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Datasheet for the decision
of 14 July 2017

Case Number: T 2418/12 - 3.5.07

Application Number: 05102959.3

Publication Number: 1587011

IPC: G06F17/30

Language of the proceedings: EN

Title of invention:
Related term suggestion for multi-sense queries

Applicant:
Microsoft Technology Licensing, LLC

Headword:
Related-term suggestion/MICROSOFT TECHNOLOGY LICENSING

Relevant legal provisions:
EPC Art. 56

Keyword:
Inventive step - all requests (no)

Decisions cited:
T 0154/04, T 1784/06, T 1928/06, T 1358/09, T 0042/10,
T 2230/10, T 1370/11, T 1734/11, T 2439/11, T 1742/12

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Case Number: T 2418/12 - 3.5.07

D E C I S I O N
of Technical Board of Appeal 3.5.07
of 14 July 2017

Appellant:	Microsoft Technology Licensing, LLC
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	Redmond, WA 98052 (US)

Representative:	Grünecker Patent- und Rechtsanwälte
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Decision under appeal:	**Decision of the Examining Division of the European Patent Office posted on 18 July 2012 refusing European patent application No. 05102959.3 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chairman	R. Moufang
Members:	R. de Man
	M. Jaedicke

Summary of Facts and Submissions

I.   The applicant (appellant), which at the time was
         Microsoft Corporation, appealed against the decision of
         the Examining Division refusing European patent
         application No. 05102959.3.

II.   With effect from 2 February 2015 the EPO registered a
         transfer of the application to Microsoft Technology
         Licensing, LLC.

III.   The Examining Division decided that the subject-matter
         of claim 1 of the main request and of the then first,
         second and third auxiliary requests lacked inventive
         step in view of the following document:

         D5: Chuang, S.-L. and Chien, L.-F.: "Automatic Query
             Taxonomy Generation for Information Retrieval
             Applications", Online Information Review, Vol. 27,
             No. 4, 2003, pp. 243-255.

IV.   In the statement of grounds of appeal, the appellant
         maintained the main request, withdrew the first
         auxiliary request and maintained the second and third
         auxiliary requests considered in the decision under
         appeal as first and second auxiliary requests.

V.   In a communication accompanying a summons to oral
         proceedings, the Board raised a number of clarity
         objections and expressed the preliminary view that the
         subject-matter of claim 1 of each request lacked
         inventive step both over a notorious general-purpose
         computer and over document D5.

VI.   In a letter dated 14 June 2017, the appellant
         maintained its main request and first and second

auxiliary requests as main request and auxiliary requests II and III, respectively, and submitted new auxiliary requests I and IV.

VII.   Oral proceedings were held on 14 July 2017. At the end of the oral proceedings, the chairman pronounced the Board's decision.

VIII.   The appellant's final requests were that the decision under appeal be set aside and that a patent be granted on the basis of the claims of the main request filed with letter of 22 May 2012 or, alternatively, on the basis of the claims of one of auxiliary request I filed with letter of 14 June 2017, auxiliary request II filed with letter of 22 May 2012 as second auxiliary request, auxiliary request III filed as third auxiliary request during oral proceedings before the Examining Division on 28 June 2012 and auxiliary request IV filed with letter of 14 June 2017.

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

"A computer-implemented method for related term suggestion

characterized by

using a configurable threshold value to assign a historical query term (108) to have a high frequency of occurrence, so-called FOO, when this historical query term (108) occurs at least a threshold number of times, and to assign a historical query term (108) to have a low FOO, when this historical query term (108) occurs less than a threshold number of times;

generating term clusters (138) as a function of
calculated similarity of term vectors (136), each term
vector (136) being generated from search results
associated with the term (108) which is a term of a set
of high FOO historical query terms (116) previously
submitted to a search engine (126), wherein the
calculated similarity, *sim(q_j, q_k)*, is determined as
follows:

$$sim(q_j, q_k) = \sum_{i=1}^{d} w_{ij} \cdot w_{ik} ;$$

wherein weight *w* for the ith vector's j^{th} term is
calculated as follows:

$$w_{ij} = TF_{ij} x \log(N / DF_j),$$

wherein TF_{ij} represents term frequency, *N* is a total
number of query terms, and DF_j is a number of extracted
feature records that contain term j;

responsive to receiving a term from an entity,
evaluating the term in view of matches of the term
(108) with terms in the term clusters (138) to identify
one or more related term suggestions, wherein a multi-
sense query comprises the term (108); and

returning at least one suggested term list (110),
wherein the terms within each list are ordered by a
combination of FOO and confidence value, wherein
multiple suggested term lists are generated when the
term matches terms in more than one term cluster, the
lists are ordered by term cluster sizes, and wherein
the confidence value is defined as:

$$dist(q_j, q_k) = 1 - sim(q_j, q_k).$$

"

