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Datasheet for the decision of 5 December 2007

Case Number: T 0052/05 - 3.5.04

Application Number: 94910528.2

Publication Number: 0651574

IPC: H04N 7/32

Language of the proceedings: EN

Title of invention:
Method and apparatus for coding/decoding motion vector, and method and apparatus for coding/decoding image signal

Patentee:
Sony Corporation

Opponent:
IGR GmbH & Co. KG.

Headword:
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Relevant legal provisions:
-

Relevant legal provisions (EPC 1973):
EPC Art. 54, 56

Keyword:
"Novelty (yes)"
"Inventive step (yes)"

Decisions cited:
-

Catchword:
-

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Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number: T 0052/05 - 3.5.04

D E C I S I O N
of the Technical Board of Appeal 3.5.04
of 5 December 2007

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Decision under appeal:
Interlocutory decision of the Opposition Division of the European Patent Office posted 12 November 2004 concerning maintenance of European patent No. 0651574 in amended form.

Composition of the Board:

Chairman: F. Edlinger
Members: M. Paci
B. Müller

Summary of Facts and Submissions

I. This is an appeal by the patent proprietor as sole appellant against the interlocutory decision of the opposition division that European patent No. 0 651 574, as amended according to the patent proprietor's third auxiliary request, met the requirements of the EPC.

II. Opposition had been filed against the patent as a whole and was based on Article 100(a) EPC on the grounds of lack of novelty and lack of inventive step.

III. The following documents were cited as prior art in the decision under appeal:

E1: "Coding of moving pictures and associated audio for digital storage media at up to about 1.5 Mbits/s", committee draft CD 11172-2 submitted to ISO-IEC/ITC1 SC29 on 23 November 1991, pages 2 to 4, 6 to 10, 24 to 26, 31, 38, 39, 43 to 46, B-1 to B-4, D-3 to D-7, D-29, D-30 and D-34 to D-36;

E2: "The MPEG video compression algorithm", Didier J. Le Gall, Signal Processing: Image Communication 4(1992), pages 129 to 140; and

E3: "Test Model 4, Draft Revision 2", ISO-IEC/JTC1/SC29/WG11, MPEG93/225b, document AVC-445b, dated 5 February 1993, pages 1 to 6, 9 to 12, 21, 22, 25 to 28, 41 to 44, 115 and 141 to 148.

IV. In a letter dated 20 September 2007 the respondent (opponent) withdrew the request for oral proceedings and informed the board that he would not be represented at the oral proceedings.

V. With a letter dated 30 November 2007 the appellant (patent proprietor) submitted a complete copy of document E3.

VI. Oral proceedings before the board were held on 5 December 2007 in the absence of the respondent. During the oral proceedings the appellant (patent proprietor) withdrew all the requests which had been filed in writing.

VII. The appellant's final requests are that the decision under appeal be set aside and that the patent be maintained as granted.

VIII. The respondent's final request is that the appeal be dismissed.

IX. Independent claims 1, 4, 7 and 10 of the patent as granted read as follows:

Claim 1

"A method of coding motion vector of macroblock coded in the forward prediction mode, the backward prediction mode or the bidirectional prediction mode, the method comprising the steps of:
detecting order of transmission of current motion vectors in a predetermined direction within one macroblock,
selecting one of L number of memories for motion vectors in the predetermined direction on the basis of the detected order of transmission to readout a former motion vector in the predetermined direction, and

subtracting the former motion vector in the predetermined direction from the current motion vectors in the predetermined direction, thus to sequentially generate current difference motion vectors in the predetermined direction."

Claim 4

"A method of reconstructing motion vectors of macroblock coded in the forward prediction mode, backward prediction mode, or the bidirectional prediction mode, the method comprising the steps of:
detecting order of reception within macroblock of received difference motion vectors in a predetermined direction;
selecting one of L number of memories for motion vectors in the predetermined direction on the basis of the detected order of reception to read out a reconstructed motion vector in the predetermined direction already reconstructed,
adding the difference motion vectors in the predetermined direction and the reconstructed motion vector in the predetermined direction already reconstructed, thus to sequentially generate new reconstructed motion vectors in the predetermined direction."

