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Datasheet for the decision
of 17 December 2013

Case Number: T 1569/09 - 3.5.04

Application Number: 96309546.8

Publication Number: 785688

IPC: H04N7/26

Language of the proceedings: EN

Title of invention:
Hierarchical encoding of videosignals

Applicant:
Sony Corporation

Headword:

Relevant legal provisions:
EPC 1973 Art. 56, 111(1), 111(2)

Keyword:
Inventive step - after amendment
Remittal to the department of first instance

Decisions cited:
G 0010/93

Catchword:

Case Number: **T 1569/09 - 3.5.04**

D E C I S I O N
of Technical Board of Appeal 3.5.04
of 17 December 2013

Appellant: (Applicant)	Sony Corporation 1-7-1 Konan Minato-ku Tokyo 108-0075 (JP)
Representative:	Turner, James Arthur D Young & Co LLP 120 Holborn London EC1N 2DY (GB)
Decision under appeal:	Decision of the Examining Division of the European Patent Office posted on 23 January 2009 refusing European patent application No. 96309546.8 pursuant to Article 97(2) EPC.

Composition of the Board:

Chairman:	F. Edlinger
Members:	C. Kunzelmann
	T. Karamanli

Summary of Facts and Submissions

I.   The appeal is against the decision of the examining
        division to refuse European patent application
        No. 96 309 546.8 under Article 97(2) of the European
        Patent Convention (EPC).

II.   The application was refused on the ground that the
        subject-matter of claim 1 of the main and the first
        auxiliary requests then on file lacked an inventive
        step over a combination of

        D1 = GOLDBERG M. et al. 'Comparative Performance of
             Pyramid Data Structures for Progressive Image
             Transmission'. In: IEEE Transactions on
             Communications, IEEE Inc., New York, US,
             Vol. 39, No. 4, 1 April 1991, pages 540 - 547,
             ISSN 0090-6778, XP000241265; and

        D3 = BARONTI S. et al. 'Content-driven differential
             encoding of an enhanced image pyramid'. In: Signal
             Processing: Image Communication, Elsevier Science
             publishers, Amsterdam, NL, Vol. 6, No. 5,
             1 October 1994, pages 463 - 469, ISSN 0923-5965,
             XP 000466027.

        The decision under appeal also raised objections under
        Articles 84 and 123(2) EPC against claim 1 of the
        second auxiliary request then on file.

        Moreover the decision under appeal also cited the
        further documents

        D2 = EP 0 667 716 A1,

D4 = BURT P. J. et al. 'The Laplacian Pyramid as a
     Compact Image Code'. In: IEEE Transactions on
     Communications, IEEE Inc., New York, US,
     Vol. COM-31, No. 4, 1 April 1983, pages 532 - 540,
     ISSN 0090-6778, XP 000570701, and

D5 = EP 0 627 859 A2.

III.   The applicant appealed and requested that the decision
       under appeal be set aside. With the statement of
       grounds of appeal, the appellant filed claims according
       to a new main and first and second auxiliary requests
       and submitted arguments in support of inventive step.

IV.   The board issued a communication pursuant to
       Article 15(1) of the Rules of Procedure of the Boards
       of Appeal (RPBA), annexed to a summons to oral
       proceedings. In this communication the board indicated
       that it tended to share the examining division's view
       as far as the appellant's main request was concerned,
       but that it tended to agree with the appellant's
       argument that a person skilled in the art would find no
       teaching in D1, D2 and D3 to adopt a quantisation
       method whereby the number of quantisation bits used for
       each hierarchy was selected in accordance with the
       magnitude of the influence of the quantisation errors
       at that hierarchy on the excluded pixel of the lower
       hierarchy when restored using the pixel data of that
       hierarchy, as discussed on page 4 of the statement of
       grounds of appeal. The board also indicated that it was
       inclined to remit the case to the first instance for
       further prosecution if the appellant made the first
       auxiliary request its main request.

