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Datasheet for the decision
of 6 October 2015

Case Number: T 2015/10 - 3.5.04
Application Number: 06825695.7
Publication Number: 1949702
IPC: H04N7/26
Language of the proceedings: EN

Title of invention:
METHODS AND APPARATUS FOR WEIGHTED PREDICTION IN SCALABLE VIDEO ENCODING AND DECODING

Applicant:
Thomson Licensing

Headword:

Relevant legal provisions:
EPC 1973 Art. 56

Keyword:
Inventive step - (no)

Decisions cited:

Catchword:
Case Number: T 2015/10 - 3.5.04

DECISION
of Technical Board of Appeal 3.5.04
of 6 October 2015

Appellant: Thomson Licensing
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Decision under appeal: Decision of the Examining Division of the
European Patent Office posted on 19 May 2010
refusing European patent application
No. 06825695.7 pursuant to Article 97(2) EPC.

Composition of the Board:
Chairman C. Kunzelmann
Members: R. Gerdes
T. Karamanli
Summary of Facts and Submissions

I. The appeal is directed against the decision to refuse European patent application No. 06 825 695.7, published as international application WO 2007/047271 A2.

II. The patent application was refused by the examining division on the grounds of lack of novelty (Article 54(1) and (2) EPC) of the subject-matter of the independent claims of the main request and first auxiliary request then on file in view of document D1: YIN P ET AL: "Weighted Prediction in SVC", JOINT VIDEO TEAM (JVT) OF ISO/IEC MPEG & ITU-T VCEG (ISO/IEC JTC1/SC29/WG11 AND ITU-T SG16 Q6), 25 July 2005, pages 1 to 10, XP002399866.

Moreover, the subject-matter of claim 1 of the second auxiliary request then on file was found not to involve an inventive step (Article 56 EPC) in view of D1 and the common general knowledge.

III. The applicant appealed against this decision and submitted claims of a third auxiliary request together with its statement of grounds.

IV. The board issued summons to oral proceedings and indicated in the annex to the summons that it tended to concur with the findings in the decision under appeal. With respect to the claims of the third auxiliary request, the board indicated that inventive step in view of D1 would have to be discussed at the oral proceedings.

V. The appellant replied with a letter dated 4 September 2015 submitting claims of a new main
request and first to third auxiliary requests as well as arguments relating to clarity and inventive step.

VI. The board held oral proceedings on 6 October 2015. As announced beforehand the appellant was not represented at the oral proceedings. The chairman noted that the appellant had requested in writing 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, in the alternative, on the basis of the claims of one of the first to third auxiliary requests, all requests filed with the letter dated 4 September 2015.

VII. Claim 1 of the main request and of the first auxiliary request reads as follows:

"A method for scalable video encoding, comprising:

encoding a block in a layer of a picture which is lower than an enhancement layer of said picture by applying a weighting parameter to a lower layer reference picture,

encoding (700, 1100) a block in said enhancement layer of said picture by applying a weighting parameter to an enhancement layer reference picture, wherein the weighting parameter used to encode the block in the enhancement layer is adaptively selected from between the weighting parameter applied to the lower layer reference picture and a different weighting parameter applicable in the enhancement layer, the block in the enhancement layer corresponding to the block in the lower layer, and the enhancement layer reference picture corresponding to the lower layer reference picture,

wherein upon adaptively selecting
a) use is made of a rate distortion optimization technique to decide on the weighting parameter to be used for each inter-layer predicted macroblock and wherein the different weighting parameter is used for all other macroblocks, or

b) wherein the cost of encoding of inter-layer macroblocks with weighting parameters applied to the lower layer reference picture is compared to the costs of encoding with different parameters for inter-layer macroblocks and for non inter-layer macroblocks."