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

"A computer-implemented method for related term
suggestion for a multi-sense query

characterized by

using a configurable threshold value to assign a
historical query term (108) to have a high frequency of
occurrence, so-called FOO, when this historical query
term (108) occurs in historical queries at least a
threshold number of times, and to assign a historical
query term (108) to have a low FOO, when this
historical query term (108) occurs in the historical
queries less than a threshold number of times, wherein
the historical queries include query terms previously
submitted to a search engine (132);

generating term clusters (138) as a function of
calculated similarity of term vectors (136), each term
vector (136) being generated from search results
associated with the term (108) which is a term of a set
of high FOO historical query terms (116) previously
submitted to a search engine (126), wherein the
calculated similarity, $sim(q_j, q_k)$, is determined as
follows:

$$sim(q_j, q_k) = \sum_{i=1}^{d} w_{ij} \cdot w_{ik} ;$$

wherein weight w for the ith vector's j^{th} term is
calculated as follows:

$$w_{ij} = TF_{ij} x \log(N / DF_j),$$

wherein TF_{ij} represents term frequency, i.e., a number
of occurrences of term j in the ith record, N is a

total number of query terms, and DF_j is a number of extracted feature records that contain term j;

responsive to receiving a term from an entity, evaluating the term in view of matches of the term (108) with terms in the term clusters (138) to identify one or more related term suggestions, wherein a multi-sense query comprises the term (108), wherein a match is one of an exact match or a match with a small number of variations such as singular/plural forms, misspellings, punctuation marks; and

returning at least one suggested term list (110), wherein the terms within each list are ordered by a combination of FOO and confidence value, wherein multiple suggested term lists are generated when the term matches terms in more than one term cluster, the lists are ordered by term cluster sizes, and wherein the confidence value is defined as:

$$dist\left(q_j, q_k\right) = 1 - sim\left(q_j, q_k\right).$$

"

XI.   Claim 1 of auxiliary request II differs from claim 1 of the main request in that the following text has been added at the end of the claim:

"wherein the term clusters are a first set of term clusters (138), and wherein the method further comprises:

determining that there is no match between the term and the terms; and

responsive to the determining:

making a second set of term clusters from calculated
similarity of term vectors (136), each term vector
(136) being generated from search results associated
with a set of low FOO historical query terms (122)
previously submitted to the search engine (126); and

evaluating the term (108) in view of terms of the
second set of term clusters (138) to identify one or
more related term suggestions;

wherein making further comprises:

identifying the low FOO historical query terms (116)
from historical query terms (116) mined from a query
log (118);

sending respective ones of at least a subset of the low
FOO historical query terms (116) to the search engine
(126) to obtain search results;

extracting features from at least a subset of search
results; and

producing the term vectors (136) from the features as a
function of term (108) and inverted term frequencies;
and

further comprising after clustering:

determining that there is no match between the term
(108) and term(s) from the first set of term clusters
(138), the first set being based on high FOO historical
query terms (116); and

responsive to the determining, identifying a match
between the term (108) and term(s) from one or more of

the second set of term clusters (138), the second set
being based on low FOO historical query terms (116);
and

responsive to identifying, generating related term
suggestion(s) comprising the term(s)."

XII.   Claim 1 of auxiliary request III differs from claim 1
       of auxiliary request II in that after "producing the
       term vectors ... inverted term frequencies" the
       following text has been inserted:

       "wherein the making the second set of term clusters is
       performed using a trained classifier (140), generated
       from high FOO query terms;"

XIII. Claim 1 of auxiliary request IV differs from claim 1 of
       auxiliary request I in that the following text has been
       added at the end of the claim:

       "otherwise,

           generating a trained classifier (140) from the term
           clusters (138) which are based on high FOO query
           terms (120) by using a statistical classification
           and machine learning technique;

           sending low FOO query terms (122), one by one, to
           the search engine (132) and receiving corresponding
           search results (130);

           extracting extracted features (134) from the search
           results (132), and generating term vectors (136)
           therefrom;

           classifying the term vectors (136) generated from

the low FOO query terms (122) in view of the
trained classifier (140) to generate respective
term clusters (138) based on the low FOO query
terms (122);

generating a suggested term list (110) from the
terms from the term clusters (138) based on the low
FOO query terms (122) that are determined to be
substantially similar to the term (108); and

sending the suggested term list (110) to the
entity."

