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Datasheet for the decision
of 8 March 2013

Case Number:	T 0762/12 - 3.5.04
Application Number:	04100907.7
Publication Number:	1465431
IPC:	H04N7/30, H04N7/34, H04N7/26
Language of the proceedings:	EN

Title of invention:
Video coder providing implicit coefficient prediction and scan adaption for image coding and intra coding of video

Applicant:
AT&T Corp.

Headword:

Relevant legal provisions:
EPC 1973 Art. 54(1), 54(2), 56, 87(1)
EPC Art. 54(3)

Keyword:
Priority - basis in priority document (yes)
Novelty - (yes)
Inventive step - non-obvious alternative

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Beschwerdekammern
Boards of Appeal
Chambres de recours

Case Number: **T 0762/12 - 3.5.04**

D E C I S I O N
of Technical Board of Appeal 3.5.04
of 8 March 2013

Appellant: AT&T Corp.
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Decision under appeal: **Decision of the Examining Division of the**
                         European Patent Office posted on 13 September
                         2011 refusing European patent application No.
                         04100907.7 pursuant to Article 97(2) EPC.

Composition of the Board:

Chairman: F. Edlinger
Members: A. Dumont
                 T. Karamanli

Summary of Facts and Submissions

I.   The appellant appealed against the decision by the
        examining division refusing European patent application
        No. 04 100 907.7.

II.   The present application claims priority from three
        applications, the earliest being US patent application:

        P1:   US 60/026,963 P filed on 20 September 1996.

III.   The examining division refused the application on the
        ground that the subject-matter of the claims in the
        requests then on file was not entitled to the earliest
        priority from P1, so that the subject-matter of the
        claims was not novel over document:

        D1:   PURI A. et al.: "Improvements in DCT Based Video
               Coding", PROCEEDINGS OF THE INTERNATIONAL SOCIETY
               FOR OPTICAL ENGINEERING, SPIE, Vol. 3024,
               12 February 1997, pages 676 to 688, XP000199866,
               ISSN: 0277-786X.

        The examining division further commented as an *obiter
        dictum* that, should the two earliest priority claims
        not be valid for the present application, the subject-
        matter of the claims might also not be novel in view of
        document EP 0 843 484 A1.

IV.   The following further documents were cited in the
        proceedings:

        D2:   PLOYSONGSANG A. et al.: "DCT/DPCM Processing of
               NTSC Composite Video Signal", in IEEE TRANSACTIONS
               ON COMMUNICATIONS, USA, Vol. COM-30, No.3,

March 1982, pages 541 to 549, XP002062314, ISSN 0090-6778;

D3: US 2,905,756 A;

D6: MUSMANN H.G. et al.: "Advances in Picture Coding", in PROCEEDINGS OF THE IEEE, Vol. 73, No. 4, April 1985, pages 523 to 548, XP002057834, ISSN: 0018-9219;

D7: TAN T.K. et al.: "Intra Prediction (T9/T10) and DC/AC Prediction Results", ISO/IEC JTC1/SC29/WG11, No. MPEG96/0939, 30 June 1996; XP030030333, ISSN 0000-0331;

D8: GRAHAM R.E.: "PREDICTIVE QUANTIZING OF TELEVISION SIGNALS", IRE Wescon, Convention Record, Part 4, Vol. 2, No. 4, 19 August 1958, pages 147 to 157, XP002051791;

D9: NETRAVALI A.N. et al.: "Picture Coding: A Review", PROCEEDINGS OF THE IEEE, Vol. 68, No. 3, March 1980, pages 366 to 407, XP002028499, ISSN: 0018-9219;

D10: COHEN P. et al.: "ADAPTIVE DIFFERENTIAL CODING OF PICTURE SIGNALS BASED ON LOCAL CONTOUR PREDICTION", COMMUNICATIONS AND KNOWLEDGE, PARTNERS IN PROGRESS, 29 November to 1 December 1976, Vol. 1, pages 6.1-1 to 6.1-5, XP002039931;

D11: GONZALEZ R.C. et al.: "Digital Image Processing", third edition, Prentice Hall, 2008, pages 543, 566 to 573, 580 to 584, 596 to 602 and 621 to 622;

D13: PENNEBAKER W.B.: "JPEG Still Image Data Compression Standard", New-York, 1993; two cover pages and pages 29 to 37; 11 pages in total;

D14: printout dated 07—10—2010 of http://mpeg.chiariglione.org/about_mpeg.htm, two pages;

D15: ISO/IEC JTC1/SC 29 N 1963, "Coding of Audio,
     Picture, Multimedia and Hypermedia Information",
     12 March 1997, seven pages.

