appeal 3.5.04
of 9 November 2021

Appellant: QUALCOMM INCORPORATED
(Applicant) International IP Administration
5775 Morehouse Drive
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Representative: Howe, Steven
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Decision under appeal: **Decision of the Examining Division of the
European Patent Office posted on 5 July 2016
refusing European patent application
No. 12701213.6 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chair B. Willems
Members: A. Seeger
G. Decker

Summary of Facts and Submissions

- I. The appeal was filed against the decision of the examining division to refuse European patent application No. 12 701 213.6, published as international patent application WO 2012/102973 A1.
- II. In the international preliminary report on patentability, the following document was cited:
- D6: Y. Chen et al.: "*Comments on Generalised P and B Pictures*", 4. JCT-VC Meeting, 95. MPEG Meeting; 20 to 28 January 2011; Daegu; Joint Collaboration Team on Video Coding of ISO/IECJTC1/SC29/WG11 and ITU-T SG.16; URL: [HTTP://WFTP3.ITU.INT/AV-ARCH/JCTVC-SITE](http://WFTP3.ITU.INT/AV-ARCH/JCTVC-SITE), no. JCTVC-D401, 16 January 2016, XP030008440
- III. The documents cited in the decision under appeal included the following:
- D7: T. Wiegand et al.: "*High Efficiency Video Coding (HEVC) text specification Working Draft 1 - JCTVC-C403*", 3. JCT-VC Meeting; 95. MPEG Meeting; 7 to 15 October 2010; Guangzhou; Joint Collaboration Team on Video Coding of ISO/IECJTC1/SC29/WG11 and ITU-T SG.16; 6 January 2011, pages 57 to 58, XP0555235629
- IV. The decision under appeal was based on the following grounds:
- (a) The subject-matter of claims 1, 14 and 15 according to the main request lacked novelty in view of the disclosure of document D7.

(b) The subject-matter of claims 1, 14 and 15 according to the first auxiliary request lacked inventive step in view of the disclosure of document D7 combined with common general knowledge.

(c) The subject-matter of claims 1, 13 and 14 according to the second auxiliary request lacked novelty in view of the disclosure of document D7.

In comments which did not form part of the decision, the examining division stated that even if the differences, pointed out by the representative, between the method of claim 1 and document D7 were to be acknowledged, the subject-matter of claim 1 would still lack inventive step in view of the disclosure of document D7 combined with common general knowledge.

V. The applicant (appellant) filed notice of appeal. With the statement of grounds of appeal, the appellant maintained the sets of claims according to the main request and the first and second auxiliary requests on which the decision under appeal was based. The appellant requested that the decision under appeal be set aside and that a European patent be granted on the basis of the claims of the main request, or, alternatively, on the basis of the claims of either the first or the second auxiliary request. It provided arguments as to why the claims met the requirements of Articles 54 and 56 EPC.

VI. The board issued a summons to oral proceedings and a communication under Article 15(1) of the Rules of Procedure of the Boards of Appeal in the 2020 version (RPBA 2020, OJ EPO 2019, A63). In this communication, the board introduced document D6 *ex officio* into the

appeal proceedings and gave the following preliminary opinion:

- (a) The distinction between a "*bi-predicted video block*" and a "*uni-directionally predicted video block*" in claim 1 was not clear.
- (b) The terms "*bi-predicted video block*" and "*uni-directionally predicted video block*" were clear when used in the context of HEVC standardisation. However, no claim 1 of any of the requests was limited to a particular coding standard.
- (c) The examining division's finding, that the subject-matter of claim 1 of the main request lacked novelty in view of the disclosure of document D7, was not correct. The subject-matter of claim 1 of the main request differed from the disclosure of document D7 in that the claim specified using a single reference picture list which combines lists L0 and L1.
- (d) The subject-matter of claim 1 of the main request lacked inventive step over the disclosure of document D7 combined with common general knowledge.
- (e) The subject-matter of claims 1, 14 and 15 of the main request lacked inventive step over the disclosure of document D6 combined with common general knowledge.
- (f) The subject-matter of claim 1 of the first and second auxiliary requests lacked inventive step over the disclosure of document D6 or document D7 combined with common general knowledge.

