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**Datasheet for the decision
of 4 May 2021**

Case Number: T 0516/17 - 3.5.04

Application Number: 07826752.3

Publication Number: 2092749

IPC: H04N7/26, H04N7/50

Language of the proceedings: EN

Title of invention:

DISCARDABLE LOWER LAYER ADAPTATIONS IN SCALABLE VIDEO CODING

Applicant:

Nokia Technologies Oy

Headword:

Relevant legal provisions:

EPC Art. 56

Keyword:

Inventive step - (no)

Decisions cited:

Catchword:



Beschwerdekammern
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Case Number: T 0516/17 - 3.5.04

D E C I S I O N
of Technical Board of Appeal 3.5.04
of 4 May 2021

Appellant: Nokia Technologies Oy
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Decision under appeal: **Decision of the Examining Division of the
European Patent Office posted on 10 August 2016
refusing European patent application
No. 07826752.3 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chair B. Willems
Members: B. Le Guen
T. Karamanli

Summary of Facts and Submissions

- I. The appeal is against the decision to refuse European patent application No. 07 826 752.3, published as international application WO 2008/047304 A1.
- II. The documents cited in the decision under appeal included the following:
- D1: Schwarz et al., "*Constrained Inter-Layer Prediction for Single-Loop Decoding in Spatial Scalability*", IEEE International Conference on Image Processing, ICIP, Italy, volume 2, 11 September 2005, pages 870 to 873
- D4: Guo et al., "*On discardable lower layer adaptations*", Joint Video Team (JVT) of ISO/IEC MPEG & ITU-T VCEG (ISO/IEC JTC1/SC29/WG11 and ITU-T SG16 Q.6), 19th meeting, Geneva, 31 March 2006 - 7 April 2006, JVT-S039, XP030006418
- III. The decision was based on the following grounds:
- (a) The subject-matter of claims 1, 2, 4, 7 and 8 of the then main request and claims 1 to 3 of the then auxiliary request lacked inventive step (Article 56 EPC) in view of the disclosure of document D4 combined with the common general knowledge of the person skilled in the art.

(b) Claims 1 to 3 of the auxiliary request contained subject-matter which extended beyond the content of the application as filed (Article 123(2) EPC).

IV. The applicant ("appellant") filed notice of appeal. With the statement of grounds of appeal, the appellant re-filed the description, claims and drawings of the main request forming the basis of the impugned decision. It also provided arguments as to why the subject-matter of the claims of the main request was new and involved an inventive step.

The appellant requested that the decision under appeal be set aside and that a patent be granted on the basis of the claims of the main request filed on 25 April 2016 (see statement of grounds of appeal, page 2, lines 2 and 3).

V. A summons to oral proceedings was issued on 6 November 2020. In a communication under Article 15(1) of the revised Rules of Procedure of the Boards of Appeal 2020 (RPBA 2020, OJ EPO 2019, A63) annexed to the summons, the board expressed its preliminary view that the independent claims of the sole request contained subject-matter which extended beyond the content of the application as filed (Article 123(2) EPC). The board also commented *inter alia* on the question of inventive step (Article 56 EPC 1973) in view of the combined disclosures of documents D1 and D4.

VI. By letter dated 2 December 2020, the appellant requested that the oral proceedings scheduled for 4 May 2021 be held by videoconference.

VII. By letter dated 1 April 2021, the appellant filed amended claims according to a sole request replacing the previous sole request on file. The appellant provided a basis for the amendments in the application as filed as well as arguments as to why the subject-matter of claim 1 of the main request involved an inventive step over the disclosures of documents D1 and D4.

VIII. As requested by the appellant, the oral proceedings were held on 4 May 2021 by videoconference pursuant to Article 15a(1) RPBA 2020, which was applicable to the oral proceedings in this case pursuant to Article 3 of the Decision of the Administrative Council of 23 March 2021 approving an amendment to the Rules of Procedure of the Boards of Appeal (CA/D 3/21) (see OJ EPO 2021, A19).

The appellant's final request was that the decision under appeal be set aside and that a European patent be granted on the basis of the claims of the sole request filed by letter dated 1 April 2021.

