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D E C I S I O N
of 30 September 2003

Case Number: T 1146/97 - 3.5.1

Application Number: 92310143.0

Publication Number: 0542474

IPC: H04N 7/13, H04N 7/133, H04N 7/137

Language of the proceedings: EN

Title of invention:
Adaptive coding and decoding of frames and fields of video signals

Applicant:
AT&T Corp.

Opponent:
-

Headword:
MPEG/AT&T

Relevant legal provisions:
EPC Art. 54, 56

Keyword:
"Novelty and Inventive step (main request) - (yes, after amendment)"

Decisions cited:
-

Catchword:
-

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Case Number: T 1146/97 - 3.5.1

D E C I S I O N
of the Technical Board of Appeal 2.5.1
of 30 September 2003

Appellant: AT&T Corp
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Decision under appeal: **Decision of the Examining Division of the European Patent Office posted 9 September 1997 refusing European application No. 92310143.0 pursuant to Article 97(1) EPC.**

Composition of the Board:

Chairman: S. V. Steinbrener
Members: A. S. Clelland
P. Mühlens

Summary of Facts and Submissions

I. This is an appeal against the decision of the examining division to refuse European patent application No. 92310143.0 on the grounds that the subject-matter of independent claim 1 lacked an inventive step and that the wording of independent claim 12 was unclear. The inventive step objection was based on the following document:

D1: WO-A-90 15506

II. The examining division argued that D1 represented the closest prior art and disclosed all the method steps carried out by the claimed apparatus; it was considered obvious for the skilled person to provide apparatus capable of carrying out the known method steps.

III. The applicant (appellant) filed an appeal and submitted revised, more limited claims. It was argued that these claims were novel and inventive with respect both to the disclosure of D1 and a further document which had been cited during the examination proceedings:

D2: EP-A-0 451 545

IV. In the course of the appeal proceedings the claims were revised a number of times in view of objections raised in communications from the Board. The claims discussed below were all received by fax on 25 November 2002. Claim 1 of the **main request** (claim set "A") now reads as follows:

"Apparatus for encoding digital video signals comprising:

a receiver (10) for receiving a digital video input signal comprising a succession of digital representations related to picture elements making up at least one frame of a video image, the frame comprising a plurality of interlaced fields;

an encoder (15A,19,23,24,23A,38,45) having at least two coding modes, one mode being for coding groups of digital representations related to frames of picture elements and another mode being for coding groups of digital representations related to interlaced fields in the frames;

CHARACTERISED IN THAT

the encoder provides a number of modes of motion compensation to the digital video input signal, the number of modes of motion compensation including for at least one type of picture a plurality of motion compensation modes such that different motion compensation is provided for frame coding and field coding, wherein at least one of the plurality of motion compensation modes performs motion compensation by separating a macroblock of pixels into a first subblock and a second subblock upon each of which motion compensation is performed such that one motion vector is associated with the first subblock and another motion vector is associated with the second subblock, and a respective motion compensation type signal for identifying the provided motion compensation mode; and

apparatus (14) responsive to the digital video input signal for producing a field/frame coding type signal which directs the encoder to perform a selected one, but not both, of the coding modes".

V. Claim 12 of the main request reads as follows:

"Apparatus for decoding a compressed video signal, comprising:

a receiver (50,52) for receiving the signal representing a compressed digital video bit stream; and

a decoder (92,94,100,100A,100B,100C,100E,74) responsive to a coding type signal recovered from the received signal, for decoding fields or frames as a function of a value of the coding type signal for developing a decoded signal;

CHARACTERISED IN THAT

the decoder is responsive to a motion compensation type signal, recovered from the received signal, for selectively and adaptively performing motion compensated decoding of the compressed digital video bitstream, wherein for at least either the use of frame coding technique or the field coding technique at least one motion compensation mode performs motion compensation by dividing a macroblock of pixels into a first subblock and a second subblock each of which is separately compensated such that one motion vector is associated with the first subblock and another motion vector is associated with the second subblock".

