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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte MARC DYMETMAN

Appeal 2016-008434
Application 13/572,817
Technology Center 2600

Before ALLEN R. MacDONALD, JOHN P. PINKERTON, and

MacDONALD, Administrative Patent Judge.

DECISION ON APPEAL
STATEMENT OF CASE


We affirm.

Exemplary Claims

Exemplary claims 1, 9, and 16 under appeal read as follows:

1. A non-transitory storage medium storing instructions executable by an electronic data processing device to perform a max-string evaluation of a weighted finite state automaton (WFSA) $A$ having initial state $q_0$ and final state $q_f$ by operations including:

   generating an unweighted automaton $B$ having the same states as the WFSA $A$ and having unweighted transitions corresponding only to the transitions of the WFSA $A$ having strictly positive weights;

   performing a powerset construction on the unweighted automaton $B$ to generate a deterministic automaton $B'$ having states $Q$ including an initial state $Q_0$ corresponding to the initial state $q_0$ of the WFSA $A$ and a final state $Q_f$ corresponding to the final state $q_f$ of the WFSA $A$;

   for each state $Q'$ of the deterministic automaton $B'$ (1) defining a set of points $L_{Q'}$, representing all vectors $w' = w \cdot a_{QQ'}$ where $a_{QQ'}$ is a transition label of a dominator of a predecessor state $Q$ connecting predecessor state $Q$ with state $Q'$ and $w$ is a prefix of the transition label $a_{QQ'}$ in predecessor state $Q$ and (2) determining a set of dominators $S_{Q'}$ in $L_{Q'}$ such that $L_{Q'}$ is included in $hull(S_{Q'})$;

   identifying the dominant vector $w_f$ in the final state $Q_f$ such that $L_{Q_f}$ is included in $hull(w_f)$; and
following backpointers from the dominant vector $w_f$ to the initial state $Q_0$ to generate the \textit{max-string} result.

9. A method to perform a \textit{max-string} evaluation of a weighted finite state automaton (WFSA) $A$ having initial state $q_0$ and final state $q_f$ wherein the paths through the WFSA $A$ define a vocabulary of strings representing possible natural language translations or transcriptions of natural language content, the method comprising:

(i) generating an unweighted automaton $B$ having the same states as the WFSA $A$ and having unweighted transitions corresponding only to the transitions of the WFSA $A$ having strictly positive weights;

(ii) generating a deterministic automaton $B'$ from the unweighted automaton $B$, the deterministic automaton $B'$ having states $Q$ including an initial state $Q_0$ corresponding to the initial state $q_0$ of the WFSA $A$ and a final state $Q_f$ corresponding to the final state $q_f$ of the WFSA $A$;

(iii) for each state $Q'$ of the deterministic automaton $B'$ including the final state $Q_f$ (1) defining a set of points $L_{Q'}$ representing all vectors $w' = w \cdot a_{QQ'}$ where $a_{QQ'}$ is a transition label of a dominator of a predecessor state $Q$ connecting predecessor state $Q$ with state $Q'$ and $w$ is a prefix of the transition label $a_{QQ'}$ in predecessor state $Q$ and (2) determining a set of dominators $S_{Q'}$ in $L_{Q'}$ such that $L_{Q'}$ is included in $\text{hull}(S_{Q'})$ where $\text{hull}(\ldots)$ is one of the convex-hull, the ortho-hull, and the ortho-convex-hull;

(iv) identifying the dominant vector $w_f$ in the final state $Q_f$ such that $L_{Q_f}$ is included in $\text{hull}(w_f)$;

(v) following backpointers from the dominant vector $w_f$ to the initial state $Q_0$ to generate the \textit{max-string} result $x$ that maximizes the sum of the weights of all paths of the WFSA $A$ that yield the string $x$; and
(vi) one of (1) generating a target natural language translation of source language content as the generated max-string result \( x \) and (2) generating a transcription of audio content as the generated max-string result \( x \);

wherein the operations (i), (ii), (iii), (iv), (v), and (vi) are performed by an electronic data processing device.

