DECISION
of 17 July 2001

Case Number: T 0395/98 - 3.5.1

Application Number: 92310670.2

Publication Number: 0550144

IPC: H04Q 1/457, H04L 27/30

Language of the proceedings: EN

Title of invention:
Method and apparatus for detection of a control signal in a communication system

Applicant:
AT&T Corp.

Opponent:
-

Headword:
Detection of control signal/AT&T

Relevant legal provisions:
EPC Art. 56, 111(1)

Keyword:
"Inventive step (no)"
"Remittal to the examining division (no)"

Decisions cited:
-

Catchword:
-
Case Number: T 0395/98 - 3.5.1

DECISION
of the Technical Board of Appeal 3.5.1
of 17 July 2001

Appellant: AT&T Corp.
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Decision under appeal: Decision of the Examining Division of the European Patent Office posted 25 November 1997 refusing European patent application No. 92 310 670.2 pursuant to Article 97(1) EPC.

Composition of the Board:

Chairman: S. V. Steinbrener
Members: A. S. Clelland
V. Di Cerbo
Summary of Facts and Submissions

I. This is an appeal against the decision of the examining division to refuse European patent application No. 92 310 670.2 on the ground that the independent claims lacked inventive step in view of the following prior art documents:

D1: GLOBECOM '82 - Conference Record, vol. 2, 29 November - 2 December 1982, Miami - FL, USA, pages D8.1.1 - D8.1.6, Yoshikazu Ikeda et al., "New Realization of Discrete Fourier Transform Applied to Telephone Signaling System CCITT No. 5"; and


In the notice of appeal, received 8 January 1998, the appellant requested that the decision be cancelled in its entirety and a patent granted. The subsequently filed statement of grounds of appeal argued that neither D1 nor D2 disclosed applying a plurality of tapers to a segment of a communicated signal, or determining a similarity score reflecting a comparison of signal components at the predetermined control signal frequencies.

II. In a communication dated 16 June 2000 the Board inter alia introduced the following document into the proceedings under Article 114(1) EPC:

D3: GB-A-2 166 925

This document had been cited in the European Search
Report. The Board also questioned the clarity of the claims in respect of the use of the term "taper".

III. In a response received on 26 October 2000 the appellant filed new claims 1 to 50 and referred to documents which were said to show that "taper" was a term of art.

IV. The Board issued a summons to oral proceedings dated 30 March 2001; in an accompanying communication the Board indicated that the clarity of the claims and inventive step were to be discussed.

V. With a response dated 18 June 2001 the appellant filed a copy of the prosecution history of the corresponding patent application before the USPTO, in which the following document was the subject of detailed discussion:


VI. In a communication dated 22 June 2001, faxed to the appellant on the same day, the Board introduced D6 into the proceedings under Article 114(1) EPC, noting that D3 and D6 appeared to be relevant to the question of the inventive step of claim 1.

VII. In the course of the oral proceedings before the Board, held on 17 July 2001, the appellant filed an amended claim 1 and requested grant of the patent on the basis of the amended claim 1 and claims 2 to 50 as received on 26 October 2000, with independent claim 26 to be amended in accordance with claim 1.
As an auxiliary request the appellant requested that the case be remitted to the Examining Division, since D3 and D6 had not been mentioned in the contested decision and remittal would give the appellant the benefit of two instances.

VIII. Claim 1 reads as follows:

"A method of discriminating control signal information from non-control signal information, the control signal information for use by a communication system element (60), the control signal information and the non-control signal information included in one or more segments of a signal communicated over a communication system channel (7), the control signal information comprising signal components at one or more predetermined control signal frequencies, the non-control signal information comprising signal components at one or more information signal frequencies, characterized by a method comprising the steps of:

applying a plurality of tapers to a segment of a communicated signal to concentrate energy around frequencies in a spectrum, to obtain a plurality of tapered versions of the segment;

performing a separate transform of each tapered segment;

determining a similarity score based on a transform of a tapered segment and a model of a control signal;

classifying one or more segments of the communicated signal as representing either control signal information or non-control signal information based on
a similarity score; and

providing an indicator signal representative of control signal information to the communication system element (60) when the communicated signal has been classified as representing control signal information."

As noted at point VII. above, claim 26 is a further independent claim, being directed to an apparatus for discriminating control signal information from non-control signal information. Although no specific amendment proposals were formalized it was indicated in the oral proceedings that claim 26 was intended to be amended to include apparatus features corresponding to the method features of claim 1.

IX. At the end of the oral proceedings, the Board's decision was announced by the Chairman.

Reasons for the Decision

1. The appeal complies with the provisions mentioned in Rule 65 EPC and is therefore admissible.

2. The request for remittal

2.1 At the oral proceedings the appellant argued that if the Board were not minded to allow the main request and grant a patent it would be appropriate to remit the case to the examining division. New claims had been filed. D3 had not been discussed by the examining division and D6 was cited for the first time only a few weeks before the oral proceedings. In order to preserve
two instances and allow time for a full consideration of the issues remittal was justified.

2.2 The Board has a discretion under Article 111(1) EPC either to exercise any power within the competence of the examining division or to remit the case. In exercising this discretion the Board will seek to balance the appellant's right to a fair procedure against the right of third parties to legal certainty.

2.3 Dealing firstly with the amendments to claim 1, and the proposed amendments to claim 26, these serve merely to clarify and limit the scope of the claims; they do not give rise to a new situation which would justify remittal.