V.   With letters of reply dated 23 September 2013 and
       2 October 2013 the appellant informed the board that it

would not attend the oral proceedings and made the first auxiliary request its main request. The previous main request became the first auxiliary request.

VI.   The oral proceedings were then cancelled.

VII.   Claim 1 of the present main request reads as follows (differences with respect to claim 1 of the requests underlying the decision under appeal are set in *italics*):

"A video signal encoding method for generating from input image data a plurality of hierarchical image data with different resolutions to encode each of the hierarchical image data, comprising:
a step for averaging a plurality of pixel values in each hierarchical image data to form higher hierarchy image data;
a step for excluding from the pixel data in each hierarchy other than the top hierarchy with the lowest resolution, pixel data corresponding to one of a plurality of lower hierarchy pixels used in the same averaging operation to generate one pixel for a higher hierarchy in order to form thinned-out data formed of the remaining pixels; and
a quantization step for compression-coding each of said top hierarchy image data and the thinned-out data in respective hierarchies *other than* said top hierarchy to generate a plurality of hierarchical coded data, wherein the number of quantisation bits used in the quantisation step is selected, *for each hierarchy other than the bottom hierarchy, in accordance with the magnitude of the influence of the quantisation errors at that hierarchy on the excluded pixel of the lower hierarchy when restored using the pixel data of that hierarchy, the magnitude of the influence being*

dependent on the number of pixels of the lower
hierarchy used in generating each pixel of that
hierarchy;
said quantization step quantizes the pixel data of each
hierarchy using a number of quantization bits assigned
to the hierarchy such that higher hierarchies are
quantized more finely *than lower hierarchies*."

VIII.   The reasons for the decision under appeal may be
        summarised as follows:

        Document D1 constituted the closest prior art. The
        method of claim 1 of the then main request differed
        from the image signal encoding method disclosed in
        section II.B "Reduced-Sum Pyramid" of D1 in that
                (i) the method was a video signal encoding
                     method, whereas D1 concerned an image signal
                     encoding method,
                (ii) a step of performing an arithmetic operation
                     was a step of averaging, and
                (iii)the quantisation step quantised the data in
                     higher hierarchies more finely.
        The decision held that the use of image signal encoding
        methods for video signal encoding was well-known and
        trivial, and that it was at least obvious from D1 that
        the sum of pixel values calculated in D1 could be
        divided by the number of pixels thereby yielding the
        mean pixel value. Feature (iii) solved the problem of
        how to perform quantisation. It was well-known that in
        hierarchical encoding the problem of choosing
        quantisation for the different hierarchies (i.e. the
        different hierarchical levels) presented itself.
        D3 pointed out that quantisation was critical in
        pyramid schemes because errors at high levels spread
        down over lower levels. A person skilled in the art
        confronted with the problem of how to perform

quantisation in the method of D1 would have recognised
that it was appropriate to perform quantisation in such
a way that the quantisation step in each layer
quantised the data in higher hierarchies more finely
than that of lower hierarchies as disclosed in D3.

The same arguments applied to claim 1 of the then first
auxiliary request.

In the application as filed there was no clear
disclosure of how the number of quantisation bits could
be selected in accordance with both the number of
levels and the number of pixels used in generating the
higher hierarchy. This feature in claim 1 of the second
auxiliary request infringed both Article 84 EPC and
Article 123(2) EPC. If it was interpreted in terms of a
4-fold finer quantisation step in each level as
disclosed in the description, this would be considered
an obvious choice.

IX.   The appellant's arguments may be summarised as follows:

The section "Reduced-Sum Pyramid" of D1 was completely
silent regarding quantisation. In D1 the averaging of a
2x2 block of pixel values would typically result in a
non-integer average value and thus entail an
undesirable increase of the amount of data. If the
average was rounded/quantised (for transmission) the
result would be a quantisation error in the higher
hierarchy created by the averaging operation. A
quantisation error would also result in the lower
hierarchy because the rounded average value would be
used to restore the pixel excluded from the 2x2 block
under the "Reduced-Sum Pyramid" scheme. The
quantisation error in the higher hierarchy would
influence the restoration of the excluded lower

hierarchy pixels by a factor of four and provide a
disincentive to average rather than take the sum of the
pixel values.

