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**Datasheet for the decision
of 24 September 2009**

Case Number: T 1929/08 - 3.5.05

Application Number: 96302679.4

Publication Number: 0741469

IPC: H04L 1/02

Language of the proceedings: EN

Title of invention:

Apparatus and methods for decoding a communication signal

Applicant:

AT&T IPM Corp.

Headword:

Encoding/Decoding of training sequences/AT&T

Relevant legal provisions:

EPC Art. 52(1), 54(1), (2), 56, 84, 111(1), 123(2)
RPBA Art. 15(3)

Keyword:

"Main request - clarity (no)"
"Auxiliary requests 1 and 2 - Added subject-matter (yes)"
"Auxiliary request 3 - clarity and novelty (yes)"

Decisions cited:

-

Catchword:

-



Case Number: T 1929/08 - 3.5.05

D E C I S I O N
of the Technical Board of Appeal 3.5.05
of 24 September 2009

Appellant:

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Representative:

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Decision under appeal:

Decision of the Examining Division of the
European Patent Office posted 28 February 2008
refusing European application No. 96302679.4
pursuant to Article 97(2) EPC.

Composition of the Board:

Chairman: D. H. Rees
Members: M. Höhn
F. Blumer

Summary of Facts and Submissions

I. This appeal is against the decision of the examining division dispatched 28 February 2008, refusing European patent application No. 96302679.4 for lack of clarity (Article 84 EPC 1973) and for lack of novelty (Article 52(1) EPC and Article 54 EPC) over prior art documents:

D1: SESHADRI N ET AL: "ADVANCED TECHNIQUES FOR MODULATION, ERROR CORRECTION, CHANNEL EQUALIZATION, AND DIVERSITY", AT&T TECHNICAL JOURNAL, AMERICAN TELEPHONE AND TELEGRAPH CO. NEW YORK, US, vol. 72, no. 4, 1 July 1993, pages 48-63, ISSN: 8756-2324; and

D2: EP-A-0 641 101.

II. The notice of appeal was filed with letter dated 22 April 2008 in which it was requested that the decision under appeal be set aside and a patent be granted. The appeal fee was paid on 28 April 2008. With the statement setting out the grounds of appeal dated 16 June 2008, the appellant filed a set of claims 1 to 5 according to a main request and a further set of claims 1 to 5 according to an auxiliary request.

III. A summons to oral proceedings to be held on 24 September 2009 was issued on 14 May 2009. In an annex accompanying the summons the board expressed the preliminary opinion that the subject-matter of the independent claims 1 and 4 of both requests did not fulfil the requirements of Article 84 EPC. The board gave its reasons for the objection. The board further noted that, since inventive step had not been dealt

with before the first instance, remittal to the department of first instance for further prosecution might be expected (Article 111(1) EPC) in case the objection under Article 84 EPC could be overcome.

- IV. With a letter dated 16 July 2009 the appellant filed four amended sets of claims 1 to 5 as a new main request and new auxiliary requests 1 to 3. The appellant informed the board that nobody would be attending the oral proceedings set for 24 September 2009 and requested that the oral proceedings be cancelled and that the procedure be continued in writing.
- V. The appellant was informed that the date for oral proceedings was maintained.
- VI. Independent claim 1 according to the main request reads as follows:

"1. An apparatus (111) for decoding communication signals, said apparatus characterised by:
means for receiving an input signal representing a communication between a first node and a second node, said input signal including a desired data signal encoded using a combination code and at least one interfering signal, said desired data signal including at least a first data set which includes a training sequence; and
processing means (206) for decoding said input signal to produce an output signal representing at least a portion of said desired signal, said processing means decoding the encoded training sequence to identify the training sequence within said input signal, said

processing means further generating a plurality of taps utilizing said identified training sequence, said processing means applying said plurality of taps to the input signal to suppress said at least one interfering signal and to produce said output signal."

Claim 1 of auxiliary request 1 differs from claim 1 of the main request in that the feature "using a combination code" has been replaced by "using one of a linear combination code and a Hamming code".

Claim 1 of auxiliary request 2 differs from claim 1 of the main request in that the feature "using a combination code" has been replaced by "using one of a linear combination code and an extended Hamming code".

Claim 1 of auxiliary request 3 differs from claim 1 of the main request in that the feature "using a combination code" has been replaced by "using one of a linear combination code and (8,4) extended Hamming code".