V.   In an annex to the summons to oral proceedings, the
      board raised the further issue of lack of inventive
      step, starting from either document D2 or document D7.

VI.   Oral proceedings were held jointly on 7 and 8 March
      2013 in appeal cases T 0762/12 and T 0763/12, both
      relating to divisional applications from the same
      parent European patent application No. 97 307 378.6.

VII. The appellant requested that the decision under appeal
      be set aside and that a patent be granted on the basis
      of claims 1 to 7 according to the sole request filed in
      the oral proceedings on 8 March 2013.

VIII. Independent claim 1 reads as follows:

      "A decoding method for decoding MPEG-4 video signals
      associated with a block X of 64 coefficients, the
      method comprising:
      receiving MPEG-4 video signals comprising a plurality
      of blocks of data, each block comprising a quantised DC
      residual signal,
      determining a first gradient between a quantised DC
      coefficient DC_A of a previously decoded block A that is
      horizontally adjacent to and left of the block X, and a
      quantised DC coefficient DC_B of a previously decoded
      block B that is vertically adjacent to and above the
      block A;
      determining a second gradient between DC_B and a
      quantised DC coefficient DC_C of a previously decoded
      block C that is vertically adjacent to and above the
      block X, wherein each of the block A, the block B and

the block C is inside a boundary of a video object plane containing the block X;

when the first gradient is less than the second gradient, predicting a DC coefficient DC_X of the block X from DC_C, otherwise, predicting the DC coefficient DC_X from DC_A;

identifying the residual signal for the block X from the MPEG-4 video signals;

generating a DC coefficient for the block X from the predicted DC coefficient DC_X of the block X and the residual signal for the block X; and

generating image data for the block X according to an inverse discrete cosine transform based on the generated DC coefficient."

IX.   Independent claim 5 reads as follows:

"A video decoder for decoding an MPEG-4 formatted video bitstream associated with a block X of 64 coefficients, the decoder being arranged:

to receive MPEG-4 video signals comprising a plurality of blocks of data, each block comprising a quantised DC residual signal,

if $|DC_A-DC_B|<|DC_B-DC_C|$, to predict at a DC coefficient predictor (400) a DC coefficient of the block X from DC_C, otherwise, to predict a DC coefficient DC_X of the block X from DC_A, where DC_A is a quantised DC coefficient for a previously decoded block A, DC_B is a quantised DC coefficient for a previously decoded block B, DC_C is a quantised DC coefficient for a previously decoded block C, the block A is horizontally adjacent to and left of the block X, the block B is vertically adjacent to and above the block A, and the block C is vertically adjacent to and above the block X, wherein each of the block A, the block B and the block C is

inside a boundary of a video object plane containing
the block X,
to identify the residual signal for the block X from
the MPEG-4 video signals;
to generate at an adder a DC coefficient for the block
block [*sic*] X from DC_X and the residual signal for the
block X; and
to generate image data for the block X according to an
inverse discrete cosine transform based on the DC
coefficient."

X.   The reasons in the decision under appeal with respect
        to the entitlement to the earliest priority from P1 and
        regarding lack of novelty may be summarised as follows:

        P1 describes a very specific method using predicted DC
        and AC transform coefficients to determine gradients
        and to predict coefficient DC_X. P1 does not contain
        claims. Generalising the specific method disclosed in
        P1 as applicable to any (unquantised) transform
        coefficients is not directly and unambiguously
        derivable from P1. Furthermore, predicting coefficient
        DC_X "based on" or "using" either coefficient DC_C or
        coefficient DC_A is also an unsupported generalisation of
        the specific formulas disclosed in P1. Hence the
        independent claims of the requests then on file are not
        entitled to the priority from P1 (see also decision
        G 2/98), so that document D1 belongs to the state of
        the art within the meaning of Article 54(1) and (2) EPC
        and deprives their subject-matter of novelty.

XI.   The objection of lack of inventive step raised by the
        board in the communication accompanying the summons and
        in the oral proceedings may be summarised as follows:

The decoding method of claim 1 differs from the method
known from the closest prior-art document D2 by the
neighbouring blocks of data used for predicting the DC
coefficient of block X.

This difference solves the problem of implementing an
alternative block-based predictive decoding method. The
solution according to claim 1 is known in the prior art
as Graham's rule (see documents D3, D6, D8 or D9). The
skilled person would immediately recognise that the
rule is applicable to pixel prediction in the spatial
domain as well as to prediction of the DC coefficient
in the frequency domain.

Adopting this solution in the method of D2 is obvious.
The same would apply starting from document D7.