- VII. By letter of reply dated 8 October 2021, the appellant filed amended claims according to a third auxiliary request and a fourth auxiliary request. It indicated a basis for the amendments in the application as filed and submitted arguments as to why the claims of all requests met the requirements of Articles 56 and 84 EPC.
- VIII. With a communication dated 29 October 2021, the board transmitted a copy of the full version of the HEVC text specification working draft JCTVC-C403 entitled "*WD1: Working Draft 1 of High-Efficiency Video Coding*" (referred to as D7a) to the appellant. The board indicated that if it were to admit the third or fourth auxiliary request into the appeal proceedings, the appellant should be prepared to discuss inventive step in view of document D7a.
- IX. By letter dated 5 November 2021, the appellant informed the board that it would not be represented at the oral proceedings scheduled for 9 November 2021 and requested that the decision "*be made on the written papers*".
- X. On 9 November 2021, the board held oral proceedings in the appellant's absence.

During the oral proceedings, the chair noted that it appeared from the file that the appellant requested that the decision under appeal be set aside and a European patent be granted on the basis of the claims of the main request or, alternatively, on the basis of one of the first to fourth auxiliary requests, the main request and the first and second auxiliary requests filed with the statement of grounds of appeal, the third and fourth auxiliary requests filed with the letter dated 8 October 2021.

At the end of the oral proceedings, the chair announced the board's decision.

XI. Claim 1 of the main request reads as follows:

"A method of coding video data comprising:

constructing (100), with a video coder, a single reference picture list that includes an identifier for each of one or more reference pictures from a memory that stores decoded reference pictures, wherein the single reference picture list, and no other reference picture list, is utilized to code a bi-predicted video block, and the same single reference picture list is utilized to code a uni-directionally predicted video block;

coding (103, 105), with the video coder, one index value of the single reference picture list if a video block of a current picture is uni-directionally predicted and two index values of the single reference picture list if the video block of the current picture is bi-predicted; and

coding, with the video coder, the video block of the current picture using the single reference picture list, and no other reference picture list, wherein, when the video block is bi-predicted, the video block is coded (106) with respect to two of the reference pictures identified in the single reference picture list by the two index values, and, when the video block is uni-directionally predicted, the video block is coded (104) with respect to one of the reference pictures identified in the same single reference picture list by the one index value."

XII. Claim 1 of the first auxiliary request differs from claim 1 of the main request by the following definition of the term constructing (100) (amendments relative to claim 1 of the main request are underlined):

"constructing (100), with a video coder, a single reference picture list that includes an identifier for each of one or more reference pictures from a memory that stores decoded reference pictures, wherein the single reference picture list, and no other reference picture list, is utilized to code a bi-predicted video block, and the same single reference picture list is utilized to code a uni-directionally predicted video block, wherein the identifier is picture order count, POC, value and/or picture number value assigned to the reference picture;"

XIII. Claim 1 of the second auxiliary request differs from claim 1 of the main request in that it adds the following text before the full stop:

", the method further comprising at least one of:

coding one or more syntax elements that indicate a number of video blocks within the current picture that are coded using bi-prediction with respect to two reference pictures in the single reference picture list; and

coding one or more syntax elements that indicate an area of the current picture that is coded using bi-prediction with respect to two reference pictures in the single reference picture list"

XIV. Claim 1 of the third auxiliary request differs from claim 1 of the main request in that it adds the following text before the full stop:

"; wherein the reference pictures are organized in the single reference picture list based on the temporal distance of the reference pictures from the current picture"

XV. Claim 1 of the fourth auxiliary request differs from claim 1 of the main request in that it adds the following text before the full stop:

"; wherein constructing the single reference picture list comprises including identifiers for reference pictures that are closer in display order to the current picture at earlier locations in the single reference picture list than reference pictures that are further away in display order from the current picture"

XVI. The appellant's arguments, insofar as they are relevant to the present decision, may be summarised as follows:

Main request and first auxiliary request

(a) The objective technical problem could not be formulated as "*how to find an alternative way of organising lists L0 and L1 of D7*" since formulating the objective technical problem in this manner meant that the problem contained pointers to the proposed solution. The objective technical problem might more fairly be stated as "*how to efficiently signal in an arrangement using both bi-predicted video blocks and uni-directionally predicted video blocks*" (see letter dated 8 October 2021, page 2, last two paragraphs).

(b) The prior art provided no motivation to arrive at the present invention. Document D7 specifically taught the use of two lists: list L0 and list L1 (see letter dated 8 October 2021, page 3, first paragraph).

Second auxiliary request

(c) Merely providing syntax elements `slice_type` and `inter_pred_idc` did not anticipate the claimed syntax elements, which indicated a number of video blocks within the current picture that were coded using bi-prediction (see statement of grounds of appeal, page 9, fifth paragraph).

Third and fourth auxiliary requests

(d) It was not possible to arrive at the arrangements specified in claim 1 of these requests from the cited prior art (see letter dated 8 October 2021, page 5).

