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Datasheet for the decision of 25 August 2011

Case Number: T 0365/08 - 3.5.05

Application Number: 04811202.3

Publication Number: 1692833

IPC: H04L 25/03

Language of the proceedings: EN

Title of invention:
Methods and apparatus for pre-filtering a signal to increase signal-to-noise ratio and decorrelate noise

Applicant:
Telefonaktiebolaget L M Ericsson (Publ)

Headword:
Methods and apparatus for pre-filtering a signal/ERICSSON

Relevant legal provisions:
EPC Art. 123(2)
RPBA Art. 15(3)

Relevant legal provisions (EPC 1973):
EPC Art. 84
EPC R. 71(2)

Keyword:
"Non-attendance at oral proceedings"
"Clarity and support by the description - no (main and auxiliary request)"
"Extension of subject-matter - yes (main and auxiliary request)"

Decisions cited:
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Case Number: T 0365/08 - 3.5.05

D E C I S I O N
of the Technical Board of Appeal 3.5.05
of 25 August 2011

Appellant: Telefonaktiebolaget L M Ericsson (Publ)
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Decision under appeal: **Decision of the Examining Division of the European Patent Office posted 28 September 2007 refusing European patent application No. 04811202.3 pursuant to Article 97(1) EPC 1973.**

Composition of the Board:

Chair: A. Ritzka
Members: P. Corcoran
G. Weiss

Summary of Facts and Submissions

I. This appeal is against the decision of the examining division to refuse the European patent application no. 04 811 202.3, publication no. EP 1 692 833. The decision was dispatched on 28 September 2007.

II. The decision under appeal was based on a request comprising a set of claims 1 to 6 filed with the letter dated 28 May 2007. The examining division found that claims 1 and 4 of the request failed to meet the requirements of Article 84 EPC.

III. Notice of appeal was received at the EPO on 29 November 2007 with the appeal fee being paid on the same date. A written statement setting out the grounds of appeal was received at the EPO on 31 January 2008. With said written statement setting out the grounds of appeal the appellant filed a new main request (i.e. "Claim set I") and an auxiliary request (i.e. "Claim set II"), both requests comprising claims 1 to 4.

In the written statement setting out the grounds of appeal, the appellant submitted *inter alia* that the invention according to the main request (i.e. "Claim set I") related to a DFE filter designed to suppress the contribution from the precursor channel taps, i.e. the taps lying before the main channel tap only. It was further submitted that the invention also related to a hybrid DFE and hybrid CSE pre-filters which are designed to partially suppress the feedback taps.

IV. In a communication accompanying a summons to oral proceedings to be held on 25 August 2011, the board gave its preliminary opinion that the appellant's requests were not allowable, in particular, because they did not appear to comply with the requirements of Articles 84 EPC 1973 and Article 123(2) EPC.

V. The board objected *inter alia* to the use of the term "pre-filter taps" in the independent claims of the appellant's requests. It was also noted that the description of the application disclosed a plurality of embodiments of the invention and that the issue of compliance with the requirements of Article 84 EPC 1973 was unlikely to be resolved in the appellant's favour unless it could be clarified in a satisfactory manner which of the disclosed embodiments were intended to be covered by the independent claims of the requests.

The appellant was also advised that, if it were to succeed in overcoming the aforementioned objections, the board would be inclined to remit the case to the department of first instance for further prosecution.

VI. In a letter of reply dated 4 July 2011, the appellant's representative stated that the appellant wished the board to make a decision in the case based on the documents and claims on file.

The letter contained the following additional statement which the board interpreted as a notification that the appellant would not be represented at the oral proceedings: "Further, the oral proceedings has to take place without any representation from the Applicant".

No substantive written response was submitted in relation to the issues raised by the board in its communication.

VII. The appellant has requested that the decision under appeal be set aside and that a patent be granted on the basis of a main request comprising claims 1-4 (i.e. "Claim set I") as submitted with the written statement setting out the grounds of appeal, or subsidiarily on the basis of an auxiliary request comprising claims 1-4 (i.e. "Claim set II") and likewise submitted with said written statement.