16. An apparatus comprising:

an electronic data processing device programmed to:

- construct a weighted finite state automaton (WFSA) having an initial state and a final state wherein the paths through the WFSA define a vocabulary of strings representing possible natural language translations or transcriptions of natural language content;
- perform a max-string evaluation of the WFSA by operations including:
  - (i) generating an unweighted automaton having the same states as the WFSA and having unweighted transitions corresponding only to the transitions of the WFSA having strictly positive weights;
  - (ii) generating a deterministic automaton from the unweighted automaton, the deterministic automaton having states including an initial state corresponding to the initial state of the WFSA and a final state corresponding to the final state of the WFSA;
  - (iii) for each state \( Q' \) of the deterministic automaton (1) defining a set of points \( L_{Q'} \) representing all vectors \( w' = w \cdot a_{QQ} \) where \( a_{QQ} \) is a transition label of a dominator of a predecessor state \( Q \) connecting predecessor state \( Q \) with state \( Q' \) and \( w \) is a prefix of the transition label \( a_{QQ} \) in predecessor state \( Q \) and (2) determining a set of dominators \( S_Q \) in \( L_{Q'} \) such that \( L_{Q'} \) is included in a
region defined by the set of dominators $S_Q$ and encompassing the set of points $L_Q$;

(iv) identifying the dominant vector $w_f$ in the final state $Q_f$ of the deterministic automaton that defines a region that encompasses the set of points $L_{Q_f}$; and

(v) following backpointers from the dominant vector $w_f$ to the initial state $Q_0$ to generate the max-string result $x$ that maximizes the sum of the weights of all paths of the WFSA that yield the string $x$; and

generate a natural language translation or transcription of the natural language content as the generated max-string result $x$.

**Rejection on Appeal**


**Appellant’s Contentions**

1. Appellant contends that the Examiner erred in rejecting claims 16–20 under 35 U.S.C. § 101 because:

**Claim 16 recites significantly more than the abstract idea of performing a max string evaluation to generate a max string result.** To wit, claim 16 additionally recites construct[ing] a weighted finite state automaton (WFSA) having an initial state and a final state wherein the paths through the WFSA define a vocabulary of strings representing possible natural language translations or transcriptions of natural language content. Claim 16 then recites perform[ing] a max-string evaluation of the WFSA. Thereafter, claim 16 recites generat[ing] a natural language translation or transcription of the natural language content as the generated max-string result $x$. In analyzing
whether claim 16 recites significantly more than merely performing a max string evaluation to generate a max string result, this ordered combination of limitations must be considered.

This ordered combination of elements transform the nature of claim 16 from the abstract idea of merely performing a max string evaluation into reciting a solution to an outstanding problem in the area of machine translation and transcription, namely the problem of computing a natural language translation or transcription in a way that both (1) uses the preferred max string path through the constructed WFSA defining a vocabulary of strings representing possible natural language translations or transcriptions (rather than using the more computationally convenient max path surrogate, and (2) performs the translation in a computationally efficient manner. Claim 16 thus recites significantly more than the (allegedly) patent ineligible concept of performing a max string evaluation.

The present claims can be closely analogized to the situation addressed by the Federal Circuit in Research Corp. v. Microsoft Corp. [As stated in Research Corp.]:

. . .

The invention presents functional and palpable applications in the field of computer technology. These inventions address a need in the art for a method of and apparatus for the halftone rendering of gray scale images in which a digital data processor is utilized in a simple and precise manner to accomplish the halftone rendering. . . . This court notes that inventions with specific applications or improvements to technologies in the marketplace are not likely to be so abstract that they override the statutory language and framework of the Patent Act.

This court also observes that the claimed methods incorporate algorithms and formulas that control the
masks and halftoning. These algorithms and formulas, even though admittedly a significant part of the claimed combination, do not bring this invention even close to abstractness that would override the statutory categories and context. The Supreme Court has already made abundantly clear that inventions incorporating and relying upon even a well known mathematical equation do not lose eligibility because several steps of the process use that mathematical equation.

Likewise, claim 16 presents functional and palpable applications in the field of machine translation and transcription. Claim 16 addresses a need in the art for machine translation or transcription in which a max string evaluation is performed to achieve accurate machine translation in a computationally efficient manner. Claim 16 is directed to specific applications or improvements to technologies in the marketplace, namely machine translation and transcription systems which are increasingly being used to translate documents available on the Internet or elsewhere, to perform automatic dictation, or so forth. The last paragraph of the immediately above-quoted passage of Research Corp. also refutes the Examiner’s position that the mere fact that claim 16 involves solving a “mathematical problem” makes it patent ineligible.

App. Br. 11–12, 14–15, Appellant’s emphasis and citations omitted, panel’s emphasis added.