Claim 7

"An apparatus for coding motion vector of macroblock coded in the forward prediction mode, the backward prediction mode, and the bidirectional prediction mode, comprising:

L number of memories for motion vector in a predetermined direction for storing motion vectors in the predetermined direction,
means for detecting order of transmission of current motion vectors in the predetermined direction within one macroblock,
means for selecting one of the L number of memories for motion vector in the predetermined direction on the basis of the detected order of transmission, thus to read out a former motion vector in the predetermined direction, and
means for subtracting the former motion vector in the predetermined direction from the current motion vectors in the predetermined direction, thus to sequentially generate current difference motion vectors in the predetermined direction."

Claim 10

"An apparatus for reconstructing motion vectors of macroblock coded in the forward prediction mode, the backward prediction mode or the bidirectional prediction mode, comprising:
L number of memories for motion vector in a predetermined direction for storing motion vectors in the predetermined direction,
means for detecting the order of reception within the macroblock of received motion vectors in the predetermined direction,
means for selecting one of L number of memories for motion vector in the predetermined direction on the basis of the detected order of reception to read out a reconstructed motion vector in the predetermined direction already reconstructed, and

means for adding difference motion vector in the predetermined direction and the reconstructed motion vector in the predetermined direction already reconstructed, thus to sequentially generate new reconstructed motion vectors in the predetermined direction."

X. In the decision under appeal the opposition division essentially reasoned as follows with respect to claim 1 of the patent as granted.

E3 discloses a method of coding the motion vectors of a macroblock. For the coding of interlaced B pictures two memories are used for storing the two motion vectors PMV1 and PMV2 for the forward direction and two memories are used for storing the two motion vectors PMV3 and PMV4 for the backward direction. It is further stated in section 8.3 on page 42 of E3 that "Every forward or backward motion vector is coded relative to the last vector of the same type". This sentence is understood as telling the reader that the vector PMV1 of the macroblock currently being encoded is coded relative to the PMV1 of a corresponding macroblock in the reference picture. The same applies for PMV2, PMV3 and PMV4. It is also clear that E3 discloses the production of differential motion vectors (see bottom of page 42). Moreover it is self-evident to the skilled person that the system simply has to know which motion vector it is currently encoding so that it is able to address the correct memory to obtain the correct motion vector of the corresponding macroblock in the reference picture.

Thus the subject matter of claim 1 is not novel in view of the disclosure of E3.

The opposition division also gave in the decision the following explanations as to why it regarded E1 and E2 as not particularly relevant.

Neither E1 nor E2 contains any disclosure or suggestion of having more than two motion vectors for any macroblock because the motion prediction is based on frames. The maximum number of two motion vectors is reached when a given macroblock is B coded, in which case there is one motion vector in a forward direction and one motion vector in a backward direction. Thus the question of the order of transmission of difference motion vectors does not arise, since there is only one difference motion vector in a given direction. Consequently the subject-matter of claim 1 is novel over each of E1 and E2. Since E1 and E2 are based on the MPEG1 system, which does not foresee more than one reference frame in any direction, the skilled person would have had no obvious reason to employ more than one difference motion vector in any direction.

XI. The appellant argued essentially as follows.

It is not in dispute that Test Model 4 (E3) was published on 5 February 1993. The patent specification acknowledges that Test Model 4 was in the public domain, but its analysis provided in the "Background Art" section of the patent specification contains part of the inventive contribution, such as the recognition of the technical problem. Therefore it should not be read as prior art.

The sentence "Every forward or backward motion vector is coded relative to the last vector of the same type" in section 8.3 on page 42 of E3, quoted by the opposition division, does not disclose or suggest detecting the order of transmission of the motion vectors and selecting one of the memories on the basis of the detected order of transmission, as defined in claim 1 of the patent. As explained in the description of the patent, the schemes used in E3 for selecting one of the memories PMV1 to PMV4 for motion vectors can lead in certain cases to an erroneous detection of a skipped macroblock. The selection of one of the memories on the basis of the detected order of transmission overcomes this problem.

XII. The respondent's arguments can be summarised as follows.

Neither claim 1 nor the remainder of the patent specification present the order of transmission as being of particular importance. What really matters is that the motion vectors are allocated to the right memories, which is also clearly achieved in E3. Moreover, the opposed patent also does not disclose how one of the memories is selected based on the order of transmission.