VIII. Claim 1 of the second and third auxiliary requests reads as follows:

"A method for scalable video encoding, comprising:

encoding a block in a layer of a picture which is lower than an enhancement layer of said picture by applying a weighting parameter to a lower layer reference picture,

encoding (700, 1100) a block in said enhancement layer of said picture by applying a weighting parameter to an enhancement layer reference picture, wherein the weighting parameter used to encode the block in the enhancement layer is adaptively selected from between the weighting parameter applied to the lower layer reference picture and a different weighting parameter applicable in the enhancement layer, the block in the enhancement layer corresponding to the block in the lower layer, and the enhancement layer reference picture corresponding to the lower layer reference picture;
wherein adaptive selection of weighting parameters used to encode the block in the enhancement layer is determined by a slice header field which can have one of three values,

a first value indicating that said enhancement layer does not inherit weighting parameters from said layer of a picture which is lower than an enhancement layer and weighting parameters applicable in the enhancement layer are always used for all macroblocks;

a second value indicating that macroblocks in said enhancement layer inherit weighting parameters from said layer of a picture which is lower than an enhancement layer; and

a third value indicating that weighting parameters used to encode the block in the enhancement layer are selected based on macroblock type, wherein inter-layer predicted macroblocks in said enhancement layer use said weighting parameters applied to the lower layer reference picture and all other macroblocks in said enhancement layer use weighting parameters applicable in the enhancement layer."

IX. In the decision under appeal, the examining division held that D1 disclosed the subject-matter of claim 1 of the main request and the first auxiliary request then on file. D1 suggested to re-use the base layer weighting parameters for the enhancement layer if the corresponding base layer existed and to keep the flexibility to use different weighting parameters for the enhancement layer. It also dealt with adaptively re-using the base layer weighting parameters when encoding a block in the enhancement layer (see Reasons 8.). The division also stated that the subject-
matter of the dependent claims was not new or did not involve an inventive step in view of the arguments given in the communication issued 13 November 2008. In that communication, the examining division argued with reference to D1, abstract and page 1, paragraph 1 as well as page 2, paragraph 2 that setting the base_pred_weight_table flag to indicate weighting parameters for inter-layer coded and not inter-layer coded blocks was implicitly disclosed by D1, where the SVC standard, that used similar techniques for inter-layer residual prediction, was mentioned. The additional feature of claim 5, wherein the encoding method added a rephrased base_pred_weight_table_flag capable of assuming one of three values, was anticipated by D1.

With respect to the then second auxiliary request, the examining division found that claim 1 of that request was distinguished from D1 by the two features relating to the use of either a rate distortion technique or the cost of encoding to adaptively select from between the weighting parameters applied to the enhancement or base layer. The technical problem was how to determine weights in the coding method proposed by D1. The use of rate distortion optimisation had been well known in the art and also had been used in the reference software of the SVC standard video codec. In addition, a trade-off between memory, complexity and coding efficiency had been suggested in D1. Hence, the subject-matter of claim 1 was obvious from D1.

X. The appellant's arguments, as far as they are relevant for the present decision, may be summarised as follows:

In the statement of grounds the appellant argued with respect to claim 1 of the then second auxiliary request
(essentially corresponding to claim 1 of the present main request and the first auxiliary request) that D1 did not give any hint how to implement a decision as to which weighting parameters to take. Starting from D1, the technical problem could be formulated as "[i]f document D1 is interpreted in the manner as done by the Examining Division, what can one further do?" (see statement of grounds, section V).

With respect to the subject-matter of claim 1 of the third auxiliary request filed with the statement of grounds (essentially corresponding to claim 1 of the present second and third auxiliary requests), the appellant argued that D1 did not disclose weighted prediction in SVC at the macroblock level. It was also silent with regard to selectivity for inter-layer prediction, use of three values for the slice header field to enable selectivity and determination of whether a lower layer's weighting parameter was used for weighted prediction in an enhancement layer by use of the macroblock type. Even if one followed the interpretation of the examining division, one would have to admit that the subject-matter of claim 1 was at least novel. The technical problem of that subject-matter was to provide an encoding apparatus for weighted prediction in scalable video coding so as to improve coding performance without additional syntax, especially for localised intensity variations. By providing the adaptive selection of weighting parameters, the invention could provide better coding efficiency for cases of localised intensity changes (see statement of grounds, section VI).

In its letter of reply to the summons to oral proceedings dated 4 September 2015, point 3.3, the appellant cited the following document:

D4 referred to the "SVC reference software JSVM [3]", wherein the encoder determines whether to use inter-layer prediction or not "based on the well-known rate distortion optimization (RDO) technique [4]." This wording was similar to the finding of the examining division in the decision under appeal. However, reference document [3] was published after the priority date of the present application. Therefore, the argumentation of the examining division was not well-grounded. In addition, according to D4, the RDO technique was used for making the binary decision "whether to use inter-layer prediction or not". In contrast to that, according to claim 1 of the main and first auxiliary requests, RDO was used "to decide on the weighting parameters for each inter-layer predicted macroblock".