VIII. The further documents on which the appeal is based, i.e. the text of the description and the drawings, are as follows:

Description, pages:

2-10 as published;

1 as filed with the letter dated 28 May 2007.

Drawings, sheets: 1/2-2/2 as published.

IX. Claim 1 of the main request reads as follows:

"A method for receiving a signal from a multiple-input-multiple-output (MIMO) communication channel having a plurality of input channels and a plurality of output channels, the method comprising the steps of:

generating (400) initial channel taps (H) that represent an impulse response estimate of the MIMO communication channel;

generating (410) pre-filter taps such that

pre-filtering of the received signal (y) using the pre-filter taps generates a prefiltered signal (y') comprising a desired pre-filtered signal corresponding to desired pre-filtered channel taps, an undesired pre-filtered signal corresponding to undesired pre-filtered channel taps and filtered background noise, wherein the desired and undesired pre-filtered channel taps are based on the initial channel taps and the pre-filter taps, and

characterised in that

the undesired pre-filtered channel taps comprise fractionally weighted feedback channel taps,

the filtered noise at the pre-filter output branches is independent, where the filtered noise comprises the filtered background noise and the undesired pre-filtered signal, and

maximizing the signal-to-noise ratio, SNR, where the SNR is defined as the sum of the ratios of the energies of the desired pre-filtered signal to the corresponding energies of the filtered noise at the pre-filter output branches."

Claim 3 of the main request seeks protection for substantially the same subject-matter as claim 1 of the request in the form of a further independent claim directed towards a receiver.

X. Claim 1 of the auxiliary request reads as follows:

"A method for receiving a signal from a multiple-input-multiple-output (MIMO) communication channel having a plurality of input channels and a plurality of output channels, the method comprising the steps of:

generating (400) initial channel taps (H) that represent an impulse response estimate of the MIMO communication channel;

generating (410) pre-filter taps such that

pre-filtering of the received signal (y) using the pre-filter taps generates a prefiltered signal (y') comprising a desired pre-filtered signal corresponding to desired pre-filtered channel taps, an undesired pre-filtered signal corresponding to undesired pre-filtered channel taps and filtered background noise, wherein the desired and undesired pre-filtered channel taps are based on the initial channel taps and the pre-filter taps, and

characterised in that

the undesired pre-filtered channel taps comprise fractionally weighted feedback channel taps,

the filtered noise at the pre-filter output branches is independent, where the filtered noise comprises the filtered background noise and the undesired pre-filtered signal, and wherein the generated pre-filter taps are given by an orthonormal linear combination involving the eigenvectors corresponding to the largest eigenvalues of a matrix C that is dependent of a further matrix representing the autocorrelation of the desired signal component such that the signal-to-noise ratio, SNR, is maximized where the SNR is defined as the sum of the ratios of the energies of the desired pre-filtered signal to the corresponding energies of the filtered noise at the pre-filter output branches."

Claim 3 of the auxiliary request seeks protection for substantially the same subject-matter as claim 1 of the request in the form of a further independent claim directed towards a receiver.

XI. Oral proceedings were held as scheduled on 25 August 2011. Nobody appeared on behalf of the appellant. The chairperson summarised the relevant facts as appearing from the file and, after due deliberation, proceeded to announce the decision.

Reasons for the Decision

1. The appeal is admissible. However, it is not allowable since the appellant's requests do not comply with the requirements of the EPC for the reasons given below.

2. *Non-attendance at oral proceedings*

2.1 In the present case, the board judged that it was appropriate to proceed by holding the oral proceedings as scheduled in the absence of the appellant as foreseen under Rule 71(2) EPC 1973, particularly in view of the fact that the appellant had not withdrawn the precautionary request for oral proceedings but had merely indicated to the board that it would not be represented at the scheduled proceedings (cf. Facts and Submissions, item VI. above).

2.2 The appellant could reasonably have expected that during the oral proceedings the board would consider the objections and issues raised in the communication annexed to the summons to oral proceedings (cf. Facts and Submissions, item V. above). In deciding not to attend the oral proceedings, the appellant effectively chose not to avail of the opportunity to present its observations and counter-arguments orally but instead to rely on its written case (cf. Article 15(3) RPBA).

