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Datasheet for the decision of 10 January 2018

Case Number: T 1035/12 - 3.5.04

Application Number: 08153435.6

Publication Number: 1959689

IPC: H04N7/26, H04N7/50

Language of the proceedings: EN

Title of invention:
Image encoding and decoding apparatus and method

Applicant:
Samsung Electronics Co., Ltd.

Headword:

Relevant legal provisions:
EPC Art. 54(1), 54(2), 84, 87(1), 88

Keyword:
Claims - clarity - main request (no)
Priority - identity of invention - auxiliary request (no)
Novelty - auxiliary request (no)

Decisions cited:
G 0002/98, G 0001/15

Catchword:

Europäisches Patentamt
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Beschwerdekammern

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Case Number: T 1035/12 - 3.5.04

D E C I S I O N
of Technical Board of Appeal 3.5.04
of 10 January 2018

Appellant: (Applicant)	Samsung Electronics Co., Ltd. 129, Samsung-ro Yeongtong-gu Suwon-si, Gyeonggi-do, 443-742 (KR)
Representative:	Portch, Daniel Elkington and Fife LLP Prospect House 8 Pembroke Road Sevenoaks, Kent TN13 1XR (GB)
Decision under appeal:	**Decision of the Examining Division of the European Patent Office posted on 13 December 2011 refusing European patent application No. 08153435.6 pursuant to Article 97(2) EPC**

Composition of the Board:

Chairman	M. Paci
Members:	R. Gerdes
	G. Decker

Summary of Facts and Submissions

I. The appeal is directed against the decision to refuse European patent application No. 08 153 435.6, published as European patent application EP 1 959 689 A2. The present application was filed as a divisional application of the earlier application No. 04 254 280.3, filed on 16 July 2004, and claims priority from the Korean applications 10-2003-0049129 (henceforth P1) of 18 July 2003 and 10-2004-0054472 (henceforth P2) of 13 July 2004.

II. The decision under appeal referred *inter alia* to the following documents:

D4: Kim W.-S. et al.: "Proposal for the unsolved issues in Professional Extensions", ITU Study Group 16 - Video Coding Experts Group -ISO/IEC MPEG & ITU-T VCEG (ISO/IEC JTC1/SC29/WG11 and ITU-T SG16 Q.6), PExt Ad Hoc Group Meeting, Trondheim, Norway, 22 to 24 July 2003, No. JVT-I012r2, 22 July 2003, pages 1 to 11, XP002640127;

D5: Kim W.-S. et al.: "Proposal for the unsolved issues in Professional Extensions II", ITU Study Group 16 - Video Coding Experts Group -ISO/IEC MPEG & ITU-T VCEG (ISO/IEC JTC1/SC29/WG11 and ITU-T SG16 Q.6), PExt Ad Hoc Group Meeting, Trondheim, Norway, 22 to 24 July 2003, No. JVT-I012r3, 22 July 2003, pages 1 to 8, XP030005749;

D6: Wiegand T.; Sullivan G.: "Draft ITU-T Recommendation and Final Draft International Standard of Joint Video Specification (ITU-T Rec. H.264 | ISO/IEC 14496-10 AVC)", ITU Study Group 16 - Video Coding Experts Group - ISO/IEC MPEG & ITU-T VCEG (ISO/IEC

JTC1/SC29/WG11 and ITU-T SG16 Q.6), 7th Meeting, Pattaya, Thailand, 7 to 14 March 2003, No. JVT-G050, 14 March 2003, pages 1 and 95 to 133, XP002328607.

III. The patent application was refused by the examining division on the grounds that claim 1 of the sole request underlying the decision under appeal was not novel under Article 54(1) and (2) EPC over the disclosure of document D4, with document D6 being incorporated by reference into document D4. D4 was comprised in the state of the art under Article 54(2) EPC because claim 1 did not validly claim priority from P1. Moreover, in a section entitled "Further Observations" appended to the decision under appeal the examining division stated *inter alia* that the subject-matter of claim 1 lacked novelty over the disclosure of D5 for essentially the same reasons as over the disclosure of D4.

IV. The applicant appealed against this decision and with the statement of grounds of appeal submitted amended claims 1 to 5 of a main request replacing all claims underlying the decision under appeal.

V. The board issued a summons to oral proceedings together with a communication. In the communication it indicated *inter alia* that it considered claim 1 to lack clarity. It also expressed the opinion that the subject-matter of claim 1 was only entitled to the priority of P2 and that it considered the examining division's arguments of lack of novelty in view of D5 to be essentially correct.

