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**Datasheet for the decision  
of 5 March 2024**

**Case Number:** T 1397/20 - 3.5.04

**Application Number:** 11811274.7

**Publication Number:** 2659678

**IPC:** H04N7/26, H04N7/30, H04N7/50

**Language of the proceedings:** EN

**Title of invention:**  
VIDEO CODING USING MAPPED TRANSFORMS AND SCANNING MODES

**Applicant:**  
Qualcomm Incorporated

**Headword:**

**Relevant legal provisions:**  
EPC Art. 54(1)  
RPBA 2020 Art. 12(4)

**Keyword:**  
Main request and auxiliary request - novelty - (no)  
Auxiliary request - amendment to case - amendment admitted  
(yes)

**Decisions cited:**

**Catchword:**



**Beschwerdekammern**  
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Case Number: T 1397/20 - 3.5.04

**D E C I S I O N**  
**of Technical Board of Appeal 3.5.04**  
**of 5 March 2024**

**Appellant:** Qualcomm Incorporated  
(Applicant) 5775 Morehouse Drive  
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**Representative:** Loveless, Ian Mark  
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**Decision under appeal:** **Decision of the Examining Division of the  
European Patent Office posted on 13 December  
2019 refusing European patent application  
No. 11811274.7 pursuant to Article 97(2) EPC.**

**Composition of the Board:**

**Chair** B. Willems  
**Members:** F. Sanahuja  
B. Müller

## Summary of Facts and Submissions

- I. The appeal is against the examining division's decision to refuse European patent application No. 11 811 274.7.
- II. The documents cited in the decision under appeal included the following:
  - D1 X. Zhao et al., "Rate-distortion optimized transform for intra-frame coding", *2010 IEEE International Conference on Acoustics, Speech and Signal Processing*, Dallas, TX, USA, 2010, pages 1414 to 1417, 14 to 19 March 2010, XP031743031, doi: 10.1109/ICASSP.2010.5495468
- III. The application was refused on the ground that the subject-matter of claims 1 to 12 of what was then the main (and sole) request was not new (Article 54 EPC).
- IV. The applicant ("appellant") filed notice of appeal. With its statement of grounds of appeal, the appellant filed a main request and submitted that this main request was identical to the main request on which the the decision under appeal was based. The appellant also filed an auxiliary request, indicated a basis in the application as filed for the amendments therein and submitted arguments as to why, in its opinion, this request should be admitted into the appeal proceedings. Moreover, it provided arguments to support its opinion that the subject-matter of claim 1 of the main request and the auxiliary request was new and involved an inventive step.

- V. The appellant was summoned to oral proceedings. In a communication under Article 15(1) RPBA, the board gave its preliminary opinion that, *inter alia*, the subject-matter of claim 1 of both requests lacked novelty over document D1 (Article 54(1) EPC).
- VI. In its reply dated 5 February 2024, the appellant argued that document D1 did not disclose the claimed two-step approach and that starting from document D1 there would be no incentive to select a transform and scanning mode combination from a subset of transform and scanning modes, or then to apply the selected transform.
- VII. The appellant's final requests were that the decision under appeal be set aside and that a patent be granted on the basis of the claims of the main request or, alternatively, of the auxiliary request, both requests filed with the statement of grounds of appeal.
- VIII. At the end of the oral proceedings, the chair announced the board's decision.
- IX. Claim 1 of the **main request** reads as follows:
- "A method of encoding video data at an encoder comprising:
- determining a subset of transform and scanning mode combinations based on an intra-prediction mode, wherein the subset is smaller than the total number of transform and scanning mode combinations that are possible for use by the video encoder and each transform and scanning mode combination in the subset has the same scanning mode and wherein the scanning mode is selected based on the intra-prediction mode;

selecting a transform and a scanning mode combination from the subset of transform and scanning mode combinations;

applying the selected transform to residual data associated with predicting a block based on the intra-prediction mode so as to generate a two-dimensional array of transform coefficients; and

applying the selected scanning mode to the two-dimensional array of transform coefficients to generate a one-dimensional array of transform coefficients."