XIV.   The appellant's arguments as relevant to this decision
        are discussed in detail below.

Reasons for the Decision

1.   The appeal complies with the provisions referred to in
        Rule 101 EPC and is therefore admissible.

2.   *The invention*

2.1   The background section of the description highlights
        the importance of identifying popular keywords relevant
        to a website, in particular in the context of search
        engine result optimisation (paragraphs [0003] and
        [0004] of the description of the application as filed).
        To allow relevant keywords to be identified without
        human intervention, the application proposes an
        automated method for "related term suggestion".

2.2   This method starts with a set of "historical query
        terms" obtained from query logs. Given a "bid term", it
        produces one or more ordered lists of query terms

related to the bid term (paragraphs [0006], [0039] and [0040]; Figure 2). The terms in each list are meant to relate to a particular "sense" of the bid term, corresponding to the context in which the bid term is used (paragraphs [0015] and [0032]). One example is given in Table 1 on page 8 of the application as filed, which shows that the "mail" bid term results in one list of query terms related to the context "online e-mail" and another list of query terms related to the context "traditional mail" (paragraphs [0021] to [0023]).

2.3   The method first divides the historical query terms into a set of query terms having a high frequency of occurrence (FOO) in the historical query logs and a set of query terms having a low FOO. A historical query term is a "high FOO" query term if the number of times it occurs is greater than or equal to a configurable threshold value (paragraph [0025]). The high-FOO query terms are then assigned to "term clusters" on the basis of their mutual "similarities" (paragraph [0040]; paragraphs [0030] and [0031]).

2.4   The "similarity" of two high-FOO query terms is determined as follows. For each query term, a "term vector" is constructed from a textual search result associated with the query term (paragraphs [0025] to [0028]). A term vector is a vector whose dimensions correspond to keywords occurring in the search result. The value of a dimension is the "term frequency-inverse document frequency" (tf-idf) score of the corresponding keyword, which is a measure of the FOO of the keyword in the search result (paragraph [0029]). The similarity between two query terms is then determined by calculating the inner product of their (normalised) term vectors, which is equivalent to calculating the

cosine of the angle between the two vectors (cf. paragraph [0030]). Effectively, this gives a measure of the textual similarity of the corresponding search results.

2.5   According to paragraph [0031], the generation of "term clusters" of "similar" query terms is performed by means of the known "density-based clustering algorithm" (DBSCAN).

2.6   As explained in paragraph [0032], after generation of the term clusters, a bid term received from an "entity" (such as a user) is "matched" with the query terms in the various term clusters. This matching operation involves a string-based comparison and looks for an exact or partial match. For each term cluster containing a query term that matches the bid term, a "term list" is returned consisting of the query terms in the term cluster ordered "by a combination of FOO and confidence value", where the confidence value is based on the "similarity" between the query term and the bid term. In case of matches with multiple term clusters, the returned term lists are ordered by term cluster size (paragraph [0033]).

2.7   The procedure may be extended to low-FOO query terms if no match is found between the received bid term and a high-FOO query term (paragraphs [0040] and [0041]; Figures 2 and 3). In this case, search results and corresponding term vectors are also generated for the low-FOO query terms, and expanded term clusters are constructed by means of a "classifier" trained on the term clusters generated from the high-FOO query terms (paragraphs [0034] to [0037]). The bid term is then matched against the expanded term clusters (paragraph [0038]).

3.   *Main request – inventive step*

3.1   Claim 1 defines a computer-implemented method for
         "related term suggestion" as described in points 2.2
         to 2.6 above.

         Apart from the statement that the method is "computer-
         implemented", the only further reference to technical
         means occurs in the feature "each vector being
         generated from search results associated with the term
         which is a term of a set of high FOO historical query
         terms previously submitted to a search engine". The
         Board considers, however, that the words "previously
         submitted" do not express the submission of query terms
         to a search engine as a step of the claimed method but
         - in so far as they limit the claimed subject-matter -
         only characterise the informational content of the
         query terms and, arguably, the search results.

         The remaining features of claim 1 express the algorithm
         underlying the computer-implemented method in terms of
         linguistic and statistical functional features. Such
         features, which "as such" fall under the exclusions of
         Article 52(2) and (3) EPC, provide a technical
         contribution only to the extent that they interact with
         the technical subject-matter of the claim for solving a
         technical problem (see decision T 154/04, OJ EPO 2008,
         46, reasons 5, under (F), and reasons 13).