The invention reduced the negative image quality
effects of quantisation errors and avoided the data
amount increase which would result from not rounding/
quantising.

D3 concerned differential pyramid encoding rather than
non-differential encoding such as provided by the
"Reduced-Sum Pyramid" method in D1. There was no
suggestion that the quantisation teachings of D3 could
be usefully applied to non-differential encoding.

A person skilled in the art, starting from D1 and
seeking to quantise the encoded hierarchical data
without introducing errors, would find no teaching to
adopt a quantisation method whereby the number of
quantisation bits used for each hierarchy was selected
in accordance with the magnitude of the influence of
the quantisation errors at that hierarchy on the
excluded pixel of the lower hierarchy when restored
using the pixel data of that hierarchy, the magnitude
of the influence being dependent on the number of
pixels of the lower hierarchy used in generating each
pixel of that hierarchy.

Reasons for the Decision

1.   *Main request: admission (Article 13(1) RPBA)*

The present main request was filed in reaction to the
board's indication given in the communication and thus
constitutes an amendment to the appellant's case within

the meaning of Article 13(1) RPBA. It corresponds to the first auxiliary request filed with the statement of grounds of appeal and therefore does not increase the complexity of the case. It allowed the board to focus on the essential objections raised in the decision under appeal and was therefore admitted into the appeal proceedings.

2.   *Main request: amendments (Article 123(2) EPC)*

2.1   Claim 1 of the main request is based on originally filed claim 1. The selection of the number of quantisation bits in accordance with the magnitude of the influence of the quantisation errors on restored excluded pixels of lower hierarchy is disclosed on page 28, second full paragraph, of the application as filed. The number of quantisation bits used in the quantisation step in higher and lower hierarchies is disclosed for instance on page 19, second full paragraph, or page 28, second full paragraph, of the application as filed.

2.2   In the decision under appeal the examining division objected in this respect that in the application as filed there was no teaching or clear disclosure of the selection of the number of quantisation bits unless the selection was interpreted as a 4-fold finer quantisation step in the higher hierarchy.

2.3   The board, however, notes that the original description discloses on page 28, second full paragraph, that the number of quantisation bits (1, 4, 16) is selected in consideration of the influence of the quantisation errors in the higher hierarchy (level) on the restored pixel value in the lower hierarchy. This influence of the quantisation errors is analysed on page 25, line 5

to page 29, line 17 and shown in figure 6 in table form
(see page 28, first paragraph). The quantisation errors
contribute with an absolute factor of 1 or 4 to the
restored pixel values in the lower hierarchy (and with
an absolute factor of 16 to the next lower hierarchy).
The factors 1 and 4 result from the number of pixels of
the lower hierarchy used in generating the pixels of
the higher hierarchy when forming the average (see
equations (1) and (2) on page 17) and used in the
corresponding restoring of excluded pixel data (see
equations (3) and (4) on pages 22 and 23 and
equations (7) to (10) on pages 26 and 27). Thus, the
specific values of 1, 4 and 16 bits discussed on
page 28, second full paragraph, are the result of a
specific teaching disclosed in relation to the
embodiment of the application.

2.4   In view of the above the board finds that the objection
under Article 123(2) EPC raised in the decision under
appeal is not valid against present (amended) claim 1.

3.   *Main request: clarity (Article 84 EPC 1973)*

3.1   In the decision under appeal the examining division
also objected that there was no clear disclosure of **how**
the number of quantisation bits could be selected in
accordance with the number of hierarchies and the
number of pixels used in generating the higher
hierarchy.

3.2   Present claim 1, however, now specifies that the
selection of the number of quantisation bits is made
"in accordance with the magnitude of the influence of
the quantisation errors at that hierarchy on the
excluded pixel of the lower hierarchy when restored
using the pixel data of that hierarchy". Claim 1 also

specifies that this magnitude is dependent on the
number of pixels of the lower hierarchy used in
generating each pixel of that hierarchy. Taking into
account the relevant teaching of the application (see
section 2.3 above) the relationship between the number
of quantisation bits in the different hierarchies is
clear.