- X. Claim 1 of the **auxiliary request** differs from claim 1 of the main request in that the selecting step has been amended as follows (additions underlined):

"selecting a transform and a scanning mode combination from the subset of transform and scanning mode combinations, wherein the transform is selected from the subset of transform and scanning mode combinations based on the intra-prediction mode;"

### **Reasons for the Decision**

1. The appeal is admissible.
2. *The invention*

The invention relates to coding of video data, in particular to selecting a transform for the residual data of a block and a scanning mode for the resulting transform coefficients.

A subset of all possible transform and scanning mode combinations is determined on the basis of an intra-prediction mode. Each transform and scanning mode combination in the subset has the same scanning mode.

One combination of one transform and one scanning mode is then selected from the subset.

3. *Auxiliary request - admittance (Article 12(4) RPBA)*

3.1 Under Article 12(2) and (4) RPBA, a submission constitutes an amendment if it is not directed to the requests, facts, objections, arguments and evidence on which the decision under appeal was based. Any such amendment may be admitted only at the discretion of the board.

The board shall exercise its discretion in view of, *inter alia*, the complexity of the amendment, the suitability of the amendment to address the issues which led to the decision under appeal, and the need for procedural economy.

3.2 In the present case, the amendments to the auxiliary request do not substantially change the subject-matter of the proceedings. Thus, the board, exercising its discretion under Article 12(4) RPBA, has decided to admit this request into the appeal proceedings.

4. *Main request and auxiliary request - novelty (Article 54(1) EPC)*

4.1 An invention is to be considered new if it does not form part of the state of the art (Article 54(1) EPC).

- 4.2 According to the description (see paragraph [0039]), a combination of a column and a row transform matrix constitutes a separable transform.
- 4.2.1 D1 discloses a first step of determining a subset of candidate transforms for an intra-prediction mode from the set of candidate transforms defined for all intra-prediction modes (see the third paragraph in section 2.1 on page 1415, "*for each IP [intra-prediction] mode i, there are a group of [column and row] candidate transform matrices  $C_i^k$  and  $R_i^k$ , where  $k=0, 1 \dots K-1$* "). The number of transforms in the subset is less than the total number of transforms, since the transforms defined for the remaining intra-prediction modes are not included in the subset, and more than one (see the running index  $k$ , including at least indexes 0 and 1).

Each intra-prediction mode in D1 has a specific coefficient scanning order - scanning mode (see the paragraph bridging the left-hand and right-hand columns on page 1415: "*[f]urthermore, in each IP mode, we use specified coefficient scanning order obtained by off-line training for each combination of column and row candidate transform matrices*").

As the subset is determined on the basis of the intra-prediction mode and each intra-prediction mode is associated with a specific scanning mode, each transform in the subset is inherently associated with an identical scanning mode. Thus, the subset implicitly contains a number of transform and scanning mode combinations, which is smaller than the total number of transform and scanning mode combinations since the possible combinations have been limited by the intra-prediction mode.

More specifically, from the set of candidate transform matrices  $C_n^k, R_n^k$  for  $n \in \{\text{intra-prediction modes}\}$  and  $k \in \{0, 1 \dots K-1\}$ , and a set of scanning modes, each associated with an intra-prediction mode, the method of D1 determines, for an intra-prediction mode  $n=i$ , a subset of transforms  $C_i^k, R_i^k$  and the scanning mode specified for intra-prediction mode  $i$ .

- 4.2.2 A second step selects a transform from the subset (see the third paragraph in section 2.1 on page 1415: "*the optimal path, which is denoted by the red dotted line in Fig. 1(b), is selected using rate distortion optimization (RDO) criteria*").

As an aside, the rate generated by a transform may only be evaluated after scanning the transform coefficients and entropy coding the scanned transform coefficients. The person skilled in the art would regard the subset as implicitly containing more than one transform and scanning mode combinations also for this reason.

- 4.2.3 It is undisputed that document D1 implicitly discloses applying the selected transform and the scanning mode (see point 2.1 of the decision under appeal).