VI. With a letter of reply dated 8 December 2017 the appellant submitted amended claims according to first and second auxiliary requests.

VII. Oral proceedings were held before the board on 10 January 2018. The appellant withdrew the second auxiliary request and finally requested that the decision under appeal be set aside and that a patent be granted on the basis of the claims according to the main request filed with the statement of grounds of appeal or according to the first auxiliary request filed with the letter dated 8 December 2017.

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

"An image decoding method comprising:

determining whether a pixel value of the block of interest has been encoded in an intra mode, an inter mode, or a weighted prediction mode;

if determined that the pixel value of the block of interest has been encoded in the intra mode, restoring a predicted pixel value of the block of interest using a block spatially adjacent to the block of interest among blocks included in the restored current image; and

if determined that the pixel value of the block of interest has been encoded in the weighted prediction mode, adjusting at least one weight value, and restoring the predicted pixel value of the block of interest using the adjusted weight value and blocks included in the restored previous image,

and characterized by the step of:

if determined that the pixel value of the block of interest has been encoded in the inter mode, restoring

the predicted pixel value of the block of interest using the block of interest and blocks included in the restored previous image,

and in that said weight value is adjusted adaptively to a number of bits expressing each pixel of a current image, wherein said weight value is adjusted using the following equation:

$$W' = W \cdot 2^{(N-M)}$$

where W is a weight value before the adjustment, W' is a weight value after the adjustment, N is the number or [sic] bits expressing each pixel of a current image, and M is 8."

IX. Claim 1 of the first auxiliary request corresponds to claim 1 of the main request with the following underlined amendments to the second feature starting with "if determined ..." in claim 1 of the main request:

"if determined that the pixel value of the block of interest has been encoded in the weighted prediction mode, adjusting at least one weight value which is multiplied by or added to a pixel value of blocks included in a restored previous image, and restoring the predicted pixel value of the block of interest using the adjusted weight value and blocks included in the restored previous image, ...".

X. According to the decision under appeal the earliest priority document P1 disclosed "that a particular scaling factor is applied both to the multiplication weight value W_i and to the additive weight value O_i." It did not disclose "that the multiplication weight

value W_i could be scaled independently from the additive weight value O_i" (see decision under appeal, Reasons, point 2.1; emphasis in original).

Since the priority claimed from P1 was invalid, document D4 formed part of the state of the art under Article 54(2) EPC and fully anticipated the subject-matter of claim 1. The disclosure of D4 had to be understood in the context of D6, pages 124 to 126, paragraph 8.4.2.3.2, which was referenced by D4. The same argument applied to D5, instead of D4 (see decision under appeal, Reasons, point 3, and "Further Observations", point 6).

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

Claim 1 of the main request was clear. It had to be interpreted in the context of the entire set of claims, which included claim 4 specifying adjusted multiplicative weight values and adjusted additive weight values. Since claim 4 depended ultimately on claim 1, it would be understood that the equation for W had to cover the possibility that W was an additive weight. The letter "W" was a natural abbreviation for the word "weight", whose initial letter was "W". A claim should be construed such that it covered all embodiments of the description. In the present case this implied that claim 1 should be construed as covering the embodiment of equation (4) of the application, which only adjusted the additive weight values O_i. It also followed from paragraph [0078] of the application as published that the symbol W without an index comprised all multiplicative and additive weight values W_1, W_2, O_1 and O_2.

Claim 1 of the first auxiliary request was modified to clarify that the equation in claim 1 applied to either the multiplicative weight values or the additive weight values (see letter of reply dated 8 December 2017, page 4, section on the first auxiliary request). The claimed subject-matter was entitled to the priority of P1. P1 should not be construed as limited to multiplying **both** the multiplicative and additive weight values by a factor. The skilled person would have derived from P1 that it was possible to adjust either the multiplicative weight values or the additive weight values, or both. The multiple occurrences of the term "a weight value" in P1 implied that a single weight value or "at least one weight value" should be adjusted (see the claims of P1 and page 4, line 13; page 6, line 12; page 9, line 19; page 11, lines 11 and 12; page 12, line 22; page 16, lines 10 and 11; and page 17, line 19). In addition, P1 disclosed in multiple passages that multiplicative or additive weight values, or both, may be used (see the word "or" on page 3, lines 10 to 12; page 12, lines 2 and 3 and 14; page 14, line 7; and page 15, line 16). Although P1 used the term "a weight value" instead of "at least one weight value", both terms had the same meaning, and thus the wording of claim 1 had explicit support in P1. Hence, the subject-matter of claim 1 was entitled to the priority of P1.