VI. Claims 1 and 12 of the **auxiliary request** (claim set "B") in substance add to the respective claims of the main request that the macroblocks are 16 by 16 blocks of pixels and the subblocks 16 by 8 blocks of pixels.

VII. The appellant argues that the claims are now clear, novel and inventive.

The Appellant's requests

The appellant has requested that the decision be cancelled in its entirety and a patent granted on the basis of the main request or, failing that, the auxiliary request. No request has been made for oral proceedings.

Reasons for the Decision

1. The appeal complies with the requirements mentioned in Rule 65(1) EPC and is admissible.

2. *Clarity of claims (main request)*

2.1 The first characterising feature of claim 1 refers to a number of modes of motion compensation which include "for at least one type of picture a plurality of motion compensation modes such that different motion compensation is provided for frame coding and field coding". It is not immediately clear what is to be understood by "type" of picture. In the context the Board considers that "type" does not refer to frames or fields, but to those pictures which undergo motion compensation, i.e. P-pictures and B-pictures, even though there is no other reference to such pictures in the claim. The claim must therefore be interpreted as requiring, for at least some motion-compensated pictures, separate motion compensation modes for frame and field coding.

2.2 Claim 1 of the main request refers to separating a "macroblock" of pixels into a first and a second "subblock". The expressions in inverted commas are not defined in the claim, but it is clear from the description (see page 8, line 55 to page 9, line 55 of the published application) that macroblocks and subblocks are respectively 16 by 16 and 16 by 8 blocks of pixels. The Board accordingly understands that frames are divided into macroblocks of pixels which are in turn divided into subblocks. A frame macroblock may apparently be divided into two field subblocks.

2.3 The claims are accordingly adequately clear, Article 84 EPC.

3. *Admissibility of amendments*

3.1 The Board considers the amendments to the independent claims to comply with Article 123(2) EPC, see in particular page 8, line 55 to page 9, line 55 of the published application.

4. *Background to the invention*

4.1 By their nature video signals, particularly if digital, require a high transmission bandwidth; this problem becomes even more acute in the case of HDTV systems. Solutions have been proposed by the Motion Picture Experts Group (MPEG) in which a number of separate techniques are combined to reduce bandwidth. One is spatial redundancy coding, in which data from individual pictures is compressed using an algorithm such as the Discrete Cosine Transform (DCT) and/or using predictive coding. Another technique is temporal

redundancy coding, which makes use of similarities in successive pictures to reduce data, for example by differential encoding so that temporally unchanging data need not be repeated, see for instance D1 at pages 1 and 2. This gives rise to formats in which pictures of different types are sent in sequence, the so-called Group of Pictures (GOP) format: an I-picture is a full video frame, whilst a P-picture is predictively encoded with respect to a previous I (or P) picture and a B-picture is bidirectionally encoded. Finally, the individual pictures are split into so-called macroblocks of pixels which in the case of P and B pictures are subjected to motion compensation, meaning that instead of actual data a motion vector indicating movement of the data is sent, see for instance page 5, lines 30 to 47 of the published application.

4.2 At the priority date of the application a problem in implementing a practical system arose from the use in standard TV systems of interlaced scanning, i.e. rather than sending a picture as a single frame each frame is made up of two interlaced fields. Because the fields are sent sequentially, artefacts can arise in the event of horizontal picture motion. This problem can be solved by providing separate field and frame data compression modes and selecting between them; the question then arises of how the decision is made as to which mode is appropriate at any given time (see D1, page 1, last paragraph to page 2, last paragraph; and D2, column 2, line 37 to column 3, line 25).