- 4.3 The appellant argued that document D1 did not teach selecting a transform and scanning mode from the subset. Instead, the method of D1 tested all possible transforms and selected one based on rate distortion optimisation analysis (see section 4.3, last paragraph, of the statement of grounds of appeal).

The board is not convinced by this argument and agrees with the examining division's view that determining a subset by fixing the scanning mode represented a

restriction of the possible transform/scanning combinations (see point 3.2 of the decision under appeal).

It is clear from D1 that only the transforms for a given intra-prediction mode are included in the subset, and that the optimal transform in terms of rate distortion optimisation is selected from the subset (see the third paragraph in section 2.1 on page 1415). Thus, not all of the possible transforms for all intra-prediction modes are tested.

It is also noted that since claim 1 does not specify the method for selecting a transform and scanning mode combination from the subset, the claim encompasses any selection method, including a method using RDO criteria for this purpose.

- 4.4 The appellant further submitted that document D1 did not disclose using one scanning mode for each intra-prediction mode. According to the appellant, the sentence bridging the left-hand and right-hand columns on page 1415 of document D1 (reproduced in point 4.2.1, second paragraph, above) disclosed determining a scanning mode for each combination of column and row candidate transform matrices in each intra-prediction mode. There was no need to include the phrase "for each combination of column and row candidate transform matrices" in the sentence if it was intended to use only one scanning mode for each intra-prediction mode.

This sentence was not the focus of document D1 and should not be read with hindsight. In the appellant's view, the sentence was ambiguous and therefore it could not directly and unambiguously disclose using one scanning mode for each intra-prediction mode.

In addition, as a further development of the Mode-Dependent Directional Transform (MDDT) method, which defined one combination of a column and a row transform matrix and a scanning mode adapted to the combination of transform matrices for each intra-prediction mode, the disclosure of document D1 should be read as generating a scanning order for each possible combination of column and row candidate matrices.

Furthermore, there was no need to store the scanning orders obtained by off-line training in both the encoder and the decoder because these scanning orders corresponded to predefined ones (e.g. horizontal, vertical or zigzag).

- 4.5 The board is of the opinion that, in the context of D1, the person skilled in the art would have directly and unambiguously concluded from the sentence bridging the left-hand and right-hand columns on page 1415 that the method of D1 uses only one scanning mode for each intra-prediction mode. This scanning mode is obtained by an off-line training process which considers all combinations of column and row candidate matrices for the corresponding intra-prediction mode to find the specified scanning mode.

The person skilled in the art would have recognised that the use of all possible combinations of candidate matrices within an intra-prediction mode for off-line training is necessary to obtain a scanning mode which fully takes into account the statistics of the residual coefficients generated by the different combinations of candidate matrices.

Such a specific coefficient scanning mode does not generally correspond to predefined scanning modes. Thus, if document D1 were to be read as disclosing the determination of one scanning mode for each combination of column and row candidate transform matrices, as opposed to MDDT which uses one scanning mode for each intra-prediction mode, these additional scanning modes would need to be additionally stored in both the encoder and the decoder in order to be used. Document D1 discloses that major implementation differences between MDDT and RDOT include the fact that, for the latter, additional memories are needed to store the candidate transform matrices (see point a. in section 2.4). However, it does not disclose any additional memory requirements for coefficient scanning orders. Therefore, the person skilled in the art would have taken the absence of memory requirements for scanning orders as confirmation that, as in MDDT, only one coefficient scanning order is used for each intra-prediction mode.

- 4.6 In view of the above, the board concurs with the examining division's opinion that the subject-matter of claim 1 of the main request is not new over document D1 (Article 54(1) EPC).
- 4.7 The additional feature of claim 1 of the auxiliary request that the transform is selected from the subset of transform and scanning mode combinations based on the intra-prediction mode is disclosed in document D1 (see point 4.2.1, first paragraph, and point 4.2.2, first paragraph, above, for the reasoning). Thus, the subject-matter of claim 1 of the auxiliary request is not new over document D1 either (Article 54(1) EPC).

5. *Conclusion*

Neither the main request nor the auxiliary request is allowable because the subject-matter of claim 1 thereof is not new. Since neither of the appellant's requests is allowable, the appeal is to 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