3.2   The algorithm underlying claim 1 serves the overall
         purpose of suggesting query terms that are semantically
         related to the various "senses" of a particular input
         term. This is not a technical problem, for whether
         terms are "related" to each other is a cognitive or
         linguistic matter and not a technical issue (cf.

decisions T 1358/09 of 21 November 2014, reasons 5.2;
T 2230/10 of 3 July 2015, reasons 3.9; and T 2439/11 of
11 November 2016, reasons 4.5).

Nevertheless, a technical interaction may be present if
technical considerations motivating the algorithm's
design can be identified that make the algorithm
particularly suitable for being performed on a computer
and that "go beyond merely finding a computer algorithm
to carry out some procedure" (cf. decision T 1358/09,
reasons 5.5).

3.3   In the statement of grounds of appeal, the appellant
        submitted that the claimed ordering of terms within a
        suggested-term list based on "confidence value"
        involved such technical considerations, because it re-
        used the similarity measure that had been calculated in
        a previous method step. Those technical considerations
        allowed an algorithm for related-term suggestion with
        reduced computational effort to be implemented.

        In the Board's view, however, the consideration that an
        intermediate result produced by an earlier algorithmic
        step may be re-used in a later step is an algorithmic
        rather than a technical consideration, as it does not
        require considerations about the internal functioning
        of a computer. This is in line with the case law of the
        boards of appeal, which generally holds that
        algorithmic efficiency is not a technical effect (cf.
        decisions T 1784/06 of 21 September 2012,
        reasons 3.1.2; T 42/10 of 28 February 2013,
        reasons 2.11; T 1370/11 of 11 March 2016, reasons 10
        to 10.5).

3.4   At the oral proceedings, the appellant argued that the
        claimed use of a "configurable threshold value" was a

technical aspect, because it made the method more
flexible and allowed its use in more circumstances.

The Board considers the use of a threshold value for
distinguishing between high-FOO and low-FOO query terms
to be a purely algorithmic choice and therefore not a
technical aspect. Making this value "configurable"
arguably is technical, at least to the extent that it
implies the presence of an input mechanism allowing the
user to configure the value. But parameter
configuration and its advantages are well known in the
art.

3.5   The appellant also argued that finding related terms by
        "matching" the bid term with the query terms in the
        term cluster was technical, because matching strings
        was computationally efficient.

        The claim is silent, however, on the technical
        implementation of the matching operation. The argument
        therefore again relies on the claimed method being
        algorithmically efficient, which is not a technical
        effect.

3.6   The Board therefore concludes that the algorithm
        underlying the computer-implemented method of claim 1
        provides no technical contribution. Implementing the
        algorithm on a computer, including a facility for
        configuring the threshold value, is a routine exercise
        for the skilled person; in fact, the claim merely
        recites the term "computer-implemented", and the
        description contains no technical details of the
        software implementation.

3.7   As explained in point 3.1 above, the Board does not
        interpret the expression "a set of high FOO query terms

previously submitted to a search engine" as a step of
the claimed method. In any event, once the non-
technical decision has been made to base the related-
term suggestion algorithm on the textual content of
search results associated with historical query terms,
it is obvious to obtain such search results by
submitting the terms to a search engine.

3.8   The subject-matter of claim 1 of the main request
       therefore lacks inventive step over a notorious
       general-purpose computer (Article 56 EPC).

3.9   The Board notes that the Examining Division took
       document D5 as closest prior art. Document D5 relates
       to a method for automatically generating a "query
       taxonomy". Like the method of the present application,
       it starts with a set of queries q, constructs
       associated term vectors v_q by means of conventional tf-
       idf techniques from "highly ranked search-result
       snippets" returned by Web search engines or information
       retrieval systems and takes the cosine of the angle
       between term vectors as a measure of the similarity
       between the corresponding queries (see section 3). The
       queries are then classified into clusters on the basis
       of their mutual similarities (section 4). Term
       suggestion is mentioned as one of the possible
       applications of the query taxonomy thus generated
       (section 7).

3.10   Although the teaching of document D5 in terms of
       purpose and common features may be "closer" to the
       claimed invention than a notorious general purpose
       computer, this does not invalidate the Board's finding
       of lack of inventive step over a notorious general
       purpose computer: Article 56 EPC requires the claimed
       invention to be non-obvious having regard to the state

of the art. Thus, there is no need for the Board to
consider whether the same conclusion of lack of
inventive step would be reached when starting from
document D5 (see e.g. decisions T 1928/06 of
20 October 2009, reasons 1.3.2; T 1734/11 of
13 January 2015, reasons 5.4; and T 1742/12 of
22 June 2016, reasons 6.6 and 10.3).