Claim 1 does not specify the number L of memories. L could, for instance, be equal to one, in which case the subject-matter of claims 1, 4, 7 and 10 would lack novelty with respect to the disclosure of each of E1 and E2. And if L were equal to two (the only case disclosed in the patent specification), this feature

would be known from E3 according to which there are two motion vectors in each direction within a macroblock.

Reasons for the Decision

1. The appeal is admissible.

Interpretation of claim 1

2. Before examining a claim for novelty and inventive step, it is necessary to construe the claim in order to determine its technical features and the matter for which protection is sought by these features in combination on a proper interpretation in the light of the description and drawings.

3. According to granted claim 1, the step of detecting the order of transmission of current motion vectors is followed by the step of selecting one of L number of memories for motion vectors on the basis of the detected order of transmission to read out a former motion vector, the former motion vector being subtracted from the current motion vectors in order to generate current difference motion vectors. The detecting, selecting and subtracting steps all refer to motion vectors in a predetermined direction. In the light of the description and drawings these steps only make technical sense and achieve the technical effect of a desired one-to-one correspondence between the motion vectors and the memories if the former motion vectors have been properly stored in these memories (see, for instance, paragraphs [0091], [0092] and [0139] of the patent specification). The board thus construes

claim 1 as requiring that the selecting step implies a selection of one of at least two memories for motion vectors "in the predetermined direction" (when the motion vector count indicates two motion vectors in a predetermined direction; see paragraph [0137] and Table 1), and the readout step implies the former motion vectors indeed being stored in these memories so that they can be properly selected (and read out) "on the basis of the detected order of transmission". To achieve these aims it is not important how the order of transmission is detected, and the board concurs with the decision under appeal (point 5.1 of the reasons) that claim 1 (and claims 4, 7 and 10) are sufficiently clear and supported by the description.

Availability to the public of E3

4. The parties no longer dispute that E3 was made available to the public on 5 February 1993 in Rome, i.e. before the earlier of the two priority dates of the patent. Its disclosure thus belongs to the state of the art, Article 54(2) EPC.

Claim 1 - Novelty

5. E3 was already cited both in the application as filed and in the patent specification, and described there in great detail as the closest prior art over which the invention provided a technical improvement (see figures 15 to 19 and the corresponding parts of the description).

6. It has not been disputed that E3 discloses a method of coding motion vectors of macroblocks coded in the forward prediction mode, the backward prediction mode or the bidirectional prediction mode (i.e. the coding of motion vectors for P pictures and B pictures), and that this method involves storing former motion vectors in memories PMV1 to PMV4, selecting one of these memories to read out a former motion vector and subtracting the former motion vector from the current motion vector in order to sequentially generate difference motion vectors.

7. The only point in dispute with respect to novelty is whether E3 discloses that **the order of transmission** of current motion vectors in a predetermined direction within one macroblock is **detected** and that the selection of one of L memories for motion vectors in the predetermined direction is done **on the basis of the detected order of transmission**.

8. In the decision under appeal the opposition division quoted the sentence "Every forward or backward motion vector is coded relative to the last vector of the same type" from page 42 of E3 and derived from it the understanding that the former motion vectors of a corresponding macroblock of the reference picture must be stored in respective memories in order to be subtracted from the corresponding current motion vectors, thus allowing the generation of difference motion vectors. This, in turn, implied that the system must know which motion vector it is currently encoding so that it is able to address the correct memory to read out the correct former motion vector. The opposition division did not mention the order of

transmission, but in view of its conclusion that the subject-matter of claim 1 lacked novelty with respect to E3, the board assumes that addressing the memories in the order of transmission of the motion vectors was regarded as a further implicit step.

9. The respondent concurred with the opposition division's reasoning regarding E3, adding only that the order of transmission of the motion vectors was of no importance. What mattered was that the motion vectors were allocated to the correct memories.

10. The board does not share the above reasoning of the opposition division and the respondent for the following reasons.