2. In the Reply Brief, further as to above contention 1, Appellant also contends that the Examiner erred in rejecting claims 16–20 under 35 U.S.C. § 101 because:

In arguing for maintaining the rejection of claim 16, the Examiner’s Answer now appears to argue to the contrary that the alleged “abstract idea” is the entirety of claim 16 excepting the very last line reading “generate a natural language translation or transcription of the natural language content as the generated
The Examiner now appears to argue the abstract idea is the combination of construct[ing] a weighted finite state automaton (WFSA) having an initial state and a final state wherein the paths through the WFSA define a vocabulary of strings representing possible natural language translations or transcriptions of natural language content and perform[ing] a max-string evaluation of the WFSA.

Respectfully, at most this bulk of claim 16 might, arguendo, constitute a combination of two different abstract ideas: the first being constructing a WFSA whose paths define a vocabulary of strings representing possible natural language translations or transcriptions of natural language content, and the second being performing a max-string evaluation of a WFSA.

The combination of these two ideas, together with the yet further recitation of generat[ing] a natural language translation or transcription of the natural language content as the generated max-string result x, constitutes significantly more than any single abstract idea that might be argued to be present in claim 16, and accordingly claim 16 is patent eligible under Section 101. Claim 16 . . . is directed to a functional and palpable application in the field of machine translation and transcription, which improves upon the state of the art in the machine translation or transcription field by utilizing an improved max string evaluation to achieve accurate machine translation in a more computationally efficient manner. This recited improvement in the field of machine translation and transcription does not lose its patent eligibility merely because some, or even a significant portion, of the claimed combination recites an algorithm or formula.

Reply Br. 5–6, Appellant’s emphasis and citations omitted, panel’s emphasis added.

3. Appellant also contends that the Examiner erred in rejecting claims 9–15 under 35 U.S.C. § 101 because:

Claim 9 is directed to significantly more than merely performing a max string evaluation. The ordered combination
of elements of claim 9 transform the nature of claim 9 from the abstract idea of merely performing a max string evaluation into reciting a solution to an outstanding problem in the area of machine translation and transcription, namely the problem of computing a natural language translation or transcription in a way that both (1) uses the preferred max string path through the constructed WFSA defining a vocabulary of strings representing possible natural language translations or transcriptions (rather than using the more computationally convenient max path surrogate, and (2) performs the translation in a computationally efficient manner. Claim 9 thus recites significantly more than the (allegedly) patent ineligible concept of performing a max string evaluation.

Claim 9 manifestly does not pre-empt all uses of the (alleged) abstract idea of performing a max string evaluation. Rather, claim 9 is directed to functional and palpable applications in the fields of machine translation and transcription. Claim 9 addresses a need in the art for machine translation or transcription in which a max string evaluation is performed to achieve accurate machine translation in a computationally efficient manner. Claim 9 is directed to specific applications or improvements to machine translation and transcription, which are increasingly being used to translate documents available on the Internet or elsewhere, to perform automatic dictation, or so forth.

App. Br. 16–17, Appellant’s emphasis and citations omitted, panel’s emphasis added.

4. In the Reply Brief, further as to above contention 3, Appellant also contends that the Examiner erred in rejecting claims 9–15 under 35 U.S.C. § 101 because:

The Examiner’s Answer performs Step 2A by identifying the abstract idea as “generating an unweighted automaton ... generating a deterministic automaton B’ from the unweighted automaton B ... for each state Q’ of the deterministic automaton B’ ... identifying the dominant vector \( W_f \) ... following
backpointers from the dominant vector $W_f$ ... that yield the string $x$.

The Examiner’s Answer then performs Step 2B by arguing that claim 9 recites the additional limitation of “generating a target natural language translation of source language content as the generated max-string result $x$ and [sic] generating a transcription of audio content as the generated max-string result $x.$” In arguing this does not constitute "significantly more" so as to satisfy Step 2B, the Examiner argues this is equivalent to “apply it” or “apply the abstract idea”.

However, even starting, *arguendo*, with the Examiner’s proposed abstract idea of generating a max-string result $x$, claim 9 recites a combination including significantly more than the single isolated additional limitation addressed by the Examiner.

More fully, claim 9 recites a method to perform a max-string evaluation of a weighted finite state automaton (WFSA) $A$ having initial state $q_0$ and final state $q_f$ wherein the paths through the WFSA $A$ define a vocabulary of strings representing possible natural language translations or transcriptions of natural language content, ... comprising ... one of (1) generating a target natural language translation of source language content as the generated max-string result $x$ and (2) generating a transcription of audio content as the generated max-string result $x$.