2.3 It is further noted that the appellant did not submit any substantive written response to the issues raised by the board in its communication. Therefore, the appellant's written case corresponds to that presented in the written statement setting out the grounds of appeal.

2.4 In view of the foregoing, the board concludes that the appellant had an opportunity to present comments on the grounds and evidence on which the board's decision is based. The reasons on which the decision is based do not constitute a departure from grounds or evidence previously put forward and on which the appellant had been given an opportunity to comment.

Main request

3. *Article 84 EPC 1973*

3.1 The description of the present application discloses a plurality of embodiments of the invention (cf. published application: [0030]), *inter alia*:

(i) a channel-shortening equalisation (CSE) pre-filter in which the scaling factor $\gamma = 1$ and the number of feedback taps $n_b = 0$;

(ii) a decision feedback equalisation (DFE) pre-filter in which the scaling factor $\gamma = 0$ and the number of feedback taps $n_b = 1$;

(iii) a hybrid CSE prefilter according to which the scaling factor $\gamma < 1$; and

(iv) a hybrid DFE prefilter in which the scaling factor $\gamma > 0$.

3.2 The appellant submitted in the written statement that the claims of the main request are restricted to a DFE pre-filter (cf. written statement: p.10 l.20-22). However, the appellant did not indicate which claim feature or features provided support for this assertion.
In further passages of the written statement the appellant appeared to argue that the claims were not entirely restricted to a DFE pre-filter but also intended to cover hybrid DFE and CSE pre-filters (cf. written statement: p.10 l.11-12).

3.3 In its communication, the board indicated to the appellant that clarification was required as to which of the disclosed embodiments were intended to be covered by the independent claims of the requests as this was not evident from the wording of said claims (cf. Facts and Submissions, item V. above). In view of the fact that the appellant did not make any response to the board's observations in this regard, the matter has not been resolved to the board's satisfaction.

3.4 The board judges that the wording of claim 1 of the main request does not permit a reliable determination as to which of the disclosed embodiments of the invention are intended to be covered by said claim. On this basis, the board finds that the claim does not define the matter for which protection is sought with sufficient clarity to meet the requirements of Article 84 EPC 1973.

3.5 It is further noted that the pre-characterising part of claim 1 of the main request introduces the term "pre-filter taps" in the context of a step which specifies "generating (410) pre-filter taps".

3.6 The description, however, only refers to "initial channel taps" which are generated based on an impulse response

estimate of the MIMO communication channel and "output channel taps" which are generated by pre-filtering the received signal using the initial channel taps (cf. published application: [0005]). Moreover, according to the description, the reference sign 410 refers to the pre-filtering of a received signal using the initial channel taps (cf. application: [0035]) and not to the generating of pre-filter taps as implied by its use in claim 1.

3.7 The use of the term "pre-filter taps" in claim 1 is thus found to give rise to a lack of clarity and also to lack support by the description. In particular, there is no support by the description for the claimed step of "generating ... pre-filter taps".

3.8 In view of the foregoing, the board finds that claim 1 of the main request fails to comply with the requirements of Article 84 EPC 1973.

4. *Article 123(2) EPC*

4.1 The board cannot identify any direct and unambiguous disclosure of "pre-filter taps" in the application as filed, nor is there any direct and unambiguous disclosure of a step of "generating ... pre-filter taps" as recited in claim 1. For this reason, the amendments to claim 1 in this respect are found to introduce subject-matter extending beyond the content of the application as originally filed contrary to Article 123(2) EPC.

5. The aforementioned deficiencies also apply *mutatis mutandis* to claim 3 of the request. In view of these deficiencies, the main request is not allowable.

Auxiliary request

6. The deficiencies noted under 3. and 4. above also apply to claims 1 the auxiliary request and *mutatis mutandis* to claim 3 of said request. In view of these deficiencies, the auxiliary request is also not allowable.

Conclusions

7. In the absence of an allowable request the appeal must be dismissed.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chair:

K. Götz A. Ritzka