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

IX. Claim 1 of the sole request reads as follows:

"A method of decoding an encoded video signal of a scalable bitstream containing an enhancement layer and a base layer, the method comprising:

decoding a slice in the enhancement layer covering regions, which in the base layer are covered by a discardable slice not needed for inter-layer prediction

and a non-discardable slice needed for inter-layer prediction;

extending a boundary of a reference block by padding sample values across the boundary outside the block, the reference block belonging to the non-discardable slice, the boundary of the reference block being with the discardable slice;

upsampling sample values of the reference block by applying filtering, wherein when applying the filtering across the reference block boundary with the discardable slice, filtering is applied at least to the padded sample values; and

decoding the slice in the enhancement layer using at least prediction with reference to the upsampled sample values of the reference block."

X. The appellant's arguments, in so far as relevant to the present decision, may be summarised as follows:

(a) The feature of claim 1 "*decoding a slice in the enhancement layer covering regions, which in the base layer are covered by a discardable slice not needed for inter-layer prediction and a non-discardable slice needed for inter-layer prediction*" (lines 3 to 5) implies that a check is carried out at the decoder to determine whether a slice in the enhancement layer covers regions, which in the base layer are covered by a discardable slice not needed for inter-layer prediction and a non-discardable slice needed for inter-layer prediction. The feature of claim 1 "*extending a boundary of a reference block by padding sample values across the boundary outside*

the block, the reference block belonging to the non-discardable slice, the boundary of the reference block being with the discardable slice" (lines 6 to 8) implies that only the boundaries between non-discardable and discardable slices are extended by padding.

(b) *"The features of the amended claim 1 differing from D1 provide the technical effect that in a case where a slice in [an] enhancement layer picture covers regions which in the base layer are covered by both discardable and non-discardable slices, the upsampling result remains predictable from a reference block within a non-discardable slice, even if the sample and residual values of the neighbouring macroblocks of discardable slices were still non-initialized. Thus, the resulting overall technical problem to be solved is how to avoid the upsampling result to become unpredictable from a reference block within a non-discardable slice even if the sample and residual values of the neighbouring macroblocks of discardable slices were still non-initialized"* (see the appellant's reply dated 1 April 2021, point 1.3, fourth and fifth paragraphs).

(c) As far as claim 1 is concerned, the objective technical problem to be solved starting from document D1 cannot be considered to be saving bandwidth, for the following two reasons:

(i) Claim 1 is directed to a decoding method; saving bandwidth is the task of the encoder, not the decoder.

- (ii) Claim 1 does not imply that the discardable slices are discarded during transmission, so the effect of saving bandwidth is not achieved.
- (d) The person skilled in the art faced with the problem of how to save bandwidth would not have combined the disclosures of documents D1 and D4 for the following two reasons:
- (i) In combining these documents, the effect of saving bandwidth would have been achieved only in the situation where the sender has knowledge of the scalable layer(s) desired for playback in the receivers.
 - (ii) The two alternatives disclosed under points 3.1 and 3.2 of document D4 require different types of macroblocks to be grouped into different slice groups. The person skilled in the art would not have integrated either of these solutions in the decoder of document D1 because it would have increased its complexity.

Reasons for the Decision

1. The appeal is admissible.
2. *Background of the invention*
 - 2.1 In the context of scalable video coding, multiple spatial resolutions of a frame can be transmitted in the bitstream. The lowest spatial resolution is called the "base layer" and the remaining layers are called

"enhancement layers". To reduce the bitstream length, some parts of an enhancement layer can be predicted from parts of a lower layer ("reference layer"), a process called "inter-layer prediction". The parts of a layer that are not needed to predict layers of higher resolutions may be identified as discardable in the bitstream. If a receiver is only interested in decoding a specific layer, the discardable parts of the lower layers can be discarded before (or during) transmission.

- 2.2 Examples of inter-layer prediction modes are inter-layer texture prediction and inter-layer residual prediction. In these modes, a block of an enhancement layer is predicted using an up-sampled version of a (texture or residual) block of a reference layer.
- 2.3 The invention addresses the case where the values of a neighbouring block within a discarded part of the reference layer are needed in the up-sampling process.
- 3. *Inventive step (Article 56 EPC 1973)*
 - 3.1 An invention is to be considered as involving an inventive step if, having regard to the state of the art, it is not obvious to a person skilled in the art (Article 56 EPC 1973).
 - 3.2 In the following, the board applies the established "problem and solution approach" to assess whether the subject-matter of claim 1 involves an inventive step (Case Law of the Boards of Appeal of the European Patent Office ("Case Law"), 9th edition 2019, I.D.2).

3.3 *Closest prior art and distinguishing features*

3.3.1 It is common ground that document D1 may be considered the closest prior art in the context of the problem and solution approach (see point 1.3 of the appellant's reply dated 1 April 2021).