*Claim 9 thus does not merely recite “apply the max-string algorithm” or anything remotely that abstract.* Rather, claim 9 is directed to the field of machine translation and transcription, and the recited method outputs a functional and palpable result, namely a translation or transcription of source language content into a target language.

Reply Br. 3–4, Appellant’s emphasis and citations omitted, panel’s emphasis added.
5. Appellant also contends that the Examiner erred in rejecting claims 1–8 under 35 U.S.C. § 101 because:

Unlike claims 9 and [16], claim 1 is not directed to a machine translation or transcription task. Accordingly, the arguments of the previous sections directed to claims 9 and [16] are not applicable to claim 1.

... It appears ... that the Office Action is again identifying the abstract idea as “generating a max string result”. Appellants respectfully traverse.

... 

[T]he combination of operations recited in claim 1 transform the WFSA structure to generate the max string result. Moreover, this combination of operations recited in claim 1 is not a well-understood, routine, conventional activity that was previously known to the industry, but rather presents an inventive concept. That this is an inventive concept is recognized by the Examiner, who has never applied any art-based rejection against claim 1 during the prosecution of this case.

App. Br. 18–20, Appellant’s emphasis and citations omitted, panel’s emphasis added.

6. In the Reply Brief, further as to above contention 3, Appellant also contends that the Examiner erred in rejecting claims 1–8 under 35 U.S.C. § 101 because:

The Examiner’s Answer begins its arguments directed to claim 1 by repeating the above statement. Reference is made back to the responsive arguments presented in the Appeal Brief.

The remainder of the arguments of the Examiner’s Answer directed to claim 1 is a quotation of MPEP § 2106.02. However, MPEP § 2106.02 was removed over three years ago, in Revision
Issue on Appeal

Did the Examiner err in rejecting claims 1–20 as failing to recite patent-eligible subject matter?

ANALYSIS

We have reviewed the Examiner’s rejections in light of Appellant’s arguments that the Examiner has erred. We disagree with Appellant’s conclusions. Except as noted herein, we adopt as our own: (1) the findings and reasons set forth by the Examiner in the action from which the appeal is taken (Final Act. 2–6); and (2) the reasons set forth by the Examiner in the Examiner’s Answer (Ans. 2–8) in response to the Appellant’s Appeal Brief. We concur with the conclusions reached by the Examiner. We highlight the following.

As to Appellant’s above contentions 1 and 2, we are not persuaded the Examiner erred. In Alice Corp. Pty. Ltd. v. CLS Bank Int’l, 134 S. Ct. 2347, (2014), the Supreme Court articulated the required analysis for distinguishing patents that claim laws of nature, natural phenomena, and abstract ideas (which are not patent eligible under 35 U.S.C. § 101) from patents that claim patent-eligible applications of these concepts. Alice Corp., 134 S. Ct. at 2355. The first step in the analysis is to determine
whether the claims at issue are directed to a patent-ineligible concept, such as an abstract idea. \textit{Id.} If the claims are directed to a patent-ineligible concept, then the second step in the analysis is to consider the elements of the claims individually and as an ordered combination to determine whether the additional elements transform the nature of the claim into a patent-eligible application. \textit{Id.}  

With respect to the first step in the analysis, the Examiner finds that claim 16 is directed to a mathematical algorithm for performing a \textit{max-string} evaluation and generating a \textit{max-string} result, which is an abstract idea (\textit{see} Final Act. 3–4; \textit{see also} Ans. 4–5), and Appellant does not contest this finding. \textit{See} App. Br. 8–15; \textit{see also} Reply Br. 5–6. Thus, we agree with the Examiner that claim 16 is directed to an abstract idea.

With respect to the second step in the analysis, we agree with the Examiner that claim 16 does not recite any additional limitations that amount to significantly more than the abstract idea. \textit{See} Ans. 5. As found by the Examiner, claim 16 merely recites mathematical algorithm steps (i.e., “generating an unweighted automaton,” “generating a deterministic automaton from the unweighted automaton,” “for each state $Q'$ of the deterministic automaton $B'$ (1) defining a set of points . . . and (2) determining a set of dominators,” “identifying the dominant vector $w_f$,” and “following backpointers from the dominant vector $w_f$ . . . that yield the string $x$”) that do not amount to more than the mathematical algorithm. \textit{See} Ans. 4–5. As also found by the Examiner, claim 16 further recites an additional limitation of generating a translation or transcription using the result of the mathematical algorithm (i.e., “generate a natural language translation or transcription of the natural content as the generated \textit{max-string}
result \( x' \)”), but this additional limitation is merely the equivalent of an instruction to apply the mathematical algorithm in either a translation or transcription context, because the additional limitation fails to explain how the translation or transcription is generated from the result of the mathematical algorithm. See Ans. 5. Thus, we agree with the Examiner that claim 16 does not recite any additional limitations that amount to significantly more than the abstract idea.