3.3   In view of the above the board finds that the objection
under Article 84 EPC raised in the decision under
appeal is not valid against present (amended) claim 1.

4.   *Inventive step (Article 56 EPC 1973)*

4.1   It is undisputed that the "Reduced-Sum Pyramid" method
disclosed in section II.B of D1 is an appropriate
starting point for the assessment of inventive step.

4.2   According to that method, hierarchy n is the original
image and hierarchy k-1 is formed from hierarchy k
$(0 < k \leq n)$ by calculating, for each spatially
contiguous, non-overlapping block of 2x2 nodes at
hierarchy k the sum of the node values in the block.
Subsequently, one of the 2x2 nodes is dropped. In the
"Reduced-Sum Pyramid" of D1 there is neither an
averaging step nor a quantisation step. The number of
bits used in the "Reduced-Sum Pyramid" method at any
hierarchy k is dependent on the number of bits used for
the values of the original image (hierarchy n) and the
level of roundoff error which is accepted in the
hierarchies $k \neq n$. If roundoff errors are not to be
introduced, the values at hierarchy k require two more
bits than those at hierarchy k-1.

4.3   The "Reduced-Sum Pyramid" specifically addresses a data
expansion problem of a "Mean Pyramid" approach (see

section II.A of D1) in which for each spatially
contiguous, non-overlapping block of 2x2 nodes at
hierarchy k the average of the node values in the block
is calculated to form hierarchy k-1. The data expansion
problem is caused by the forming of hierarchies k ≠ n
which results in the total number of nodes in the mean
pyramid being larger than the number of pixels in the
original image. The "Reduced-Sum Pyramid" avoids the
data expansion problem by dropping one of the 2x2 nodes
in each block. Thus an averaging step would be contrary
to the teaching of the "Reduced-Sum Pyramid" approach
as it would mean returning to the "Mean Pyramid"
approach.

4.4   In this context the board notes that extra bits per
node are needed in both the "Mean Pyramid" and
"Reduced-Sum Pyramid" approach: in the former to
accurately record the average and in the latter to
avoid roundoff errors. In the "Mean Pyramid" approach,
these extra bits can be avoided by rounding off the
node values to the same resolution as the original
image.

4.5   The examining division identified three distinguishing
features over the "Reduced-Sum Pyramid" approach in D1,
one of which was that the quantisation step quantised
the data in higher hierarchies more finely (see
point VIII above). But the examining division
considered that there was no clear disclosure in the
application as to how the number of quantisation bits
could be selected (see also section 3 above) and that,
in view of D3, finer quantisation, in particular a
4-fold finer quantisation step in each level, would be
an obvious choice. Based on these considerations the
examining division held that it was at least obvious
from D1 that the sum of pixel values calculated in the

"Reduced-Sum Pyramid" approach in D1 could be divided
by the number of pixels, thereby yielding the mean
pixel value and that consequently "the technique of
averaging **and** excluding" was obvious (emphasis by the
board, see point 2.I.1.c.1 of the decision under
appeal).

4.6   Present claim 1 comprises the feature that the number
        of quantisation bits used in the quantisation step is
        selected, for each hierarchy other than the bottom
        hierarchy, in accordance with the magnitude of the
        influence of the quantisation errors at that hierarchy
        on the excluded pixel of the lower hierarchy when
        restored using the pixel data of that hierarchy, the
        magnitude of the influence being dependent on the
        number of pixels of the lower hierarchy used in
        generating each pixel of that hierarchy. Thus the
        method of present claim 1 implies a step of analysing
        the influence of the quantisation errors at that
        hierarchy on the excluded pixel of the lower hierarchy
        when restored using the pixel data of that hierarchy.
        It is clear from the present application that the
        4-fold finer quantisation step in each level arises
        from the particular pyramid scheme disclosed in the
        present application (see point 2.3 above). For
        instance, different values for the influence of the
        quantisation errors would result if block sizes other
        than 2x2 were used or if the "Reduced-Sum Pyramid"
        known from D1 were used for forming the higher
        hierarchy.