4.3 In D1 the differences between corresponding pixels in the successive fields and frames are calculated separately and in dependence on which difference is

greater a decision is taken as to which mode should be used for data compression, see page 3, lines 4 to 24 and Figure 7. The process is said to be suitable *inter alia* for 16 by 16 and for 16 by 8 macroblocks in the case of frame and field data respectively, see page 5, lines 9 to 15. There is no discussion of the specific data compression used, although DCT and "vector quantizing" - presumably motion compensation - are mentioned, see page 4, lines 13 to 17.

4.4 Turning to D2, in the preferred embodiment both signals undergo the same motion compensation, see column 12, lines 10 to 12, and data compression is thereafter carried out on the two signals separately, see column 8, lines 38 to 57 and Figure 3. The compressed signals are only then evaluated to determine which has the greater error, see column 4, lines 8 to 17.

5. *Inventive step (main request)*

5.1 It is common ground that the most relevant documents in the present proceedings are D1 and D2. The Board has also considered the rest of the prior art cited in the European Search Report, including highly relevant documents falling in the Article 54(3) EPC field, and accepts that the claims of both requests are novel. The primary issue to be decided is accordingly that of inventive step in the light of the above-mentioned documents.

5.2 D1 does not disclose apparatus as such but rather a method; the Board takes the view however that the skilled person, given the method, would find it obvious to provide suitable hardware for its implementation. It

therefore appears that the skilled person, starting out from D1, could be expected to provide encoding apparatus in accordance with the claim preamble, i.e. a receiver for receiving a digital video signal made up of frames of interlaced fields and an encoder having modes for coding frame and field data.

5.3 The technical problem to be solved by the present invention may therefore be seen in a further improvement of data compression and image reconstruction as set out at page 3, line 52 to page 4, line 1 of the published application. Although D1 does refer in passing to "vector quantizing", and to macroblocks and subblocks, see point 3.1 above, the blocks are discussed in the context of DCT compression and there is no suggestion of a plurality of motion compensation modes and separate motion compensation of subblocks as required by the characterising part of claim 1. Nor does it appear to the Board that the skilled person would have any reason to modify the D1 disclosure in a manner which would lead to the claimed subject-matter.

5.4 Claim 12 relates to decoding apparatus in which subblocks are decoded with differing motion compensation vectors. D1 does not discuss decoding; in the light of the discussion of encoding at point 4.3 above the Board considers that the skilled person would not be led by D1 to the claimed decoding apparatus.

5.5 Turning now to D2, Figure 3 shows a receiver (scan converter 32) for receiving a digital video signal made up of frames of interlaced fields, and encoders having modes for coding frame data (42, 44, 46) and field data

(36, 38). The preamble of claim 1 is accordingly known from D2. However, as noted at point 3.4 above both frame and field signals undergo the same motion compensation, data compression thereafter being carried out on the two signals separately. Referring to Figure 3, only a single motion compensator 64 and motion estimator 66 are provided. The skilled person, faced with the above-mentioned problem, is accordingly not taught to provide a number of modes of motion compensation and separate motion compensation of subblocks as required by the characterising part of claim 1. Nor does it appear to the Board to be obvious to provide these features.

5.6 As regards claim 12, the decoding apparatus disclosed at column 12, line 54 to column 13, line 12 of D2 and shown at Figure 8 provides motion compensation for each pixel block, see column 12 at lines 56 and 57. There is no suggestion of the division of macroblocks into subblocks each of which is separately compensated.

5.7 The Board accordingly concludes that the subject-matter of each of claims 1 and 12 involves an inventive step having regard to the disclosure of D1 or D2. Nor does it appear to the Board that a combination of D1 and D2 or of either with any other document cited in the European Search Report would lead the skilled person to the claimed invention.

6. In view of the Board's conclusions on the main request it is not necessary to consider the auxiliary request.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside

2. The case is remitted to the first instance with the order to grant a patent on the basis of claims 1 and 12 of the main request filed with letter dated 25 November 2002, the dependent claims, description and drawings to be adapted.

The Registrar: The Chairman:

M. Kiehl S. V. Steinbrener