The appellant did not provide arguments in the appeal proceedings with regard to novelty over D5, except that D5 was not prior art under Article 54(2) EPC because the priority P1 was valid.

Reasons for the Decision

1. The appeal is admissible.

The invention

2. The invention concerns weighted prediction encoding and decoding of a video sequence. In weighted prediction, multiplicative weighting factors W_i and/or additive weighting factors (offsets) O_i are applied to pixels in motion-compensated reference pictures in order to predict the corresponding pixels in the prediction image. Weighted prediction is known to provide excellent compression efficiency when applied to a region where images gradually become dark or bright or to a region in which two scenes overlap when one scene is replaced by another. This prediction mode has been incorporated into the H.264/MPEG-4 Part 10/AVC standard (see D6 and paragraph [0002] of the present application as published).

In the conventional image encoding and decoding method (main profile of the H.264 standard) images are encoded with 8 bits per pixel. However, for high-resolution imaging (extended profile) 10 or 12 bits per pixel are required. The present application proposes scaling the weighting factors of the weighted prediction mode accordingly, i.e. multiplying the weights by a corresponding number of bits, for example according to the equation:

$$W' = W \cdot 2^{N-8}$$

with N being the number of bits per pixel and W and W' being the weight before and after the adjustment,

respectively. The present application discloses embodiments in which all multiplicative and additive weights are adjusted:

$$W_1'=W_1 \cdot 2^{(N-M)}$$
$$W_2'=W_2 \cdot 2^{(N-M)} \qquad \text{equation (3)}$$
$$O_1'=O_1 \cdot 2^{(N-M)}$$
$$O_2'=O_2 \cdot 2^{(N-M)}$$

or only the additive weights, the multiplicative weights remaining unchanged:

$$W_1'=W_1$$
$$W_2'=W_2 \qquad \text{equation (4)}$$
$$O_1'=O_1 \cdot 2^{(N-M)}$$
$$O_2'=O_2 \cdot 2^{(N-M)}$$

(see also paragraphs [0005] to [0007], [0037] and [0041] of the application as published).

Main request, clarity, Article 84 EPC

3. According to Article 84 EPC, the claims must define the matter for which protection is sought, and they must be clear and concise and be supported by the description.

3.1 According to established case law it follows from the requirement of legal certainty that a claim cannot be considered clear within the meaning of Article 84 EPC if it comprises an unclear technical feature for which no unequivocal generally accepted meaning exists in the relevant art. This applies all the more if the unclear feature is essential for delimiting the subject-matter claimed from the prior art (see Case Law of the Boards of Appeal of the European Patent Office, 8th edition 2016, section II.A.3.1).

3.2 Claim 1 refers to "at least one weight value" which is "adjusted adaptively to a number of bits" using the equation $W' = W \cdot 2^{(N-M)}$.

3.3 On the one hand, according to the description of the application, pixel values are multiplied by at least one adjusted weight value W_i, and other adjusted weight values O_i are added to the products (see paragraphs [0040], [0071] and [0078] and claim 5 of the application as published). Hence, it appears that the weight values referred to in claim 1 comprise values W_1, W_2, O_1 and O_2.

On the other hand, the mathematical terminology of the application seems to imply that the generalised symbol W in the equation $W' = W \cdot 2^{(N-M)}$ relates only to the multiplicative weights W_i. It is therefore unclear whether the equation $W' = W \cdot 2^{(N-M)}$ in claim 1 should be construed as applying only to the weight values W_i or also to the offset values O_i. It is also noted that the symbol W has no generally recognised meaning in the technical field.

It follows that it is unclear whether the subject-matter of claim 1 covers the embodiment of equation (4) (see point 2 *supra*) and claim 11 of the application as published.

3.4 The appellant argued that the skilled person would understand the expression "at least one weight value" in claim 1 as referring to the multiplicative weight values W_i or to the additive weight values O_i or to both. Claim 1 had to be interpreted in the context of the entire set of claims, which included present

claim 4, in which both multiplicative weight values and additive weight values are adjusted.

The board does not find this argument persuasive for the following reasons:

Claim 4 specifies that "the predicted pixel value ... is restored by multiplying pixel values ... by the adjusted weight values and adding other adjusted weight values to a result of the multiplication." Formally, this implies that "the adjusted weight values" are weights used for "multiplying pixel values". According to claim 4 other weight values are also adjusted and added to a result of the multiplication, but these are not necessarily adjusted using the above equation $W' = W \cdot 2^{(N-M)}$. Moreover, an independent claim should be clear in itself, since a dependent claim can be deleted in further proceedings.