With respect to claim 1 of the second and third auxiliary requests, the appellant argued in its letter of reply to the summons that D1 only provided two values for the base_pred_weight_table_flag. It was silent as to what weighting parameters to use when the flag was equal to 0. The provision of three different values for the flag was especially useful when the base layer did not use weighted prediction but the enhancement layer did, and the sequence included local intensity variations.
Reasons for the Decision

1. The appeal is admissible.

Main request and first auxiliary request

2. It is common ground that D1 may be considered as the closest prior art with respect to the subject-matter of claim 1 of the main request and of the first auxiliary request.

2.1 D1 relates to weighted prediction in scalable video coding. It discloses a method for scalable video encoding, comprising the steps of encoding a block in a base layer of a picture by applying base layer weighting parameters to the base layer reference picture (see D1, abstract). An enhancement layer block of the picture is also encoded by applying weighting parameters (see introduction, first sentence), wherein the weighting parameters used to encode the enhancement layer block are adaptively selected from between the weighting parameters applied to the corresponding base layer reference picture and different weighting parameters applicable in the enhancement layer (see chapter 2, second and third paragraphs, and chapter 4).

2.2 D1 does not disclose the following steps of the method of claim 1:

(a) to use a rate distortion optimisation technique to decide on the weighting parameters to be used for each inter-layer predicted macroblock and to use different weighting parameters for all other macroblocks, or
(b) to compare the cost of encoding of inter-layer macroblocks with lower/base layer weighting parameters with the costs of encoding with different parameters for inter-layer macroblocks and for non inter-layer macroblocks.

2.3 Distinguishing feature (a) provides the technical effect that weighting parameters are chosen from those available for the base and enhancement layer such that rate distortion is optimised. Similarly, distinguishing feature (b) provides the effect of optimising the cost of encoding. Therefore, the technical problem can be regarded as how to determine weights in the coding method proposed by D1.

2.4 The board agrees with the arguments of the examining division (see point IX above) that the use of rate distortion optimisation was well known in the art. Similarly, the cost of encoding was a well-known criterion. In addition, a trade-off between memory, complexity and coding efficiency had been suggested in D1. Hence, the subject-matter of claim 1 was obvious from D1.

2.5 The appellant referred to D4 to show that the examining division's reasoning was not well-grounded. D4 states: "In the SVC reference software JSVM [3], the encoder determines whether to use inter-layer prediction or not with an algorithm based on the well-known rate distortion optimization (RDO) technique [4]." It is correct that D4 and the referenced document [3] were published after the priority date of the present application. However, this fact does not allow the conclusion to be drawn that the SVC reference software JSVM did not use RDO before the priority date of the present application. If anything follows from the cited
passage of D4, then it is the fact that RDO was employed for video compression before the priority date, because referenced document [4] is entitled "Rate-Distortion Optimization for Video Compression" and was published before that date.

In addition, the appellant argued that, according to D4, the RDO technique was used for making the binary decision "whether to use inter-layer prediction or not". In contrast to that, according to claim 1 of the main and first auxiliary requests, RDO was used "to decide on the weighting parameters for each inter-layer predicted macroblock". However, in both cases the RDO criterion was employed to optimise video transmission parameters.

The appellant also argued that the technical problem should be formulated as "[i]f document D1 is interpreted in the manner as done by the Examining Division, what can one further do?" (see point X above). The board cannot accept this formulation, since it is unspecific for the present case. Hence, the problem is not based on the technical effect of exactly those features distinguishing the claim from the prior art (see Case Law of the Boards of Appeal of the European Patent Office, 7th edition, 2013, section I.D. 4.3)

In conclusion, the appellant's arguments did not convince the board.

2.6 As a result, the subject-matter of claim 1 of the main request and the first auxiliary request was obvious to a person skilled in the art in view of D1 and common general knowledge. Hence, it lacks an inventive step (Article 56 EPC 1973).
Second and third auxiliary requests

3. Claim 1 according to the second and third auxiliary requests does not specify the above criteria (a) and (b) to decide on the weighting parameters. Instead, it defines different selections of applicable enhancement layer weighting parameters and how these are indicated by a three-valued slice header field:

(c) a first value [of the slice header field] indicating that said enhancement layer does not inherit weighting parameters from said [base] layer of a picture which is lower than an enhancement layer and weighting parameters applicable in the enhancement layer are always used for all macroblocks;

(d) a second value indicating that macroblocks in said enhancement layer inherit weighting parameters from said layer of a picture which is lower than an enhancement layer; and

(e) a third value indicating that weighting parameters used to encode the block in the enhancement layer are selected based on macroblock type, wherein inter-layer predicted macroblocks in said enhancement layer use said weighting parameters applied to the lower layer reference picture and all other macroblocks in said enhancement layer use weighting parameters applicable in the enhancement layer.