2.4 Of the cited documents, D3 was cited in the European Search Report as a "Y" document, i.e. relevant to inventive step in combination with another document, whilst D6 is in the name of one of the present inventors and was drawn to the Board’s attention by the appellant. Indeed, both documents were well known to the appellant, having been discussed in detail in the parallel US application: papers from the prosecution history before the USPTO and filed by the appellant in the course of the present proceedings contain a submission to the USPTO dated 23 December 1994 discussing D3 and D6 in detail. Finally, the Board notes that the application is still at the examination stage ten years after the priority date.

2.5 Consequently, the Board does not consider that the case should be remitted to the examining division.

3. The amendments to claim 1
The Board is satisfied that the amended claim 1 meets the requirement of Article 123(2) EPC as to added subject-matter and is adequately clear and supported by the description, Article 84 EPC. As noted above, no concrete amendments were put forward for claim 26.

4. Technical background

4.1 DTMF control tones, now in general use for analogue phone signalling, can be confused by the exchange with speech, a phenomenon referred to in the application as "talk-off". It is therefore necessary to provide a discriminator which will detect only the control tones and reject speech or other extraneous signals. One way of doing this is to time-divide an incoming signal into data windows or segments; such windows start and end abruptly and are referred to in the art as "rectangular" windows. Each window is subjected (typically) to FFT or DFT processing to provide an output in the frequency domain in the form of a power spectrum which can be compared with a reference. By deriving a similarity score between the processed signal and a processed model control signal the input signal can be classified as either being or not being a control signal.

4.2 However, directly performing a transform on rectangular data windows has undesirable results. The abrupt start and end of the window causes the generation of Fourier components or "sidelobes" and leads to a distortion of the derived power spectrum, termed "spectral leakage"; by control of the amplitude across the windows before transformation this can be avoided, see eg document D1 at sections 2.5.1 and 2.5.2. In the application a plurality of "taper" functions are used, the preferred
functions being of a class referred to as "discrete prolate spheroidal sequences" or DPSS.

5. **Inventive Step**

5.1 Although the contested decision relies upon D1, the Board takes the view that the single most relevant document is D3.

5.2 Referring to D3 the document discloses, in the language of claim 1, a method of discriminating control signal information \( x(n) \), Figure 2) from non-control signal information (page 5, lines 46 to 51), the control signal information for use by a communication system element (Figures 1 and 2, PABX CONTROL), the control signal information and the non-control signal information included in one or more segments of a signal communicated over a communication system channel (TRUNK CIRCUIT), the control signal information comprising signal components at one or more predetermined control signal frequencies (page 1, lines 9 to 16) and the non-control signal information comprising signal components at one or more information signal frequencies (implicit in any PABX system).

5.3 In accordance with D3 a similarity score is determined; referring to Figure 2, based on a transform (DFT circuit 5 in Figure 1) of a segment and a model of a control signal (REF TONE GEN 9 in Figure 1, \( \cos nF \) and \( \sin nF \) in Figure 2) the signal energy at the control signal frequency (25) is compared (26) with the total signal energy (18) to classify the input signal as either a control signal or not. In other words, each segment (ie window) of the communicated signal is classified as representing either control signal...
information or non-control signal information and a signal (TO PABX CONTROL in Figure 2) indicates when the communicated signal has been classified as representing control signal information (page 5, lines 52 to 70).

5.4 The subject-matter of claim 1 accordingly differs from that of D3 in that the claim requires that a plurality of tapers be applied to a segment of a communicated signal to concentrate energy around frequencies in a spectrum, to obtain a plurality of tapered versions of the segment. Therefore, the technical problem solved with respect to D3 may be seen in avoiding spectral leakage and hence false tone detections.

5.5 However, as has been pointed out above (see point 4.2) the skilled person starting from D3 would be aware that the use of a rectangular window function gives rise to the problem of "spectral leakage", which causes an undesirable level of false detections. The solution to this problem, the use of a tapered window function in order to improve spectral resolution, is known per se, D6 being one of a number of documents which suggest it. D6 is concerned with spectral analysis in order to derive "line components", i.e. discrete frequencies or tones, whilst enabling the use of data windows, see page 1056, left hand column. It suggests at pages 1059 to 1061 the use of the DPSS function, the appellant’s preferred function, as a tapered window function. In Figure 1 at page 1061 the first five functions of a DPSS series are shown; the text, see particularly that relating to equation 3.6 at page 1060 and to Figures 2 and 3 at page 1063, indicates that the first five DPSS functions are summed and averaged. In other words, D6 discloses the application of a plurality of tapers to a single data window.
5.6 The skilled person seeking to solve the problem of spectral leakage in the D3 method would find the solution in D6. By applying the teaching of D6 to D3 the skilled person would thus arrive at the subject matter of claim 1. The Board accordingly concludes that the subject matter of claim 1 lacks an inventive step, Articles 52(1) and 56 EPC. The same objection applies to a notionally amended claim 26.

5.7 The appellant argued at the oral proceedings that D3 taught away from using tapered window functions, reference being made to the statement on page 3 (line 8) that "Since the present invention requires no accurately tuned bandpass filters, the cost disadvantage of the ... prior art tone detectors is overcome". The Board does not interpret this statement as teaching away from using tapered window functions; D3 rather replaces bandpass filters, which it acknowledges as known in the prior art, by a processor implementing a Discrete Fourier Transform (DFT), see page 2, lines 59 to 63.

5.8 The appellant also argued at the oral proceedings that D6 does not discriminate control signals from non-control signals. The Board notes however that pages 1065 to 1067 of D6 discuss with reference to Figure 5 an example of "spectra typically found in communications systems" with two "line components" which are not harmonically related buried in white noise. Indeed, although not explicitly stated in D6, the Board considers that the example given in this passage discusses the specific problem of detecting control tones addressed in the application.
Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:  The Chairman:

M. Kiehl  S. V. Steinbrener