4.7   When forming the "Reduced-Sum Pyramid" in D1 there is
        no need for quantisation. Quantisation only becomes
        necessary when compression coding is additionally
        considered, typically for transmission. In this respect
        the board agrees with the finding in the decision under

appeal that it was well-known that lossy encoding could
be performed by means of quantisation and that in any
method of hierarchical encoding (such as the different
approaches disclosed in D1) the problem of choosing
quantisation for the different hierarchical layers
presented itself (see point 2.I.1.a.7 of the decision
under appeal).

4.8   D3 proposes a modified "Gaussian-Laplacian Pyramid",
        which is a type of pyramid discussed in section II.F of
        D1 and is different from the "Mean Pyramid" and the
        "Reduced-Sum Pyramid". The general statement in D3,
        point 3.2, that "Quantisation is critical in pyramid
        schemes, because errors at high levels may be spread
        down over lower ones" does not disclose which specific
        quantisation scheme must be chosen for any particular
        type of pyramid. This general statement implies that
        finer quantisation is required for higher levels than
        for lower levels if errors at high levels spread down
        over lower ones. But the extent to which quantisation
        must be finer for higher levels needs to be determined
        separately for each type of pyramid, because the
        influence of quantisation errors at a high level on the
        lower levels depends on the particular type of pyramid.
        In particular, D3 does not discuss if or how the manner
        in which quantisation errors at high levels may spread
        down over lower ones is influenced by node dropping if
        a "Reduced-Sum Pyramid" is used.

4.9   In view of the above the board finds that the objection
        under Article 56 EPC raised in the decision under
        appeal is not valid against present (amended) claim 1.

5.   Moreover, also in the other documents discussed in the
        decision under appeal there is no teaching to adopt a
        quantisation method whereby the number of quantisation

bits used for each hierarchy is selected in accordance
with the magnitude of the influence of the quantisation
errors at that hierarchy on the excluded pixel of the
lower hierarchy when restored using the pixel data of
that hierarchy. Thus on the basis of claim 1 of the
present main request the board finds that the decision
under appeal is to be set aside.

5.1   Since the board decided that the decision under appeal
       is to be set aside on the basis of the appellant's
       present main request, there is no need for the board to
       consider the allowability of the appellant's present
       first and second auxiliary requests.

6.   *Remittal (Article 111(1) EPC 1973)*

6.1   In the present case, in the decision under appeal the
       examining division decided only on the patentability of
       the subject-matter of claim 1 of the requests then on
       file and took no decision on the other independent
       claims or the dependent claims of the requests then on
       file. Hence full examination of the application as to
       patentability requirements has not yet been carried
       out. Further examination, however, is still necessary
       since there are, for instance, further independent
       claims in the present main request. The board sees no
       reason to go beyond its primary task of examining the
       contested decision. Full examination as to
       patentability requirements is the task of the examining
       division (G 10/93, OJ EPO 1995, 172, point 4 of the
       Reasons).

6.2   Thus the board considers it appropriate to exercise its
       discretionary power under Article 111(1) EPC 1973 to
       remit the case to the department of first instance for
       further prosecution. Consequently, according to

Article 111(2), first sentence, EPC 1973, the examining division is bound by the *ratio decidendi* of the board on claim 1 of the present main request, in so far as the facts are the same. Therefore it depends on the facts whether and to which extent the *ratio decidendi* for claim 1 of the present main request applies also to the other claims of that request or to the claims of any further requests which the examining division might admit into the proceedings under Rule 137(3) EPC for example.

Order

For these reasons it is decided that:

1.   The decision under appeal is set aside.
2.   The case is remitted to the department of first instance for further prosecution.

The Registrar: The Chairman:

K. Boelicke   F. Edlinger

Decision electronically authenticated