The subject-matter of independent method claim 4 of all requests essentially corresponds in terms of method features to that of claim 1 of the respective request.

VII. The appellant requested in writing that the decision under appeal be set aside and that a patent be granted on the basis of the main request, or, subsidiarily, on the basis of any of auxiliary requests 1 to 3, all requests filed by letter of 16 July 2009.

VIII. Oral proceedings were held on 24 September 2009 in the absence of the appellant. After deliberation on the

basis of the submissions and requests, the board announced its decision.

Reasons for the Decision

1. *Admissibility*

The appeal is admissible.

2. *Non-attendance of oral proceedings*

In its letter of 16 July 2009 the appellant announced that it would not be represented at the oral proceedings and requested that the procedure be continued in writing. The board considered it to be expedient to maintain the set date for oral proceedings. Nobody attended the hearing on behalf of the appellant.

Article 15(3) RPBA stipulates that the board shall not be obliged to delay any step in the proceedings, including its decision, by reason only of the absence at the oral proceedings of any party duly summoned who may then be treated as relying only on its written case.

The appellant also had to expect that the board would discuss the appellant's newly filed main request and auxiliary requests 1 to 3 in respect of their compliance with, inter alia, Article 84 EPC and Article 123(2) EPC, as it had been warned in the board's annex to the summons for oral proceedings.

Thus, the board was in a position to take a decision at the end of the hearing.

Main request

3. *Amendments (Article 123(2) EPC)*

3.1 In section 8.1 of the appealed decision it was mentioned that, in contrast to claim 1 before the examining division, the previous claim 1 had been restricted to the encoding of the training sequence only. It is not clear whether this was intended as an objection (the section appears to relate to Article 113(1) EPC). At any rate an objection under Article 123(2) EPC (and thereby any corresponding objection against present amended claim 1) would not be justified since it was originally disclosed that the whole desired data signal is encoded using a combination code (see e.g. p. 5, l. 8-9 and p. 6, l. 6-10 of the original description).

3.2 Equally if section 8.2 of the appealed decision intended to raise an objection based on a generalisation of the feature of the output signal of claim 1 to just being directed to at least a portion of the desired signal instead of the whole communication, any such objection has been overcome by replacing this formulation by "suppress said at least one interfering signal and to produce said output signal" in present amended claim 1 as disclosed e.g. on p. 17, l. 19 or on p. 6, l. 12-13 of the original description.

3.3 The subject-matter of amended independent claims 1 and 4 is originally disclosed in the application as published on p. 2, l. 54 to p. 3, l. 1 and on p. 3, l. 6-12 in combination with p. 5, l. 14 to p. 6, l. 14 or original claim 34. With regard to the added feature of

decoding the encoded training sequence, in the application as published it is disclosed that the input signal as a whole is decoded (see e.g. p. 3, l. 16 or p. 6, l. 21) and the input signal comprises a desired signal that comprises a first data set (see e.g. p. 3, l. 8-9) which can comprise a training sequence (see e.g. p. 5, l. 45; original claim 4). At least the first data set and therefore also the training sequence are encoded (see e.g. p. 3, l. 9 of the application as published). Therefore, when decoding the input signal as a whole, the training sequence therein will be decoded as well.

The same information is found in the originally filed description on p. 5, l. 1 to p. 7, l. 5 and p. 20, l. 10 to p. 22, l. 21.

Hence, the added feature of decoding the encoded training sequence is at least implicitly disclosed in the original application documents.

3.4 Original claims 1, 15 and 34 are directed to the use of a combination code in general for encoding the training sequence. The application as originally filed therefore provides a literal disclosure for the use of a "combination code".

3.5 The subject-matter of dependent claims 2, 3 and 5 is originally disclosed on p. 20, l. 20 to p. 21, l. 3 as well as on p. 22, l. 6-10 and l. 18-21 of the original description and in original claim 21.

Thus, the requirements of Article 123(2) EPC are fulfilled.

4. Clarity (Article 84 EPC)

The term "combination code" used in claims 1 and 4 is unclear, since according to the description (see e.g. p. 5, l. 16) this term comprises the use of "algebraic combination codes" which expression, however, does not have a clear meaning in the art. The original description fails to give a definition what is understood by an "algebraic combination code" in the context of the present application. Despite having been invited to do so in the annex to the summons for oral proceedings, the appellant did not provide the board with a document or indeed any arguments indicating that this term had an accepted meaning in the art before the priority date. An (8,4) extended Hamming Code is mentioned as a single example for such an "algebraic combination code" without indicating what the required features would be for a code to qualify as an "algebraic combination code".