Reasons for the Decision

1. The appeal is admissible.
2. Main request - inventive step (Article 56 EPC)
 - 2.1 Document D6 is an appropriate starting point for the assessment of inventive step. The appellant did not contest this.
 - 2.2 Document D6 discloses that generalised P and B (GPB) pictures are supported in the working draft of HEVC (see D6, abstract).

Further, document D6 discloses that each prediction unit of a GPB slice, i.e. each video block, may be either uni-directionally predicted from reference picture list L0 or bi-directionally predicted. A GPB slice has two reference picture lists L0 and L1 which are identical (see D6, section 1 "Introduction").

Document D6, section 1 "Introduction" refers to the "*current working draft*" of HEVC. Document D7 is a two-page extract from "*WD1: Working Draft 1 of High-Efficiency Video Coding*". When document D6 is read in conjunction with document D7 (to which it refers), the introduction of document D6 discloses the following features of claim 1:

A method of coding video data (see D7, title) comprising:

constructing, with a video coder (the presence of a video coder is implicit in the video coding specification D7), a [set of reference picture lists] ~~single reference picture list~~ that includes an identifier for each of one or more reference pictures from a memory that stores decoded reference pictures, wherein the ~~single~~ reference picture list (list L0 and list L1 include identifiers of reference pictures stored in a decoded picture buffer), and no other [set of reference picture lists] ~~reference picture list~~, is utilised to code a bi-predicted video block (list L0 and list L1 are the only reference picture lists used), and the same [set of reference picture lists] ~~single reference picture list~~ is utilised to code a uni-directionally predicted video block (depending on the prediction direction, i.e. whether `inter_pred_idc`

is either 0 or 1, list L0 or list L1 is used, respectively, see D7, Table 7-9);

coding, with the video coder, one index value of the [set of reference picture lists] ~~single reference picture list~~ if a block of a current picture is uni-directionally predicted (`inter_pred_idc = 0` or `1` combined with either `ref_idx_l0` or `ref_idx_l1`) and two index values of the [set of reference picture lists] ~~single reference picture list~~ if the video block of the current picture is bi-predicted (`inter_pred_idc = 2` combined with `ref_idx_l0` and `ref_idx_l1`);

coding, with the video coder, the video block of the current picture using the [set of reference picture lists] ~~single reference picture list~~, and no other [set of reference picture lists] ~~reference picture list~~ (list L0 and list L1 are the only reference picture lists), wherein, when the video block is bi-predicted (`inter_pred_idc = 2`), the video block is coded with respect to two of the reference pictures identified in the [set of reference picture lists] ~~single reference picture list~~ by the two index values (`ref_idx_l0` and `ref_idx_l1`), and, when the video block is uni-directionally predicted (`inter_pred_idc = 0` or `1`), the video block is coded with respect to one of the reference pictures identified in the same [set of reference picture lists] ~~single reference picture list~~ by the one index value (either `ref_idx_l0` or `ref_idx_l1`).

- 2.3 Thus, the board finds that the subject-matter of claim 1 of the main request differs from the disclosure of document D6 and its reference to document D7 in that the claim specifies using a single reference picture list which combines lists L0 and L1.

2.4 The board agrees with the appellant that the objective technical problem may be formulated as how to efficiently signal in an arrangement using both bi-predicted video blocks and uni-directional predicted video blocks (see point XVI(a) above).

2.5 Document D6 identifies the following problem for GPB slices: since reference picture list L0 and reference picture list L1 are identical, a construction of list L1 is useless and the signalling of information for list L1 is redundant (see D6, section 2 "Problem", items 2) and 3)).

As a solution to the identified problem, document D6 proposes avoiding reference picture list construction for list L1 when the slice is a GPB slice (see D6, section 3.2 and section 4).

Hence, when faced with the problem of how to efficiently signal in an arrangement using both bi-predicted video blocks and uni-directional predicted video blocks, the skilled person is prompted to consider list L1 to be identical to list L0 for particular slice types, and thus to be useless.

2.6 The board finds that in this situation it would have been obvious to the skilled person to avoid data duplication and to omit construction of list L1, i.e. to merge the identical lists L0 and L1 into a single list L0.

2.7 The board is not convinced by the appellant's argument that the prior art provided no motivation to arrive at the present invention (see point XVI(b) above). The board finds that document D6 provides a motivation of

this sort and in fact, in stating that list L1 is redundant and useless, prompts the use of only a single list.