4.   *Auxiliary request I – inventive step*

Claim 1 of auxiliary request I differs from claim 1 of
the main request in a number of clarifications. Since
these clarifications do not affect the inventive-step
reasoning given above, the subject-matter of claim 1 of
auxiliary request I likewise lacks inventive step
(Article 56 EPC).

5.   *Auxiliary requests II and III – inventive step*

5.1   The features added to claim 1 of each of auxiliary
requests II and III extend the method for related-term
suggestion to low-FOO query terms, as described in
point 2.7 above.

Claim 1 of auxiliary request III is more precise, in
that the added feature "wherein the making the second
set of term clusters is performed using a trained
classifier, generated from high FOO query terms"
clarifies that the classification of the low-FOO query
terms into term clusters is based on the clusters
formed from high-FOO query terms.

5.2   The Board observes that claim 1 of both requests refers
to a "second set" of term clusters to be generated on
the basis of the low-FOO historical query terms,
suggesting that the low-FOO query terms are clustered

into a set of clusters separate from the clusters
containing the high-FOO query terms, and not into
"expanded term clusters", as the teaching disclosed in
paragraph [0038] does. At the oral proceedings, the
appellant submitted that the words "second set" may be
understood as distinguishing the original (first) set
of unexpanded term clusters from the set of expanded
term clusters, i.e. the original term clusters but now
including the low-FOO query terms.

The Board accepts this interpretation for the purpose
of assessing inventive step in respect of auxiliary
requests II and III.

5.3   The method according to claim 1 of auxiliary requests
        II and III hence implements a two-step term clustering
        approach. In the first step, the high-FOO query terms
        are taken all together and divided into clusters by
        means of a clustering algorithm. In the second step,
        the remaining low-FOO query terms are added one by one
        to the clusters formed in the first step by means of a
        "trained classifier". The appellant argued that
        classifying all query terms using this two-step
        approach was computationally more efficient than
        classifying them all in a single step, which would have
        been the approach taken by the skilled person.

        However, the claimed two-step approach still concerns
        the algorithm and is, in the Board's view, not based on
        technical considerations going beyond "merely finding a
        computer algorithm". That the approach may be more
        efficient than other approaches (which would however
        depend on the specific clustering algorithm used and on
        its implementation), and also less straightforward,
        would be relevant if the algorithm were technical. But
        the Board considers that it is not.

5.4   The definition of the second step explicitly states
       that the search results from which the term vectors for
       the low-FOO query terms are generated are obtained by
       "sending respective ones of at least the subset of the
       low FOO historical query terms to the search engine".

       Submitting a query term to a search engine to obtain
       search results is technical, but it is also obvious
       once the non-technical decision has been made to base
       the related-term suggestion algorithm on the textual
       content of search results associated with historical
       query terms (cf. point 3.7 above).

5.5   The final aspect of claim 1 of both requests to be
       considered is the decision to add the low-FOO query
       terms to the term clusters formed from high-FOO query
       terms only if no match is found between the received
       bid term and the high-FOO query terms. Since it is
       reasonable to assume that the term clusters generated
       by the method are not used only once for a single bid
       term but are used to find related terms for multiple
       received bid terms, this decision has the effect that
       the returned results do not include low-FOO query terms
       until the first bid term is received that does not
       match any of the high-FOO query terms. Since the Board
       cannot see any technical effect in this, and the
       appellant has not alleged any, this aspect, too, cannot
       support an inventive step.

5.6   Hence, the subject-matter of claim 1 of auxiliary
       requests II and III lacks inventive step (Article 56
       EPC).

6.   *Auxiliary request IV – inventive step*

6.1   Claim 1 of auxiliary request IV, despite differences in
          wording, largely corresponds to claim 1 of auxiliary
          request III. It adds that the "trained classifier" is
          generated by means of a "statistical classification and
          machine learning technique". It refers to "term
          clusters based on the low FOO query terms" rather than
          a "second set of term clusters", but the Board agrees
          with the appellant that this may still be interpreted
          as referring to the "expanded term clusters" discussed
          in paragraph [0038] of the description (cf. point 5.2
          above).

6.2   The reference to a "statistical classification and
          machine learning technique" limits the choice of
          algorithm used for assigning low-FOO query terms to an
          appropriate term cluster, but this algorithmic feature
          does not render the non-technical algorithm technical.

6.3   The Board therefore concludes that the subject-matter
          of claim 1 of auxiliary request IV also lacks inventive
          step (Article 56 EPC).

7.   *Conclusion*

          Since none of the appellant's substantive requests is
          allowable, the appeal is to be dismissed.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

I. Aperribay   R. Moufang

Decision electronically authenticated