3.1 Feature (d) specifying the use of base layer weighting parameters in the enhancement layer is disclosed in D1 (see third paragraph of chapter 2, base_pred_weight_table_flag equal to 1). However, D1 does not disclose which weighting parameters are
applied to the enhancement layer if the binary slice header field base_pred_weight_table_flag is equal to 0. Hence, features (c) and (e) as well as the use of a three-valued slice header field to indicate the selection of weighting parameters were not disclosed in D1.

3.2 In the decision under appeal, the examining division referred to the dependent claims of the requests underlying the decision under appeal, those dependent claims containing features corresponding to features (c) and (e). The examining division stated that the subject-matter of the dependent claims was not new or did not involve an inventive step in view of the arguments given in the communication issued on 13 November 2008. In that communication, the examining division argued with reference to D1, abstract and page 1, paragraph 1 as well as page 2, paragraph 2 that setting the base_pred_weight_table flag to indicate weighting parameters for inter-layer coded and not inter-layer coded blocks was implicitly disclosed by D1, where the SVC standard, that used similar techniques for inter-layer residual prediction, was mentioned. It also addressed claims 5 and 6, which specified that the rephrased base_pred_weight_table_flag was capable of assuming one of three values and that it indicated different weighting parameters for use in the enhancement layer. Hence, the examining division considered the subject-matter of the dependent claims underlying the decision under appeal to lack at least inventive step in view of D1 and the common general knowledge.

In its statement of grounds, point VI, and its letter dated 4 September 2015, point 5.3, the appellant provided arguments in support of novelty. It also
formulated the technical problem solved by the alleged invention, and specified a technical effect achieved by the claimed subject-matter.

However, the board sees no reason why the board should deviate from the examining division's assessment of inventive step, in particular why the division's evaluation of the distinguishing features in view of the common general knowledge was wrong (Article 56 EPC 1973), and the appellant did not provide arguments in this respect. For these reasons alone, the board concludes that the decision under appeal with respect to the subject-matter of claim 1 of the second and third auxiliary requests should not be overturned.

3.3 In addition, the board notes the following with respect to these distinguishing features. The redefinition of a flag to represent three optional values instead of two is a common measure in video coding. This measure has apparent advantages and disadvantages, such as the ability to signal additional encoder modes versus the need for a modification of the standard and the need to reserve an additional bit for this flag, which are well known to the skilled person. With respect to feature (c), it is noted that D1 (see abstract) disclosed that the enhancement layer could have a weighting table containing different parameters from the base layer. It is obvious to provide an indication that this table is selected as an alternative to the base layer weighting table. The skilled person would have considered providing such indication in the same way as for the base layer weighting table, i.e. by using the corresponding flag in the slice header. Similarly, feature (e) is regarded as obvious for the skilled person (see application itself, page 19, lines 3 to 7 and D1, chapter 1, first paragraph and the
reasoning of the examining division in the
communication dated 16 December 2009, point 5).

3.4 As set out above, the appellant's arguments essentially
concern the novelty of the claimed subject-matter,
which is not disputed. Additionally, the appellant
identified as a relevant technical effect that - by
providing the adaptive selection of weighting
parameters - the invention could provide better coding
efficiency for cases of localised intensity changes
(see statement of grounds, section VI and letter dated
4 September 2015, point 5.3). However, according to the
application as filed (see page 11, lines 10 to 13 und
page 26, lines 26 to 29), this effect is achieved by
the provision of an adaptive selection of weighting
parameters which feature is disclosed in D1.

3.5 As a result, the board finds that the subject-matter of
claim 1 according to the second and third auxiliary
requests lacks an inventive step (Article 56 EPC 1973).

Conclusion

4. It follows from the above that none of the appellant's
requests is allowable.
Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

K. Boelicke C. Kunzelmann

Decision electronically authenticated