11. The sentence in E3 quoted by the opposition division refers to coding of motion vectors relative to the last vector of the "same type" (frame or field type; see E3, page 26, first line of section 5.1, and page 44), but it fails to disclose that the memories for storing these motion vectors must be selected on the basis of a detected order of transmission of motion vectors in a predetermined direction. In the case of field prediction, which is the only relevant situation (because in the case of frame prediction only one motion vector is transmitted in a predetermined direction, so that the "order of transmission" becomes meaningless), E3 discloses only two concrete schemes for allocating the motion vectors to the memories PMV1 to PMV4. To select respective ones of these memories, both schemes (see bottom of page 44 and section L.14.10 on page 145) rely either on the reference field and the predicted field of the motion vector (for P pictures on

page 44 and B pictures on page 145), or only on the reference field in a given direction (B pictures of page 44) to select one of the memories PMV1 to PMV4 (see also paragraphs [0047] to [0050] of the patent specification). There is no disclosure in E3 of a step of detecting the order of transmission of motion vectors or a step of selecting one of the memories on the basis of the detected order of transmission.

12. For the above reasons, the subject-matter of claim 1 is novel with respect to the disclosure of E3.

13. Both E1 and E2 deal with frame prediction only (MPEG1), in which case there is no more than one motion vector in a predetermined direction within one macroblock. The method of claim 1 comprises specific steps for dealing with the situation of L being greater than one. These steps, based on the detection of the order of transmission, are not disclosed in E1 and E2 because detecting the order of transmission of a single vector does not make any technical sense.

For the above reasons, the subject-matter of claim 1 is also novel with respect to the disclosures of E1 and E2.

Claim 1 - Inventive step

14. As mentioned under point 11 above, according to E3, in the case of field prediction (the only situation where there is more than one motion vector in any given direction within a macroblock), the selection of respective ones of the memories PMV1 to PMV4 for storing or reading out a motion vector in a given direction (forward or backward) is based either on both

the reference field and the predicted field of the motion vector (for P pictures on page 44 and B pictures on page 145) or on the reference field only (B pictures of page 44).

15. As explained in the patent specification from paragraph [0060] to paragraph [0078] and shown in figures 18 and 19, the memory allocation suggested in E3, in certain situations, can lead to the same memory register being used twice to store motion vectors in a given direction within the same macroblock. This creates the problem that the first motion vector is no longer held in memory and that skipped macroblocks are erroneously detected in certain situations, as explained in relation to figure 18 of the patent specification.

16. The method of claim 1 solves these problems by detecting the order of transmission of the motion vectors in a predetermined direction within one macroblock and by selecting one of the memories on the basis of the detected order of transmission. This ensures that the motion vectors in a predetermined direction within one macroblock are allocated to different memories so that none of them is overwritten by another motion vector within the same macroblock.

17. E3 does not mention any of the above problems. Nor does it suggest detecting the order of transmission of the motion vectors in a predetermined direction within one macroblock and selecting respective ones of the memories on the basis of the detected order of transmission, for any other reason. These features are not suggested by E1 or E2 either because, in contrast

to E3, these documents are not concerned with the storing and updating of more than one motion vector in a predetermined direction within one macroblock (see point 13 above).

18. For the above reasons the board judges that the subject-matter of claim 1 was not rendered obvious by any combination of E1, E2 and E3 and has to be considered as involving an inventive step (Article 56 EPC).

Claims 2 to 12

19. The method of reconstructing motion vectors of independent claim 4 is the mirror image of the coding method of claim 1. Since the decoding method also carries out, in particular, the detecting, selecting and readout steps referred to above in a decoder, the reasoning concerning novelty and inventive step with respect to claim 1 also applies *mutatis mutandis* to claim 4.

20. The apparatus of independent claims 7 and 10 has means corresponding to the steps of the methods of claims 1 and 4, respectively. Thus the same conclusion applies to them. Since claims 2, 3, 5, 6, 8, 9, 11 and 12 are dependent on one of independent claims 1, 4, 7 or 10, their subject-matter is also novel and inventive.

21. In conclusion, the board is of the opinion that the grounds for opposition mentioned in Article 100 EPC do not prejudice the maintenance of the patent unamended and rejects the opposition pursuant to Article 102(2) EPC.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The patent is maintained unamended.

The Registrar: The Chairman:

D. Sauter F. Edlinger