The wording of independent claims 1 and 4 therefore does not define the subject-matter for which protection is sought in a manner sufficiently clear. Thus, the main request does not fulfil the requirements of Article 84 EPC.

Auxiliary request 1

Independent claims 1 and 4 of this request are directed to "using one of a linear combination code and a Hamming code".

5. *Amendments (Article 123(2) EPC)*

The description discloses a plurality of different embodiments for a linear combination code (see the linear combination codes mentioned on p. 5, l. 18 onwards, and p. 11, l. 12-20, in particular the definition given on p. 5, l. 18 and 19). Therefore the board accepts that linear combination codes can be claimed in general. Moreover the skilled person would be familiar with the concept of a linear function or combination of variables, so that the terminology adopted is appropriate to the context. On the other hand since there was no accepted meaning in the art before the priority date for the expression "algebraic combination code" and the application only discloses an (8,4) extended Hamming Code as a single example (see on p. 11, l. 21 onwards of the published application), there is no direct and unambiguous disclosure for the use of Hamming codes in general.

Amended claims 1 and 4 of this request therefore do not fulfil the requirements of Article 123(2) EPC.

Auxiliary request 2

Independent claims 1 and 4 of this request are directed to "using one of a linear combination code and an extended Hamming code".

6. *Amendments (Article 123(2) EPC)*

The application only discloses an (8,4) extended Hamming Code as a single example (see on p. 11, l. 21 onwards of the published application). However, there

is no direct and unambiguous disclosure for the use of other extended Hamming codes in general for carrying out the invention.

Amended claims 1 and 4 of this request therefore do not fulfil the requirements of Article 123(2) EPC.

Auxiliary request 3

Independent claims 1 and 4 of this request are directed to "using one of a linear combination code and a (8,4) extended Hamming code".

7. Amendments (Article 123(2) EPC)

The application explicitly discloses an (8,4) extended Hamming Code as an example (see on p. 11, l. 21 onwards of the published application) for carrying out the invention. Hence, the wording of independent claims 1 and 4 is restricted to the concrete example given for an "algebraic combination code" in the original application. Therefore, the amendment is directly and unambiguously disclosed under Article 123(2) EPC.

8. Clarity (Article 84 EPC)

8.1 The clarity objection raised in the appealed decision against the category of previous claim 2 is strictly no longer relevant since claim 2 has been substantially amended. However, an analogous objection that apparatus features are apparently defined by method steps still applies to present claims 2 and 3. The board considers this a minor matter of formulation which could be dealt with in a Rule 71(3) communication.

- 8.2 The feature "suppressing said second data set with respect to said first data set" of previous claim 4 objected to in section 6 of the appealed decision is still found in present amended claim 4. The same formulation is found in original independent method claim 15.

The board does not agree with the examining division. It is clear from the application as a whole that interfering signals are to be eliminated by the use of an equalizer for which the coefficients ("taps") are to be determined. The board judges it to have been well known in the art that such an equalizer is used for suppressing specific frequencies. In the light of the common general knowledge of the skilled reader, the wording and the function of the feature objected to is clear. The rest of the claim defines that the first data set comprises the desired signal and the training sequence whereas the second data set consists of an interfering signal. The skilled reader will understand that the interfering signal shall be eliminated in order to achieve the desired signal as an output signal.

Thus the objections under Article 84 EPC in the appealed decision are therefore either not justified or have been overcome by amendment.

9. Novelty (Article 52(1) EPC and Article 54(2) EPC)

- 9.1 The examining division's objection is based on the premise that none of the independent claims actually specifies that an encoded training sequence is being decoded. The examining division argued the independent

claims only define that the training sequence is identified. Whether or not the training sequence was encoded at the transmitter side was irrelevant for the functioning of the claimed decoding apparatus and method, because in any case the pattern remains recognizable or "identifiable" by the receiver. The claimed decoder was considered to work independently of the fact that the training sequence is encoded at the transmitter. The examining division therefore concluded that the feature "said input signal including a desired signal encoded using one of a linear combination code and an algebraic combination code" which comprises the training sequence which, too, is therefore encoded was not limiting for the subject-matter of independent apparatus claim 1. Hence, this feature did not distinguish the subject-matter of claims 1 and 4 from the prior art documents D1 and D2 (see sections 1, 2 and 9 of the appealed decision).