XII.   The arguments by the appellant may be summarised as
        follows:

        The amended claims are entitled to priority from P1.
        Thus D1 does not belong to the state of the art.

        The decoding method of claim 1 differs from the
        decoding method of the prior art D2 by:

        -    decoding MPEG-4 signals;
        -    predicting the DC coefficient based on the result
             of the comparison of differences between
             previously decoded DC coefficients.

        The technical problem should be formulated generally as
        providing an alternative block-based coding scheme.

        D2 relies on decorrelation (see also D11 and D13). The
        DC coefficient of one subblock only represents the

average intensity of that subblock and thus does not represent the average intensity of spatially adjacent pixels, whereas D3 relies on spatial correlation between adjacent pixels. D2 and D3 are thus fundamentally incompatible.

DC coefficient prediction is based in D2 on a subblock to be predicted and four neighbouring subblocks, and requires the transmission of overhead information. The skilled person would not have considered selecting a less accurate method, such as Graham's rule, which uses only values of previously received adjacent pixels and does not require overhead information transmission.

In conclusion, there was no incentive at the filing date of the present application to apply Graham's rule to subblock processing. As a result, the subject-matter of claim 1 is inventive starting from D2.

D3, not D2, should be regarded as the closest prior art. However, each individual pixel of D3 cannot be regarded as a block of size 1x1. The method of claim 1 is thus also inventive starting from D3.

D7 appears to have been submitted for confidential consideration at the July 1996 Tampere MPEG meeting. D7 is dated "July 1996". As explained in documents D14 and D15, at least some of the documents of the MPEG working group are restricted to MPEG members or might be post-published. Neither the examining division nor the board has provided evidence of the date on which D7 became available to the public. Thus D7 should be excluded from further consideration.

Reasons for the Decision

1.   The appeal is admissible.

2.   Entitlement of the claims to priority from P1

2.1   Amended claim 1 specifies the essential features of the adaptive DC prediction in a method of decoding MPEG-4 video signals. It expressly sets out that the DC coefficients DC_A, DC_B and DC_C used in the steps of determining the first and second gradients are quantised, with blocks A, B and C being inside a boundary of a video object plane containing block X. The coefficient DC_X of claim 1 is predicted according to the formulas in sections 2.1 and 2.2 of P1, and the DC coefficient is generated from the predicted coefficient DC_X and the residual signal (see also Figures 1(b) and 2(b) of P1). The amendment thus has a direct basis in P1.

2.2   The examining division had objected to the coefficient DC_X being predicted "based on" either coefficient DC_C or coefficient DC_A. Amended claim 1 sets out a step of predicting DC_X "from" either DC_C or DC_A. This constitutes in the board's view a wording derivable from, and covering, both alternatives disclosed in the formulas in sections 2.1 and 2.2 of P1, read together with the passage (page 2, lines 6 to 8) mentioning prediction "from the horizontally adjacent or from vertically adjacent previous block". The amendment thus has a direct basis in P1.

2.3   Thus the board is convinced that the objections in the decision under appeal regarding the priority claimed from P1 do not apply to amended claim 1. The board is

satisfied that the subject-matter of amended claim 1 is directly and unambiguously derivable from P1.

2.4   Independent apparatus claim 5 was amended accordingly, in particular with the coefficients DC_A, DC_B and DC_C being quantised and with DC_X being predicted from either DC_C or DC_A.

2.5   The board is also satisfied that the features of dependent claims 2 to 4, 6 and 7 are directly and unambiguously derivable from P1.

2.6   In conclusion, the subject-matter according to claims 1 to 7 and the subject-matter according to the earliest priority document P1 relate to "the same invention" within the meaning of Article 87(1) EPC 1973. Those claims thus enjoy the right to priority from P1.

3.   Novelty (Article 54(1) EPC 1973)

3.1   Since the claims are entitled to priority from P1, they enjoy a date of priority, within the meaning of Article 89 EPC 1973, of 20 September 1996. Since document D1 was published on 12 February 1997, it is not comprised in the state of the art under Article 54(2) EPC 1973.

3.2   The examining division commented as an *obiter dictum* in the decision under appeal that European patent application published as EP 0 843 484 A1 might be relevant as prior art under Article 54(3) EPC. That document mentions international standards such as MPEG-1, H.261, MPEG-2 and H.263. However, it does not relate to MPEG-4 video signals, as set out in the present claims, so that its content is not novelty-destroying.

3.3   No further objection was raised under Article 54(1) EPC
        1973 in the first-instance proceedings. The board is
        also satisfied that the subject-matter of the claims is
        novel over the further prior-art documents on file.