- 2.8 Therefore, the board concludes that the subject-matter of claim 1 lacks inventive step in view of the disclosures of documents D6 and D7 combined with the common general knowledge of the skilled person.
3. First auxiliary request - inventive step (Article 56 EPC)
 - 3.1 Claim 1 of the first auxiliary request differs from claim 1 of the main request in that it further specifies "*the identifier is picture order count, POC, value and/or picture number value assigned to the reference picture*".
 - 3.2 The board finds that identifying a picture by a picture number or a POC value is normal practice in video coding.
 - 3.3 The appellant did not contest this.
 - 3.4 Therefore, the board finds that the subject-matter of claim 1 of the first auxiliary request does not involve an inventive step in view of the disclosures of documents D6 and D7 combined with the common general knowledge of the skilled person.
4. Second auxiliary request - inventive step (Article 56 EPC)
 - 4.1 Claim 1 of the second auxiliary request differs from claim 1 of the main request in that it comprises at least one of:

(a) coding one or more syntax elements that indicate a number of video blocks within the current picture that are coded using bi-prediction with respect to two reference pictures in the single reference picture list

(b) coding one or more syntax elements that indicate an area of the current picture that is coded using bi-prediction with respect to two reference pictures in the single reference picture list

4.2 The board finds that the syntax elements `slice_type` and `inter_pred_idc` in Table 7-9 of document D7 indicate whether the video blocks are coded using uni-directional prediction (`inter_pred_idc = 0` or `1`) or bi-prediction (`inter_pred_idc = 2`).

4.3 The appellant submitted that merely providing syntax elements `slice_type` and `inter_pred_idc` did not anticipate the claimed syntax elements which indicated a number of video blocks within the current picture that were coded using bi-prediction (see point XVI(c) above).

4.4 However, the board finds that by counting the joint occurrences of `slice_type = B` and `inter_pred_idc = 2` for video blocks in a current frame, the number of video blocks within the current picture that are coded using bi-prediction can be determined. In that sense, the syntax elements `slice_type` and `inter_pred_idc` for all video blocks within a current frame indicate a number of video blocks within the current picture that are coded using bi-prediction.

- 4.5 Therefore, the board finds that feature (a) quoted under point 4.1 above is rendered obvious by the disclosures of documents D6 and D7 combined with the common general knowledge of the skilled person.
- 4.6 Since claim 1 of the second auxiliary request requires at least one of features (a) and (b), this leads to the conclusion that the subject-matter of this claim does not involve an inventive step for the same reasons as set out for claim 1 of the main request (see section 2 above).
5. Third and fourth auxiliary requests - admittance (Article 13(2) RPBA 2020)
- 5.1 The third and fourth auxiliary requests were filed after the notification of the summons to oral proceedings. These auxiliary requests are therefore amendments within the meaning of Article 13(2) RPBA 2020.
- 5.2 The board introduced document D6 *ex officio* into the appeal proceedings. Further, the board raised an objection of lack of inventive step starting from document D6 for the first time in the communication under Article 15(1) RPBA 2020. In response to this communication, the appellant filed the third and fourth auxiliary requests with the aim of overcoming this new objection. This represents an exceptional circumstance within the meaning of Article 13(2) RPBA 2020. Exercising its discretion under this provision, the board thus decided to admit the third and fourth auxiliary requests into the appeal proceedings, although the appellant did not submit explicit reasons in this respect.

6. Introduction of document D7a into the appeal proceedings (Article 114(1) EPC) and the right to be heard (Article 113 EPC)
 - 6.1 Document D7a is the full version of the HEVC text specification working draft JCTVC-C403 from which document D7 is a two-page extract.
 - 6.2 For the assessment of inventive step of the subject-matter of claim 1 according to the third and fourth auxiliary requests, the board finds it appropriate to introduce document D7a *ex officio* into the appeal proceedings on the basis of Article 114(1) EPC. It is established case law that in *ex parte* proceedings the boards of appeal are restricted neither to examination of the grounds for the contested decision nor to the facts and evidence on which the decision is based (see G 10/93, OJ EPO 1995, 172, Reasons, point 3 and Case Law of the Boards of Appeal of the European Patent Office, 9th edition 2019, V.A.3.3).
 - 6.3 With the communication dated 29 October 2021, the board transmitted a copy of document D7a to the appellant. The board indicated that if it were to admit the third or fourth auxiliary request into the appeal proceedings, the appellant should be prepared to discuss inventive step in view of document D7a.

In reply, the appellant did not provide further comments but informed the board that it would not be represented at the oral proceedings scheduled for 9 November 2021 and requested that the decision "*be made on the written papers*".
 - 6.4 In view of the board's communication dated 29 October 2021, the use of document D7a in an

objection of lack of inventive step against claim 1 of the third and fourth auxiliary requests cannot be surprising for the appellant.