3.3.2 Document D1 discloses a method of decoding an encoded video signal of a scalable bitstream containing an enhancement layer and a base layer (see the abstract and Figure 1). The method comprises the following steps:

- extending a boundary of a reference block by padding sample values across the boundary outside the block (see page 3, right-hand column, first and second paragraphs, and Figure 4, yellow, green, purple and blue samples)
- up-sampling sample values of the reference block by applying filtering (see page 3, left-hand column, lines 7 to 12)
- decoding a block in an enhancement layer using prediction with reference to the up-sampled sample values of the reference block of the reference layer (see page 3, left-hand column, lines 7 to 12)

Regarding the up-sampling step, it is implicit that the padding process disclosed on page 3, right-hand column, first and second paragraphs, is carried out to enable filtering across the reference block boundary. Filtering is thus applied to the padded sample values.

3.3.3 It is common ground that document D1 does not disclose the following features of claim 1 (see point 1.3 of the appellant's reply dated 1 April 2021):

(a) "*decoding a slice in the enhancement layer covering regions which in the base layer are covered by a discardable slice not needed for inter-layer prediction and a non-discardable slice needed for inter-layer prediction*" (claim 1, lines 3 to 5)

(b) "*the reference block belonging to the non-discardable slice, the boundary of the reference block being with the discardable slice*" (claim 1, lines 7 and 8)

(c) "*decoding the slice in the enhancement layer using at least prediction with reference to the upsampled sample values of the reference block*" (claim 1, lines 12 and 13)

3.3.4 The board has not been persuaded that claim 1 implies that (i) a check is carried out at the decoder to determine whether a slice in the enhancement layer covers regions which in the base layer are covered by a discardable slice not needed for inter-layer prediction and a non-discardable slice needed for inter-layer prediction, and (ii) only the boundaries between non-discardable and discardable slices are extended by padding (see point X.(a) *supra*). The claim does not contain any step of checking whether or not slices in the base and enhancement layers are discardable and does not exclude the possibility that boundaries between non-discardable slices are extended in the same manner as boundaries between non-discardable and discardable slices.

3.3.5 As indicated under point 3.3.2 *supra*, document D1 discloses decoding a block in an enhancement layer using prediction with reference to the up-sampled sample values of the reference block of the reference layer. In view of this and the preceding point, the board interprets the distinguishing features identified under point 3.3.3 *supra* as specifying the following situation:

- The block in the enhancement layer belongs to a decoded slice covering regions which in the base layer are covered by a discardable slice not needed for inter-layer prediction and a non-discardable slice needed for inter-layer prediction.
- Its reference block belongs to the non-discardable slice.
- The boundary to be extended is with the discardable slice.

3.4 *Objective technical problem*

3.4.1 According to the "problem and solution approach", a technical problem is defined on the basis of the technical effects achieved by the claimed invention when compared with the closest prior art (see Case Law, I.D.2).

3.4.2 Identifying the slices of the base layer not needed for inter-layer prediction as "discardable" in the bitstream allows such slices to be easily discarded along the transmission path if the receiver is not interested in reconstructing a video corresponding to the visual quality of the base layer. Discarding slices saves bandwidth.

- 3.4.3 The board does not find the appellant's arguments in point X.(c) *supra* persuasive. Saving bandwidth is not the task solely of the encoder. By being adapted for decoding the bitstream encoded by a specific encoder designed to save bandwidth, a decoder also contributes (even if indirectly) to the effect of saving bandwidth (see point X.(c)(i) *supra*). Moreover, although it is correct that claim 1 does not imply discarding slices (see point X.(c)(ii) *supra*), the board considers that merely identifying discardable slices in the bitstream contributes in itself to saving bandwidth because it allows unneeded slices to be identified and discarded along the transmission path.
- 3.4.4 The board has not been persuaded that the effect of the distinguishing features identified under point 3.3.3 *supra* is that the upsampling result remains predictable (see point X.(b) *supra*). The upsampling process disclosed in relation to Figure 4(a) of document D1 is not affected (for example, not made more "predictable") by the situation specified under point 3.3.5 *supra*. Since the upsampling process in document D1 is independent of sample values of the blocks neighbouring the reference block, it can be reproduced at the decoder irrespective of whether or not neighbouring blocks are part of a discarded slice. In that context, reference is also made to point 3.3.4 *supra*.
- 3.4.5 Therefore, the board disagrees that the objective technical problem to be solved should be formulated as "*how to avoid the upsampling result to become [sic] unpredictable from a reference block within a non-discardable slice even if the sample and residual values of the neighbouring macroblocks of discardable*

slices were still non-initialized" (see point X.(b) *supra*).