Further, regarding Appellant’s argument that claim 16 can be closely analogized to the claims at issue in Research Corp. v. Microsoft Corp., 627 F.3d 859 (Fed. Cir. 2010), we disagree with Appellant. In Research Corp., the Federal Circuit observed that the claim was not solely directed to the algorithms and formulas used to control the half-toning of gray scale images against a blue noise mask, but, instead, was directed to the overall half-toning technique that utilized the aforementioned algorithms and formulas. See Research Corp., 627 F.3d at 969. This is in contrast to the Examiner’s finding that claim 16 is essentially directed to the mathematical algorithm for performing a max-string evaluation and generating a max-string result. See Ans. 4–5.

Claim 16 is more similar to the claims at issue in In re Grams, 888 F.2d 835 (Fed. Cir. 1989). In Grams, the Federal Circuit affirmed the rejection of claims relating to a method of testing a complex system to determine whether a system condition is normal as non-statutory subject matter under 35 U.S.C. § 101. See Grams, 888 F.2d at 841. The Federal Circuit held that, the claims were not statutory because they were essentially directed to the underlying mathematical algorithm itself, and that the presence of a physical step in the claim to derive data for the mathematical
The algorithm did not render the claims statutory. See Grams, 888 F.2d at 840. Like the claims at issue in Grams, claim 16 is essentially directed to the mathematical algorithm for performing a max-string evaluation and generating a max-string result, and the presence of an additional limitation of generating a translation or transcription using the result of the mathematical algorithm does not render the claims patent-eligible. Thus, we conclude claim 16 does not recite patent-eligible subject matter.

As to Appellant’s above contentions 3 and 4, we are not persuaded the Examiner erred. Claim 9 is substantially similar to claim 16, in that claim 9 merely recites steps of a mathematical algorithm for performing a max-string evaluation and generating a max-string result, and further recites an additional limitation of generating a translation or transcription using the result of the mathematical algorithm. Further, the Examiner’s findings regarding claim 9 are substantially similar to the findings regarding claim 16 (see Final Act. 3–4; see also Ans. 5–6), and Appellant’s above contentions 3 and 4 are substantially similar to Appellant’s above contentions 1 and 2. See Appeal Br. 16–17; see also Reply Br. 3–4. Thus, for reasons discussed above, we agree with the Examiner’s findings that: (a) claim 9 is directed to an abstract idea; and (b) claim 9 does not recite any additional limitations that amount to significantly more than the abstract idea.

As to Appellant’s above contentions 5 and 6, we are not persuaded the Examiner erred. As found by the Examiner (see Ans. 6) and as uncontested by Appellant (see App. Br. 18), unlike claims 9 and 16, claim 1 solely recites steps of a mathematical algorithm for performing a max-string evaluation and generating a max-string result, and does not recite an additional limitation of generating a translation or transcription using the
result of the mathematical algorithm.¹ Thus, claim 1 is even more similar to the claims at issue in Grams. Thus, for reasons substantially similar to the reasons discussed above, we agree with the Examiner’s findings that: (a) claim 1 is directed to an abstract idea; and (b) claim 1 does not recite any additional limitations that amount to significantly more than the abstract idea.²

CONCLUSIONS


(2) Claims 1–20 are not patentable.

DECISION

We affirm the Examiner’s rejections of claims 1–20 as failing to recite patent-eligible subject matter under 35 U.S.C. § 101.

¹ Claims 6 and 7 recite an additional limitation of generating a translation or transcription, respectively, using the result of the mathematical algorithm. However, for the reasons discussed above, these additional limitations do not amount to significantly more than the mathematical algorithm.

² While we agree with Appellant that the reference to Section 2106.02 of the Manual of Patent Examining Procedure (“MPEP”) in the Examiner’s Answer is a reference to an outdated section of the MPEP (see Reply Br. 2–3; see also Ans. 6–7), this does not alter our conclusion that the Examiner made the correct ultimate finding that claim 1 fails to recite patent-eligible subject matter.
No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(1)(iv).

AFFIRMED