The appellant also argued that the letter "W" was a natural abbreviation for the word "weight", whose initial letter was "W", thereby applying to both the multiplicative weight values W_i and the additive weight values O_i.

The board, however, regards it as more natural to construe W as referring to the multiplicative weights W_i only.

The appellant also referred to paragraph [0078] of the application as published, which refers to the "weight values, W, W_1, W_2, O_1 and O_2". It inferred from that passage that "W" comprised all multiplicative and additive weight values W_1, W_2, O_1 and O_2.

The board is not convinced that that passage provides an unambiguous definition of the symbol W. Moreover, it is established jurisprudence of the boards of appeal that the claims should be clear in themselves, without there being any need for the skilled person to refer to the description (see Case Law of the Boards of Appeal of the European Patent Office, 8th edition 2016, section II.A.6.3.5).

For this last reason too, in the context of clarity the board cannot concur with the appellant's argument that a claim should be construed such that it covers all embodiments of the description.

3.5 It follows from the above that claim 1 of the appellant's main request does not meet the requirement of clarity of Article 84 EPC.

First auxiliary request, clarity, Article 84 EPC

4. Claim 1 of the first auxiliary request differs from claim 1 of the main request by the following amendments relating to the adjustment of the weight values (amendments underlined):

"adjusting at least one weight value <u>which is multiplied by or added to a pixel value of blocks included in a restored previous image</u>, ...
... and in that said weight value is adjusted adaptively to a number of bits expressing each pixel of a current image, wherein said weight value is adjusted using the following equation:

$W' = W \cdot 2^{(N-M)}$ ...".

4.1 The appellant argued during the oral proceedings that the above amendments clarified that the "at least one weight value" which is adjusted according to the above equation may be a multiplicative weight value, an additive weight value, or both (see also letter of reply dated 8 December 2017, page 4, section on the first auxiliary request).

4.2 The board agrees with that interpretation of claim 1. The clarified wording in claim 1 thus encompasses all embodiments in which at least one weight value, be it multiplicative or additive, is adjusted according to the equation $W' = W \cdot 2^{(N-M)}$. In particular, it encompasses the embodiments of equations (3) and (4) (see point 2 above and paragraph [0041] and claims 6 and 7 of the application as published).

First auxiliary request, validity of the priority, Article 87 EPC

5. The appellant has not disputed that document D5 was made available to the public before the filing date of P2, but after the filing date of P1. Hence, whether document D5 belongs to the state of the art under Article 54(2) EPC depends on whether the priority from P1 is valid for the subject-matter of claim 1.

5.1 According to Article 87(1) EPC "[a]ny person who has duly filed ... an application for a patent ... shall enjoy, for the purpose of filing a European patent application in respect of the same invention, a right of priority ...".

The requirement for claiming priority of "the same invention", referred to in Article 87(1) EPC, means that priority of a previous application in respect of a

claim in a European patent application in accordance with Article 88 EPC is to be acknowledged only if the skilled person can derive the subject-matter of the claim directly and unambiguously, using common general knowledge, from the previous application as a whole (see Enlarged Board of Appeal decision G 2/98, OJ 2001, 413, headnote, confirmed in G 1/15, Reasons 6.2).

Hence, in order to decide whether claim 1 of the first auxiliary request relates to the same invention as the previous application P1, the board must examine whether the subject-matter of claim 1 - as construed by the board (see point 4.2) - can be derived using the above criterion from the previous application as a whole.

Priority - disclosure of P1

5.2 P1 discloses the embodiment of equation (3) of the present application for the specific case of M = 8 bits (see equation (4) of P1), i.e. multiplying the values of all weights by the factor 2^{N-8}. However, in contrast to the present application, P1 does not disclose the embodiment of equation (4) of the present application. In all passages referring to the adjustment of weights, P1 specifies that multiplicative and additive weights are adjusted to the adequate number of bits (see, for example, page 5, lines 17 to 21; page 7, lines 13 to 17; page 8, line 19, to page 9, line 5; page 10, lines 2 to 21; page 11, lines 8 to 13; page 13, lines 19 to 21; and page 14, line 2).

