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D E C I S I O N
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:
-

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Boards of Appeal

Chambres de recours

Case Number: T 0395/98 - 3.5.1

D E C I S I O N
of the Technical Board of Appeal 3.5.1
of 17 July 2001

Appellant: AT&T Corp.
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Representative: David S. Weitzel
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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

        D2: Patent Abstracts of Japan, vol. 010, no. 110
             (P-450) & JP-A-60 238 984.

        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 similiarity 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:

       D6:   David J. Thomson, "Spectrum Estimation and Harmonic Analysis", Proc. IEEE, vol. 70, no. 9, September 1982, pages 1055 to 1096.

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 explictly 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

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