3.4.6 In view of the above, the board formulates the objective technical problem as how to save bandwidth.

3.5 *Obviousness*

3.5.1 To determine whether the claimed invention would have been obvious to the person skilled in the art starting from the closest prior art and the objective technical problem, the boards apply the "could-would approach". This means asking whether the person skilled in the art would have carried out this invention in the expectation of solving the underlying technical problem or in the expectation of some improvement or advantage (see Case Law, I.D.5).

3.5.2 Document D4 discloses a method for reducing the bit rate used for transmission when single-loop decoding is carried out (see D4, page 1, section 2). At the encoder, macroblocks are grouped into non-discardable or discardable slices according to whether or not they contain data needed for inter-layer prediction (see D4, section 3). Discardable slices not needed for reconstructing the scalable layers desired for playback in the receivers are not transmitted (see D4, page 1, section 2).

3.5.3 Document D1 relates to single-loop decoding (see its title). The person skilled in the art would thus have modified D1's disclosure according to D4's teachings in the expectation of reducing the bit rate, i.e. in the expectation of saving bandwidth.

3.5.4 In doing so, the "Current MB" illustrated in Figure 4 of document D1 - used as a reference block in the base layer for predicting a block in an enhancement layer - would have been signalled in a non-discardable slice of the base layer because it is used for inter-layer prediction (see D1, section III). Data of macroblocks neighbouring the "Current MB" would have been signalled in a non-discardable or a discardable slice of the base layer depending on whether they had been used for inter-layer prediction. Similarly, data of any of the macroblocks of the enhancement layer would have been signalled in a non-discardable or a discardable slice depending on whether they had been used for inter-layer prediction of a higher layer.

Decisions about whether data of macroblocks in a certain layer are used for the inter-layer prediction of data of a higher layer are usually taken by an encoder to meet certain rate-distortion constraints. For the same rate-distortion constraints, distributing macroblocks into discardable and non-discardable slices depends solely on the content of the video to be encoded. The situation identified under point 3.3.5 *supra*, in which a slice of an enhancement layer covers a discardable and a non-discardable slice in the base layer and a block belonging to the slice of the enhancement layer is predicted from a "Current MB" (document D1, Figure 4) having a common boundary with a block of a discardable slice, would inevitably have materialised if videos were encoded in line with the principles taught by document D4. As a matter of fact, it follows from a natural understanding of paragraphs [0002] to [0018] of the application as filed that the situations described in paragraphs [0017] and [0018] - which essentially correspond to the distinguishing features mentioned in point 3.3.3 -

necessarily arise when known solutions are combined.
This was not contested by the appellant.

- 3.5.5 Since the encoder in document D1 modified according to the teachings of document D4 would inevitably have generated a bitstream covering the situation identified under point 3.3.5 *supra*, it follows that its decoder would inevitably have decoded any such bitstream.
- 3.5.6 The board therefore takes the view that the person skilled in the art would have arrived at the distinguishing features identified under point 3.3.3 *supra* by modifying the disclosure of document D1 according to the teachings of document D4.
- 3.5.7 The board does not find the appellant's arguments under point X.(d) *supra* convincing.

The fact that bandwidth is saved when the sender has knowledge of the scalable layers desired for playback in the receivers (see point X.(d)(i)) would not have discouraged the person skilled in the art from applying document D4's solution in the expectation of saving bandwidth, rather it would have encouraged them to do so.

The argument under point X.(d)(ii) *supra* falls short simply because points 3.1 and 3.2 of document D4 specify processes which are carried at the encoder, not the decoder. In any case, the person skilled in the art would not have been deterred from implementing a prior-art method solving a technical problem merely because this method also increases complexity. The "could-would approach" mentioned under point 3.5.1 *supra* only entails asking whether the person skilled in the art would have carried out this invention "in the

*expectation of solving **the underlying technical problem** or in the expectation of **some improvement or advantage**" (emphasis added by the board).*

3.6 In view of the above, the board comes to the conclusion that the subject-matter of claim 1 of the sole request lacks inventive step in view of the combination of the disclosures of documents D1 and D4.

4. Since the appellant's sole request is not 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