9.2 However, in addition to replacing the term "algebraic combination code" by the concrete example found in the original application, the appellant has reacted to this objection by introducing a specific step of "decoding the encoded training sequence" into claims 1 and 4.

In amended apparatus claim 1 the processing means for decoding are not specified by structural features. This raises the question whether a decoder may be specified by the encoding of the signal it receives for the purpose of decoding, if no decoding means are specified in detail. In the concrete case of the present application the appellant has not explicitly specified that the decoding means are operable to decode the input signal using a linear combination code or a (8,4)

extended Hamming code. Instead the information regarding the code used is limited to the encoding of the input signal, which includes the training sequence.

If an apparatus claim only defines that decoding means are able to receive and decode a signal having a specific structure (here being encoded) without specifying any concrete features of the means for decoding, it has to be ensured that such a feature really provides a solution and does not have to be considered a mere desideratum. Functional features require that they imply to the skilled reader at least one concrete realization for this feature. The board regards this condition as fulfilled in the present situation, because if the training sequence has been encoded using a linear combination code or an (8,4) extended Hamming code, a suitable algorithm has to be applied for successfully decoding and identifying the training sequence. The skilled reader will therefore interpret the decoding means (claim 1) or the step of decoding (claim 4) in such a way that knowledge of the code and the algorithm used for encoding the input signal with the training sequence is used for decoding as well.

The amendment resulting in the added feature "decoding the encoded training sequence to identify the training sequence within the input signal" is therefore considered a limiting feature in independent claims 1 and 4, limiting the scope of the claimed subject-matter to the use of a linear combination code or an (8,4) extended Hamming code for decoding and identifying the encoded training sequence.

9.3 D1 discloses the use of a training sequence in order to determine equalizer coefficients for removing interference signals (see p. 53, right hand column). Even if one considers the reference to GSM and IS-54 in D1 as involving a channel coding (see p. 54, left hand column, and in particular figure 4 with use of CRC computation followed by a convolutional coding for digital speech transmission for IS-54), this implies only encoding/decoding of the speech information to be transmitted in general. There is no disclosure that training sequences are encoded and decoded the same way in D1 as in GSM or IS-54. It is explicitly noted in D1 that GSM and IS-54 do not specify the method of equalization (see p. 54, left hand column, first paragraph). Such a general teaching, however, clearly does not disclose and anticipate the use of a linear combination code or a (8,4) extended Hamming code for encoding/decoding of a training sequence to identify the training sequence, intended to be used for determining the taps of the equalizer.

This is an issue concerning whether the skilled person would have regarded such a measure as obvious in the light of the teaching of D1 when taking into account the common general knowledge or further prior art, i.e. it is part of the examination of inventive step under Article 56 EPC, but not of novelty. As to the GSM and IS-54 standards, the examining division did not raise an objection for lack of novelty based on any document describing said standards, e.g. document D1.

D2 discloses an adaptive equalizer, but discloses neither training sequences nor algorithms for their decoding. Even if one considers the use of a training sequence to be implied by the indication to use

conventional techniques for updating equalizer coefficients according to channel conditions (as argued by the examining division in section 3 of the appealed decision), this clearly does not anticipate encoding/decoding of the training sequence using one of a linear combination code and an (8,4) extended Hamming code.

Thus neither prior art document D1 nor D2 discloses decoding a training sequence that has been encoded using a linear combination code or an (8,4) extended Hamming code. The subject-matter of independent claims 1 and 4 is therefore novel over the disclosure of D1 or the disclosure of D2.

Thus, the auxiliary request 3 overcomes all the objections of the appealed decision.

10. The appealed decision was solely based on Articles 52(1), 54(1) and (2) and 84 EPC. In particular, the requirement of Article 56 EPC has not yet been examined by the first instance for the subject-matter of the present claims on file, which now include the aspect of decoding the training sequence encoded with a linear combination code or an (8,4) extended Hamming code to identify the training sequence. The board therefore informed the appellant in the annex to the summons dated 14 May 2009 that it intended to remit the file to the first instance for further prosecution (Article 111(1) EPC) if the objections under Article 84 EPC were overcome.

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 on the basis of the third auxiliary request.

The Registrar

The Chairman

K. Götz

D. H. Rees