By not attending the oral proceedings, the appellant deliberately chose to rely only on its written submissions.

6.5 Therefore, the board finds that the appellant's right to be heard under Article 113 EPC was not compromised.

7. Third auxiliary request - inventive step
(Article 56 EPC)

7.1 Claim 1 of the third auxiliary request differs from claim 1 of the main request on account of the following feature: *"wherein the reference pictures are organised in the single reference picture list based on the temporal distance of the reference pictures from the current picture"*.

7.2 Document D7a discloses in the second paragraph on page 63: *"Let entryShortTerm be a variable ranging over all reference entries that are currently marked as 'used for short-term reference'. When some values of entryShortTerm are present having PicOrderCnt(entryShortTerm) less than PicOrderCnt(CurrPic), these values of entryShortTerm are placed at the beginning of refPicList0 in descending order of PicOrderCnt(entryShortTerm). All of the remaining values of entryShortTerm (when present) are then appended to refPicList0 in ascending order of PicOrderCnt(entryShortTerm)."*

7.3 Hence, according to document D7a, in list L0 the reference pictures earlier than a current picture are

organised based on their respective distances to the current picture. In particular, the reference picture with the smallest distance to the current picture comes first. The same holds for the reference pictures later than the current picture.

- 7.4 The appellant argued that it is not possible to arrive at the feature quoted under point 7.1 above from the cited prior art (see point XVI(d) above).

The board agrees that this feature was not explicitly mentioned in document D7.

However, it is disclosed in document D7a (see point 7.3 above) on which the appellant did not provide comments.

- 7.5 Document D6 refers to the working draft of HEVC (see D6, abstract). Hence, the board finds that it would have been obvious to the skilled person to construct the reference picture list L0 of document D6 according to the latest working draft of HEVC, i.e., according to document D7a. Thereby, the skilled person would have arrived at the feature quoted under point 7.1 above.

- 7.6 Document D7 is an extract from document D7a. Therefore, the same inventive step objection as set out under section 2 above for the main request applies when document D7 is replaced by its full-version document D7a.

- 7.7 In view of the above, the board concludes that the subject-matter of claim 1 of the third auxiliary request lacks inventive step in view of the disclosures of documents D6 and D7a combined with the common general knowledge of the skilled person.

8. Fourth auxiliary request - inventive step
(Article 56 EPC)
- 8.1 Claim 1 of the fourth auxiliary request differs from claim 1 of the main request on account of the following feature: *"wherein constructing the single reference picture list comprises including identifiers for reference pictures that are closer in display order to the current picture at earlier locations in the single reference picture list than reference pictures that are further away in display order from the current picture"*.
- 8.2 The passage of document D7a quoted under point 7.2 above discloses that the construction of list L0 comprises a step of including identifiers for reference pictures earlier than the current picture. The identifiers for these reference pictures are included in list L0 such that reference pictures having a smaller distance in picture order count from the current picture are at earlier locations than reference pictures that are further away in picture order count from the current picture. Therein, a difference in picture order count values indicates a difference in display order (see description, paragraph [0024]: *"The POC values may indicate the display order of the pictures"*).
- 8.3 The appellant argued that it is not possible to arrive at the feature quoted under point 8.1 above from the cited prior art (see point XVI(d) above).

The board agrees that this feature was not explicitly mentioned in document D7.

However, it is disclosed in document D7a (see point 8.2 above) on which the appellant did not provide comments.

8.4 Document D6 refers to the working draft of HEVC (see D6, abstract). Hence, the board finds that it would have been obvious to the skilled person to construct the reference picture list L0 of document D6 according to the latest working draft of HEVC, i.e., according to document D7a. Thereby, the skilled person would have arrived at the feature quoted under point 8.1 above.

8.5 Document D7 is an extract from document D7a. Therefore, the same inventive step objection as set out under section 2 above for the main request applies when document D7 is replaced by its full-version document D7a.

8.6 Therefore, the board concludes that the subject-matter of claim 1 of the fourth auxiliary request lacks inventive step in view of the disclosures of document D6 and document D7a combined with the common general knowledge of the skilled person.

9. Conclusion

The main request and the first to fourth auxiliary requests are not allowable because claim 1 of each of these requests does not meet the requirements of Article 56 EPC. Since none of the appellant's requests is allowable, the appeal must be dismissed.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chair:



K. Boelicke

B. Willems

Decision electronically authenticated