In particular, in the section entitled "Structure and Operation of the Invention" (starting on page 4), it is stated with regard to the invention in general that "[t]he number of bits per pixel adapting unit may set a reference number of bits per pixel, and **may multiply**

the multiplication and addition weight values, which are generated by the implicitly-defined and explicitly-defined weight value generation units, **by a value of an exponentiation of 2**, wherein the value is obtained by subtracting a number of bits per pixel of a current image from the reference number of bits per pixel." (see page 5, lines 17 to 21, and with identical wording page 7, lines 13 to 17; emphasis added by the board). Similar wording is employed on page 11, lines 8 to 13, to describe the invention in general.

P1 discloses as a further example that the particular weight values W1 = W2 = 32 and O1 = O2 = 0 may be used (see page 13, lines 9 to 14). This example illustrates that some weighting factors may be equal to zero, which is in compliance with the H.264 standard (see, for example, D6, equations (8-222) and (8-223) on page 125). It is implicit for the skilled person that weight values equal to zero need not be shifted. Hence, the skilled person would understand from the disclosure of P1 that all non-zero weights should be adjusted according to the number of bits per pixel.

5.3 The appellant argued that P1 implicitly disclosed the generic wording of claim 1 because the multiple occurrences of the term "a weight value" in P1 implied that "at least one weight value" should be adjusted (see the claims of P1 and page 4, line 13; page 6, line 12; page 9, line 19; page 11, lines 11 and 12; page 12, line 22; page 16, lines 10 and 11; and page 17, line 19).

The board acknowledges that there are multiple passages in P1 referring to "a weight value". It further acknowledges that P1 mentions generally in several passages that multiplicative **or** additive weight values

(such as in the example disclosing the particular weight values W1 = W2 = 32 and O1 = O2 = 0) may be used, which is also well known from the H.264 standard as disclosed in D6. However, there is no indication that the disclosure of P1 extends to embodiments in which only some of the non-zero weights are multiplied by the factor 2^{N-8}. In contrast, as set out above, in all passages relating to the adjustment of specific weights, P1 consistently discloses that multiplication **and** addition weight values are multiplied by "a value of an exponentiation of 2".

Priority - conclusion

5.4 It follows that the subject-matter of claim 1 of the first auxiliary request differs from the disclosure of P1 in that the claimed subject-matter has been generalised to include embodiments in which some non-zero weights are adjusted to the number of bits per pixel and others are not.

5.5 As a consequence, the above requirement for claiming priority of "the same invention" (see point 5.1 above) is not fulfilled to the extent that the subject-matter of claim 1 of the first auxiliary request encompasses embodiments according to which only some of the non-zero weights are multiplied by the factor 2^{N-8}, because the skilled person cannot derive that subject-matter directly and unambiguously, using common general knowledge, from P1 as a whole.

First auxiliary request, novelty, Article 54(1) and (2) EPC

6. D5 is an input document of the appellant to the Joint Video Team and relates to extensions of the H.264 standard *inter alia* for extended pixel bit depth. It

has not been disputed that D5 was available to the public before the filing date of the later priority document P2. Hence, D5 is prior art under Article 54(2) EPC for subject-matter which is not disclosed in P1.

6.1 The authors of D5 refer specifically to the H.264 standard (see D6), section 8.4.2.3.2 on weighted prediction, which is therefore considered to be incorporated by reference into D5. The features of the preamble of claim 1, except for the step of "adjusting at least one weight value", are disclosed in the standard. Also, the first feature of the characterising portion of claim 1 ("if determined that the pixel value of the block of interest has been encoded in the inter mode, restoring the predicted pixel value of the block of interest using the block of interest and blocks included in the restored previous image,") is disclosed in D6. In particular, D6 discloses a decoding method for intra, inter and weighted prediction encoded image data (see for example the reference to P and B slices under equation (8-229)), spatial restoration in intra mode (chapter 8.3) and the conventional inter and weighted prediction modes (see chapter 8.4.2).

As an extension of the weighted prediction defined in that standard, the authors of D5 propose adjusting the additive weight values (o_0, o_1) to the pixel bit depth by multiplying them by 2^{N-8}, while the multiplicative weight values w_0 and w_1 remain the same regardless of the pixel bit depth (see section 2.5), which corresponds to the embodiment of equation (4) of the present application for the specific case of M=8 (see point 2 above).

6.2 Hence, D5 discloses all features of claim 1 of the first auxiliary request. The appellant has not provided counter-arguments against this finding. The subject-matter of claim 1 is therefore not novel over D5.

Conclusion

7. It follows that neither the appellant's main request nor its first auxiliary request is allowable.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

K. Boelicke M. Paci

Decision electronically authenticated