4.   Inventive step (Article 56 EPC 1973)

4.1   Document D2 is in the board's view closer to the
        invention than D3 since D2 relates to a hybrid DCT/DPCM
        decoding method as the method of claim 1. Each 4x12
        block in the frequency (DCT) domain is divided into
        three 4x4 subblocks (see Figures 3 and 4). The DC
        coefficient associated with a subblock X is predicted
        based on a comparison with coefficients of previously
        decoded subblocks neighbouring subblock X. Contrary to
        the present invention, D2 requires the transmission of
        overhead information ("directional bits") together with
        the video signals in order to determine which of the
        neighbouring subblocks is to be used for prediction.

4.2   The method of D2 and the method of claim 1 differ
        (*inter alia*) by the prediction scheme for the DC
        coefficient. The objective technical problem may thus
        be generally formulated as providing an alternative
        prediction scheme for a block-based decoding method.

4.3   Graham's rule according to D3 exploits the expected
        correlation between pixels, in particular in small
        (contiguous) picture regions, to predict the value of a
        picture element, thereby achieving compression without
        overhead transmission (see D3, column 1, lines 28 to 37
        and column 5, lines 1 to 10). Further documents also
        refer to Graham's rule in the spatial (pel) domain (see
        D6, section "B. Adaptive Prediction" on pages 533 and
        534; D8, section "Nonlinear Predictor" on pages 149

and 150; and D9, Figure 28 and the corresponding
description on page 382).

4.4   On the one hand, orthogonal transformation into the
       frequency domain (for instance by discrete Fourier
       transform DFT in D11; or by discrete cosine transform
       DCT in D13 or in the MPEG-4 standard) aims to
       decorrelate transform coefficients within a block (see
       D11, the second paragraph of section 8.2.8 on page 566;
       and see D13, the first paragraph on page 29). On the
       other hand, prediction following Graham's rule
       essentially relies on correlation between neighbouring
       blocks (see D2, page 544, left-hand column, first
       paragraph; and see D10, section "PREDICTOR OPERATION
       PRINCIPLE" on page 6.1-1).

4.5   The DC coefficient in the frequency domain, which
       corresponds to the average intensity of a subblock (see
       D2, page 542, right-hand column, last paragraph), does
       not directly correspond to a spatially adjacent block
       of pixels in D2 as in the present invention, where
       adjacent 64x64 blocks in the frequency domain directly
       correspond to spatially adjacent blocks of 64x64
       pixels, and where a DC coefficient thus directly
       corresponds to the average intensity of the
       corresponding adjacent blocks of pixels. Consequently,
       D2, by dividing blocks into subblocks prior to
       prediction, blurs the correspondence between DC
       coefficients in the frequency domain and corresponding
       adjacent picture regions, or their average intensity,
       in the spatial domain.

4.6   As a result, the board is not convinced that the
       skilled person would have readily envisaged replacing
       the DC prediction method according to D2 by the
       alternative method following Graham's rule known

exclusively in the pixel domain. Consequently, the
subject-matter of claim 1 is found to involve an
inventive step over a combination of D2 with any one of
documents D3, D6, D8 or D9.

4.7   Document D7 relates to the proposal by the working
        group (ISO/IEC JTC1/SC29/WG11) responsible for the
        MPEG-4 standard. D7 is dated "July 1996", which is the
        date of the Tampere meeting of the working group.
        According to D14, such a working group is usually a
        large group of experts from companies and
        organisations. However, the board cannot determine
        without further investigations whether the members of
        the particular working group for the MPEG-4 standard
        can be regarded as members of the public or whether
        they were bound to confidentiality. According to D14
        and D15 (section "2 Media"), not all documents are
        published during a meeting, and some documents might be
        published after the meeting. From the evidence
        available, the board cannot determine whether D7 was
        made public during that meeting or at a later date
        preceding the earliest priority date of the present
        application, i.e. 20 September 1996. As a result, since
        there is insufficient evidence on file for the public
        availability of D7 before the relevant date of the
        present application, the board disregards D7 in the
        present appeal proceedings.

5.   Further prosecution

        In view of the above, the board considers that the
        reasons for refusing the present application, even
        taking account of the further comments made by the
        examining division, have been overcome by the amended
        claims, at least in so far as the cited documents
        belong to the state of the art under Article 54(2) EPC

1973 or Article 54(3) EPC. However, the issue of methods for decoding MPEG-4 signals has arisen for the first time in the appeal proceedings because of the amended claims. Since this issue was not examined by the examining division, the board remits the case to it for further prosecution.

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